City of San Diego

CONTRACTOR'S NAME: Stanek Constructor, Inc.
ADDRESS: 2434 Auto Park Way, Suite 102, Escondido, CA 92029
TELEPHONE NO.: 760-871-0102 **FAX NO.:** 760-871-0100
CITY CONTACT: Lisa Nguyen - Contract Specialist, Email: LTNguyen@sandiego.gov
Phone No. (619) 533-3435, Fax No. (619) 533-3633
I.DaRosa / RWBustamante /Lad

CONTRACT DOCUMENTS

FOR

ORIGINAL

MBC - ODOR CONTROL FACILITY UPGRADES

VOLUME 1 OF 2

BID NO.:	K-16-6313-DBB-3
SAP NO. (WBS/IO/CC):	S-00323
CLIENT DEPARTMENT:	2011
COUNCIL DISTRICT:	6
PROJECT TYPE:	BO

THIS CONTRACT IS SUBJECT TO THE FOLLOWING:

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

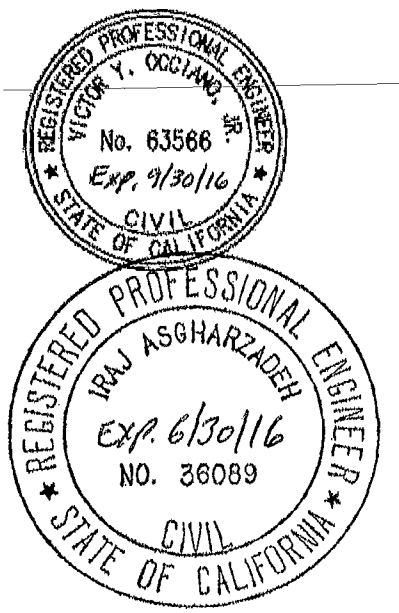
BID DUE DATE:

2:00 PM
SEPTEMBER 10, 2015
CITY OF SAN DIEGO
PUBLIC WORKS CONTRACTS
1010 SECOND AVENUE, 14th FLOOR, MS 614C
SAN DIEGO, CA 92101

ENGINEER OF WORK

The engineering Specifica tions and Special Provisi ons contained herein have been prepared by or under the direction of the following Registered Engineer:

1) Registered Engineer	July 21, 2015 Date	Seal:
2) For City Engineer	7-21-15 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 - Odor Control Facility Upgrades** (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. **Environmental Protection Agency (EPA)** - In accordance with EPA's Program for Utilization of Small, Minority Disadvantaged and Women Business Enterprises in procurement under Federal assistance programs, the Contractor agrees to the applicable "fair share" objectives negotiated with EPA as follows:

   4.6. **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.

4.7. 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.

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

4.9. 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 August 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, BidsOnlineTM 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: At 1:00PM
Date: August 11, 2015
Location: MBC Main Lobby, 5240 Convoy St. 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 links to the online prequalification application are available at:

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

11.2. The completed application must be submitted online to the Public Works Contracts, Prequalification Program no later than 2 weeks prior to the bid opening. For additional information or the answer to questions about the prequalification program, contact David Stucky at 619-533-3474 or dstucky@sandiego.gov.

11.3. As a result of the City's fiduciary requirement to safeguard vendor data, City staff will not be able to provide information regarding contractors' prequalification status over the telephone. Contractors may access real-time information about their prequalification status via their vendor profile on PlanetBids™.

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
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 bidder who is not selected for contract award may protest the award of a contract to another bidder by submitting a written protest in accordance with section 22.3017 of the San Diego Municipal Code.

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. REQUIRED DOCUMENT SCHEDULE:

31.1. 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.

31.2. 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
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

ITEM	WHEN DUE	FROM	DOCUMENT TO BE SUBMITTED
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 4 WORKING DAYS OF BID OPENING WITH GOOD FAITH EFFORT DOCUMENTATION	ALL BIDDERS	EPA FORM 334 – Utilization Report Form
22.	PRIOR TO PRE-CONSTRUCTION MEETING	APPARENT LOW BIDDER	Contractor's Experience and Past Project Documentation. See Technical Specifications Section 01080
23.	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
24.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	If the Contractor is a Joint Venture: • Joint Venture Agreement • Joint Venture License
25.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Form BB05 - Work Force Report

ITEM	WHEN DUE	FROM	DOCUMENT TO BE SUBMITTED
26.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contract Forms - Agreement
27.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contract Forms - Payment and Performance Bond
28.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Certificates of Insurance and Endorsements
29.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contractor Certification - Drug-Free Workplace
30.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contractor Certification - American with Disabilities Act
31.	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 CONSTRUCTOR, INC., herein called "Contractor" for construction of **MBC - Odor Control Facility Upgrades**; Bid No. **K-16-6313-DBB-3**; in the amount of FIVE MILLION NINTY SEVEN HUNDRED THOUSAND 00/100 ($5,097,000.00), which is comprised of the Base Bid alone.

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) Phased Funding Schedule Agreement.

   (e) That certain documents entitled **MBC - Odor Control Facility Upgrades**, on file in the office of the Public Works Department as Document No. **S-00323**, 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 - Odor Control Facility Upgrades**, Bid Number **K-16-6313-DBB-3**, San Diego, California.

3. For such performances, the City shall pay to Contractor the amounts set forth at the times and in the manner and with such additions or deductions as are provided for in this contract, and the Contractor shall accept such payment in full satisfaction of all claims incident to such performances.

4. No claim or suit whatsoever shall be made or brought by Contractor against any officer, agent, or employee of the City for or on account of anything done or omitted to be done in connection with this contract, nor shall any such officer, agent, or employee be liable hereunder.

5. This contract is effective as of the date that the Mayor or designee signs the agreement.

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

THE CITY OF SAN DIEGO

By _____

Print Name: ALBERT P. RECHANY
Albert P. Rechany, Deputy Director

Date: 12/15/15

APPROVED AS TO FORM

Jan I. Goldsmith, City Attorney

By _____

Print Name: Christine Leone
Deputy City Attorney

Date: 12/15/15

CONTRACTOR

By _____

Print Name: George E. Fook

Title: Vice President

Date: 11-3-15

City of San Diego License No.: B2008006605

State Contractor's License No.: 869424

CONTRACT FORMS

ATTACHMENTS

Bond No. 0196165
Premium: $38,164.00

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 Five Million Ninety-Seven Thousand and NO/100 Dollars ($5,097,000.00) for the faithful performance of the annexed contract, and in the sum of Five Million Ninety-Seven Thousand and NO/100 Dollars ($5,097,000.00) for the benefit of laborers and materialmen designated below.

Conditions:

If the Principal shall faithfully perform the annexed contract **MBC - Odor Control Facility Upgrades**, Bid Number **K-16-6313-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

Jan I. Goldsmith, City Attorney

By_____
Deputy City Attorney

Approved:

By:_____
Albert P. Rechany
Deputy Director
Public Works Contracting Group

Stanek Constructors, Inc.
Principal

By_____

George E. Fooke
Printed Name of Person Signing for Principal

Berkley Insurance Company
Surety

By_____
Kristen L. McCormick, Attorney-in-fact
CA License #0E46980

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 $ 38,164.00

Bond No. 0196165

STATE OF COLORADO

COUNTY OF DENVER } SS

On October 26, 2015 before me Michele K. Delimont

PERSONALLY APPEARED Kristen L. McCormick

personally known to me (or 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.

WITNESS my hand and official seal.

Signature Michele K. Delimont

Michele K. Delimont

My Commission Expires: February 25, 2018

MICHELE K DELIMONT
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20144009025
MY COMMISSION EXPIRES FEBRUARY 25, 2018

This area for Official Notarial Seal

OPTIONAL

Though the data below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent reattachment of this form.

CAPACITY CLAIMED BY SIGNER

- ☐ INDIVIDUAL
- ☐ CORPORATE OFFICER

TITLE(S)

- ☐ PARTNER(S) ☐ LIMITED ☐ GENERAL
- ☒ ATTORNEY-IN- FACT
- ☐ TRUSTEE(S)
- ☐ GUARDIAN/CONSERVATOR
- ☐ OTHER

SIGNER IS REPRESENTING:
NAME OF PERSON(S) OR ENTITY(IES)
Berkley Insurance Company

DESCRIPTION OF ATTACHED DOCUMENT

TITLE OF TYPE OF DOCUMENT

NUMBER OF PAGES

DATE OF DOCUMENT

SIGNER(S) OTHER THAN NAMED ABOVE

ALL PURPOSE ACKNOWLEDGEMENT

No. BI-7724a

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.

(Seal)

Attest:
By _____
Ira S. Lederman
Senior Vice President & Secretary

Berkley Insurance Company
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

_____
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

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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 - Odor Control Facility Upgrades**

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

(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 E. Foote

Title Vice President

CONTRACTOR CERTIFICATION

AMERICAN WITH DISABILITIES ACT (ADA) COMPLIANCE CERTIFICATION

PROJECT TITLE: **MBC - Odor Control Facility Upgrades**

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

(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 - Odor Control Facility Upgrades**

I declare under penalty of perjury that I am authorized to make this certification on behalf of Stacy & Witbeck Constructors, as Contractor, that I am familiar with the requirements of City of San Diego Municipal Code § 22.3004 regarding Contractor Standards as outlined in the WHITEBOOK, Section 7-13.4, ("Contractor Standards"), of the project specifications, and that Contractor has complied with those requirements.

I further certify that each of the Contractor's subcontractors whose subcontracts are greater than $50,000 in value has completed a Pledge of Compliance attesting under penalty of perjury of having complied with City of San Diego Municipal Code § 22.3004.

Dated this 3rd Day of Nov, 2015.

Signed _____

Printed Name George E. Foote

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 - Odor Control Facility Upgrades
(Name of Project)

as particularly described in said contract and identified as Bid No.: **K-16-6313-DBB-3**; SAP No. (WBS/IO/CC): **S-00323**; and **WHEREAS**, the specification of said contract requires the Contractor to affirm that "all brush, trash, debris, and surplus materials resulting from this project have been disposed of in a legal manner"; and **WHEREAS**, said contract has been completed and all surplus materials disposed of:

_____

_____

_____

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

_____

_____

_____

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

Dated this _____ DAY OF _____, _____.

_____ Contractor
by

ATTEST:

State of _____
County of _____

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

Notary Public in and for said County and State

ATTACHMENTS

ATTACHMENT A

SCOPE OF WORK

SCOPE OF WORK

1. **SCOPE OF WORK:** The scope of work includes several areas within the project location. A summary of the work within each area is provided below. Refer to the plans for more details.

1.1. The Work shall be performed in accordance with:

1.1.1. The Notice Inviting Bids and Plans numbered **37241-001-D** through **37241-238-D,** inclusive.

1.2. Area 60 (Chemical Building and Odor Control System)

1.2.1. Demolish or remove and dispose of portions of ductwork as shown on the plans.

1.2.2. Demolish and dispose existing heat exchanger shell and replace with spool pieces as shown on the plans.

1.2.3. Remove and dispose abandoned hot water piping, temperature sensors and other instrumentation as indicated on the plans.

1.2.4. Replace existing spool piece at fan inlet with new open/close dampers for all trains.

1.2.5. Perform structural retrofits to framing as indicated on plans.

1.2.6. Provide access platforms, catwalks, ladders, and stairways for accessing overhead equipment and control instrumenation as indicated on the plans.

1.2.7. Relocate electrical conduits as required for installing structural retrofits, catwalks and access platforms.

1.2.8. Remove existing motor starters and replace with variable frequency drives (VFDs) as indicated on the plans.

1.2.9. Remove existing instrumentation and wiring as indicated on the plans.

1.2.10. Provide new terminal boxes, local control panels, wiring, I/O points, and modifications as indicated on the plans to tie in new equipment to the distributed control system (DCS).

1.2.11. Once modifications have been completed in all the areas, readjust fan speeds as required to comply with the required airflow capacities.

1.3. Area 76 (Grit Removal Facility and Centrifuge Building)

1.3.1. Demolish and dispose of portions of ductwork in the Grit Room as shown on the plans.

1.3.2. Remove and dispose existing channels at hatch opening of the Thickened Solids Wet Well in the Centrifuge Room.

1.3.3. Remove existing level sensor in the Thickened Solids Wet Well.

1.3.4. Provide new structural framing and hatch cover as indicated on the plans.

1.3.5. Provide new light fixture and switch in place of the level sensor as indicated on plans.

1.3.6. Separate the Grit Room into a general ventilation area and a foul air collection area:

1. Provide partition framing columns as indicated on structural plans.
2. Provide structural framing as shown on plans.
3. Provide non-slip metal plate on existing grating as shown on plans.
4. Install fiberglass reinforced plastic (FRP) deck to isolate areas as shown on plans.
5. Install FRP partition walls on framing; in some locations, partition walls need to be cut to fit around existing obstructions including pipes and conduits.
6. Provide ingress/egress doors and access windows in partition walls as shown on plans.
7. Provide new exhaust air openings and registers as indicated on plans.

1.3.7. Prepare plans and specifications for any changes that are required to the building sprinkler system and obtain relevant permits from the City. If minor modifications or no changes are required, obtain a no-plan permit from the City.

1.3.8. Install new roof opening, inline exhaust air fan, and ductwork routed to Area 86 as indicated.

1.3.9. Install new window-mounted room exhaust fan and weatherhood on the second floor.

1.3.10. Re-hang door on second floor of the Grit Room as indicated on plans.

1.3.11. Replace existing starters for all three Area 76 foul air fans with VFDs. See electrical plans for details on conduits, motor control panels, requirements for wiring, I/O points, and modifications to the DCS.

1.4. Area 86 (Dewatered Biosolids Storage Building and Truck Loadout Facility)

1.4.1. Demolish and dispose of portions of foul air ductwork in the building as shown on the plans.

1.4.2. Demolish and dispose of portions of supply air ductwork as shown on the plans.

1.4.3. Provide new structural framing as shown on the structural plans.

1.4.4. Install new foul air ductwork in the Truck Loadout area and connect to existing foul air ductwork as well as new ductwork (from Area 76) as shown.

1.4.5. Install new FRP "fumehood" in each Truck Loading lane and connect new ductwork to hood.

1.4.6. Install new supply air ductwork and registers as shown on plans.

1.4.7. Provide non-slip metal plate on existing grating (second floor) as shown on plans.

1.4.8. Install fiberglass reinforced plastic (FRP) deck to isolate areas as shown on plans.

1.4.9. Install floor drains and drain piping below non-slip metal plate.

1.4.10. Relocate electrical conduits, drain lines, sensors, junction boxes, closed circuit cameras, lighting fixtures, and other equipment as required for installing structural framing and new ductwork.

1.4.11. Prepare plans and specifications for any changes that are required to the building sprinkler system and obtain relevant permits from the City. If minor modifications or no changes are required, obtain a no-plan permit from the City.

1.4.12. Replace existing starters for all Area 86 foul air fans with VFDs. See electrical plans for details on conduits, motor control panels, requirements for wiring, I/O points, and modifications to the DCS.

1.5. Area 94 (Wastewater Pump Station and Secondary Odor Control System)

1.5.1. Demolish or remove and dispose of portions of ductwork as shown on the plans.

1.5.2. Demolish and dispose existing heat exchanger shell and replace with spool pieces as shown on the plans.

1.5.3. Remove and dispose abandoned hot water piping, temperature sensors and other instrumentation as indicated on the plans.

1.5.4. Remove and dispose existing chemical day tanks, metering pumps, valves, and piping within chemical pad and containment area as shown.

1.5.5. Remove existing motorized valves at the recirculation pumps and replace with hand-operated valves as indicated on plans. Re-pipe scrubber recirculation pumps and piping to allow either pump to service either train.

1.5.6. Inside the wet well, cut and remove portion of safety railing required for installing water cannon as shown. Install water cannon and connect to existing recycled water pressure line.

1.5.7. Perform structural retrofits to framing as indicated on plans.

1.5.8. Provide access platforms, catwalks, ladders, and stairways for accessing overhead equipment and control instrumenation as indicated on the plans.

1.5.9. Relocate electrical conduits as required for installing structural retrofits, catwalks and access platforms.

1.5.10. Remove existing motor starters and replace with variable frequency drives (VFDs) as indicated on the plans.

1.5.11. Remove existing instrumentation and wiring as indicated on the plans.

1.5.12. Provide new terminal boxes, local control panels, wiring, I/O points, and modifications as indicated on the plans to tie in new equipment to the distributed control system (DCS).

1.5.13. Once modifications have been completed in all the areas, readjust fan speeds as required to comply with the required airflow capacities.

1.6. General Items

1.6.1. Provide submittals and shop drawings as outlined in the Contract Documents.

1.6.2. Conduct testing, provide O&M training and manuals as outlined in the Contract Documents.

2. **CONSTRUCTION COST:** The City's estimated construction cost for this contract is **$4,794,000**.

3. **LOCATION OF WORK:** Metropolitan Biosolids Center
5240 Convoy Street
San Diego, CA 92111

4. **CONTRACT TIME:** The Contract Time for completion of the Work shall be **270 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.

#16

PHASED FUNDING SCHEDULE AGREEMENT

Check one:

☒ First Phased Funding Schedule Agreement

☐ Final Phased Funding Schedule Agreement

BID NUMBER: K-16-6313-DBB-3

CONTRACT OR TASK TITLE: MBC- Odor Control Facility Upgrades

CONTRACTOR: Stanek Constructors, Inc.

Funding Phase	Phase Description	Phase Start	Phase Finish	Not-to-Exceed Amount
1	Bonds, Permits, and Mobilization. Electrical, Mechanical, Instrumentation, and Structural Submittals. Demolition work included in the following areas: Area 60 Mechanical Systems such as heat exchangers, ductwork, electrical, and control instrumentation to 2 of the 3 trains of the Odor Control System. Area 76 Mechanical Systems such as ductwork, grilles, and building such as door, window, and roof opening. Area 86 Mechanical Systems such as ductwork, and grilles, and building such as roof skylight. Area 94 Chemical tanks, pumps, motorize valves, piping, platforms, concrete pads, electrical panels and wiring, and water piping. Construction work included in the following areas: Area 60 To 2 of the 3 trains of the Odor Control System construct the following: Mechanical Systems such as motorized dampers, valves, ductwork and fittings. Relocation of existing electrical conduits & wiring, and new electrical conduits & wiring. New structural supports to equipment and ductwork, structural platforms, catwalks, ladders, and safety railing. Coating and	NTP	8/31/2016	$3,197,000.00

	painting. Instrumentation controls to mechanical systems. **Area 76** Building systems including partition wall, access doors, ductwork and piping supports, and roof opening. Mechanical systems including booster fan, ductwork, grilles, and ductwork fittings. Electrical conduits and wiring. **Area 86** Exhaust Hood and non-slip solid metal plate over load-out area. Mechanical systems ductwork, grilles, and ductwork fittings. Structural railing system and supports for hood, ductwork, and piping Electrical conduits and wiring. **Area 94** Mechanical Systems install valves, ductwork fittings and water cleaning system (water canon)to wet well. Relocation of existing electrical conduits & wiring, and new electrical conduits & wiring. New structural supports to equipment and ductwork, structural platforms, catwalks, ladders, and safety railing.			
2	**Area 60** Demolish Mechanical Systems such as heat exchangers, ductwork, electrical, and control instrumentation on the remaining train of the Odor Control System. To remaining train of the Odor Control System construct the following: Mechanical Systems such as motorized dampers, valves, ductwork and fittings. Relocation of existing electrical conduits & wiring, and new electrical conduits & wiring. New structural supports to equipment and ductwork, structural platforms, catwalks, ladders, and safety railing. Coating and painting. Instrumentation controls to mechanical systems. Air Balance the complete Odor Control System. Provide Testing and Start-up **Area 76, 86, & 94** Mechanical, Electrical, and Instrumentation systems integration. Coating and painting.	9/1/2016	NOC	$1,900,000.00

	Air Balance the complete Odor Control System. Provide Testing and Start-up			
			Total	$5,097,000.00

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: Idalmiro Manuel Da Rosa
Project Manager

Department Name: Public Works, E&CP, AE&P

Date: 10-26-15

CONTRACTOR

By: _____

Name: George Foote

Title: Vice President/Operations Manager

Date: 10-23-15

-END OF PHASED FUNDING SCHEDULE AGREEMENT-

ATTACHMENT C

EQUAL OPPORTUNITY CONTRACTING PROGRAM

EQUAL OPPORTUNITY CONTRACTING PROGRAM REQUIREMENTS

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

D. CITY'S EQUAL OPPORTUNITY COMMITMENT.

1. Nondiscrimination in Contracting Ordinance.

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

   The Contractor shall not discriminate on the basis of race, gender, religion, national origin, ethnicity, sexual orientation, age, or disability in the solicitation, selection, hiring, or treatment of subcontractors, vendors, or suppliers. The Contractor shall provide equal opportunity for subcontractors to participate in subcontracting opportunities. The Contractor understands and agrees that violation of this clause shall be considered a material breach of the contract and may result in contract termination, debarment, or other sanctions.

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

2. Disclosure of Discrimination Complaints. As part of its Bid or Proposal, the Bidder shall provide to the City a list of all instances within the past 10 years where a complaint was filed or pending against Bidder in a legal or administrative proceeding alleging that Bidder discriminated against its employees, subcontractors, vendors, or suppliers, and a description of the status or resolution of that complaint, including any remedial action taken.

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

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

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

E. EQUAL EMPLOYMENT OPPORTUNITY OUTREACH PROGRAM.

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

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

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

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

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

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

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

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

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

the time, place, employees present, subject matter, and disposition of meetings.

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

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

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

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

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

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

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

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

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

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

14. The Contractor develops and maintains documentation for on-the-job training opportunities, participates in training programs, or both for all of its employees, including people of color and women, and establishes

apprenticeship, trainee, and upgrade programs relevant to the Contractor's employment needs.

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

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

ATTACHMENT D

CLEAN WATER STATE REVOLVING FUND (CWSRF)

FUNDING AGENCY PROVISIONS

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

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

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

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

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

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

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

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

2. EQUAL OPPORTUNITY CLAUSES:

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

1. The equal opportunity clause located 41 CFR 60.1.4(a), which specifies the obligations imposed under Executive Order 11246.

2. The equal opportunity clause located at 41 CFR 60-741.5, which contains the obligations imposed by Section 503 of the Rehabilitation Act of 1973.

3. The "Equal Opportunity Clause" (Resolution No. 765092) filed on December 4, 1978, in the Office of the City Clerk, San Diego, California and incorporated in the "Standard Federal Employment Opportunity Construction Contract Specifications (Executive Order 11246 - Document No. 769023, filed September 11, 1984, in the Office of the City Clerk, San Diego, California) is applicable to all non-exempt City construction contracts and subcontracts of $2,000 or more.

4. Age Discrimination Act of 1975, Pub. L. 94-135.

5. Title VI of the Civil Rights Act of 1964, Pub. L. 88-352.

6. Section 13 of the Federal Water Pollution Control Acts Amendments of 1972, Pub. L. 92-5200 (the Clean Water Act).

7. Section 504 of the Rehabilitation Act of 1973, Pub. L. 93-112 (Executive Orders 11914 and 11250).

8. Women's Minority Business Enterprises, Executive Orders 11625, 12138 and 12432.

9. Section 129 of the Small Business Administration Reauthorization and Amendment Act of 1988, Pub. L. 100-590.

3. STANDARD FEDERAL EQUAL EMPLOYMENT SPECIFICATIONS:

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

3.2. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions The Contractor shall document these efforts fully, and shall implement affirmative 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 sections1810 through 1815.

8.6. **Required Provisions for Subcontracts.** Contractor shall include at a minimum a copy of the following provisions in any contract they enter into with a subcontractor: California Labor Code sections 1771, 1771.1, 1775, 1776, 1777.5, 1810, 1813, 1815, 1860 and 1861.

8.7. **Labor Code Section 1861 Certification.** Contractor in accordance with California Labor Code section 3700 is required to secure the payment of compensation of its employees and by signing this Contract, Contractor certifies that "I am aware of the provisions of Section 3700 of the California Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this Contract."

8.8. **Labor Compliance Program**. The City has its own Labor Compliance Program authorized in August 2011 by the DIR. The City will withhold contract payments when payroll records are delinquent or deemed inadequate by the City or other governmental entity, or it has been established after an investigation by the City or other governmental entity that underpayment(s) have occurred. For questions or assistance, please contact the City of San Diego's Equal Opportunity Contracting Department at 619-236-6000.

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

with the DIR in compliance with Labor Code sections 1771.1 and 1725.5, and Contractor shall provide proof of registration to the City upon request.

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

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

General Decision Number: CA150001 07/24/2015 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
4	05/29/2015
5	06/19/2015
6	07/10/2015
7	07/17/2015
8	07/24/2015

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/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 06/01/2015

	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

ELEC0569-006 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 06/01/2015

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

HOLIDAYS: New Year's Day, M.L. King Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day and day after Thanksgiving, Christmas Day

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ELEV0018-001 01/01/2015

	Rates	Fringes
ELEVATOR MECHANIC	$ 49.90	28.38

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

Labor Day, Veterans Day, Thanksgiving Day, Friday after Thanksgiving, and Christmas Day.

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* ENGI0012-003 07/06/2015

	Rates	Fringes
OPERATOR: Power Equipment (All Other Work)		
GROUP 1	$ 39.95	23.35
GROUP 2	$ 40.73	23.35
GROUP 3	$ 41.02	23.35
GROUP 4	$ 42.51	23.35
GROUP 5	$ 41.86	23.35
GROUP 6	$ 41.83	23.35
GROUP 8	$ 42.84	23.35
GROUP 9	$ 42.19	23.35
GROUP 10	$ 42.96	23.35
GROUP 11	$ 42.31	23.35
GROUP 12	$ 43.13	23.35
GROUP 13	$ 43.23	23.35
GROUP 14	$ 43.26	23.35
GROUP 15	$ 43.34	23.35
GROUP 16	$ 43.46	23.35
GROUP 17	$ 43.63	23.35
GROUP 18	$ 43.73	23.35
GROUP 19	$ 43.84	23.35
GROUP 20	$ 43.96	23.35
GROUP 21	$ 44.13	23.35
GROUP 22	$ 44.23	23.35
GROUP 23	$ 44.34	23.35
GROUP 24	$ 44.46	23.35
GROUP 25	$ 44.63	23.35
OPERATOR: Power Equipment (Cranes, Piledriving & Hoisting)		
GROUP 1	$ 41.30	23.35
GROUP 2	$ 42.08	23.35
GROUP 3	$ 42.37	23.35
GROUP 4	$ 42.51	23.35
GROUP 5	$ 42.73	23.35
GROUP 6	$ 42.84	23.35
GROUP 7	$ 42.96	23.35
GROUP 8	$ 43.13	23.35
GROUP 9	$ 43.30	23.35
GROUP 10	$ 44.30	23.35
GROUP 11	$ 45.30	23.35
GROUP 12	$ 46.30	23.35
GROUP 13	$ 47.30	23.35

OPERATOR: Power Equipment
(Tunnel Work)

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

PREMIUM PAY:

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

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

SEE ZONE DEFINITIONS AFTER CLASSIFICATIONS

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

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

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

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

GROUP 4: Asphalt plant fireman; Backhoe operator (mini-max or

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

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

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

GROUP 8: Asphalt or concrete spreading operator (tamping or finishing); Asphalt paving machine operator (Barber Greene or similar type); Asphalt-rubber distribution operator;

Backhoe operator (up to and including 3/4 yd.), small ford, Case or similar; Cast-in-place pipe laying machine operator; Combination mixer and compressor operator (gunite work); Compactor operator (self-propelled); Concrete mixer operator (paving); Crushing plant operator; Drill Doctor; Drilling machine operator, Bucket or auger types (Calweld 150 bucket or similar types - Watson 1500, 2000 2500 auger or similar types - Texoma 700, 800 auger or similar types - drilling depth of 60' maximum); Elevating grader operator; Grade checker; Gradall operator; Grouting machine operator; Heavy-duty repairman; Heavy equipment robotics operator; Kalamazoo balliste regulator or similar type; Kolman belt loader and similar type; Le Tourneau blob compactor or similar type; Loader operator (Athey, Euclid, Sierra and similar types); Mobark Chipper or similar; Ozzie padder or similar types; P.C. slot saw; Pneumatic concrete placing machine operator (Hackley-Presswell or similar type); Pumpcrete gun operator; Rock Drill or similar types; Rotary drill operator (excluding caisson type); Rubber-tired earth-moving equipment operator (single engine, caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds. up to and including 50 cu. yds. struck); Rubber-tired earth-moving equipment operator (multiple engine up to and including 25 yds. struck); Rubber-tired scraper operator (self-loading paddle wheel type-John Deere, 1040 and similar single unit); Self-propelled curb and gutter machine operator; Shuttle buggy; Skiploader operator (crawler and wheel type over 1-1/2 yds. up to and including 6-1/2 yds.); Soil remediation plant operator; Surface heaters and planer operator; Tractor compressor drill combination operator; Tractor operator (any type larger than D-5 - 100 flywheel h.p. and over, or similar-bulldozer, tamper, scraper and push tractor single engine); Tractor operator (boom attachments), Traveling pipe wrapping, cleaning and bendng machine operator; Trenching machine operator (over 6 ft. depth capacity, manufacturer's rating); trenching Machine with Road Miner attachment (over 6 ft depth capacity): Ultra high pressure waterjet cutting tool system mechanic; Water pull (compaction) operator

GROUP 9: Heavy Duty Repairman

GROUP 10: Drilling machine operator, Bucket or auger types (Calweld 200 B bucket or similar types-Watson 3000 or 5000 auger or similar types-Texoma 900 auger or similar types-drilling depth of 105' maximum); Dual drum mixer, dynamic compactor LDC350 (or similar types); Monorail locomotive operator (diesel, gas or electric); Motor patrol-blade operator (single engine); Multiple engine

tractor operator (Euclid and similar type-except Quad 9 cat.); Rubber-tired earth-moving equipment operator (single engine, over 50 yds. struck); Pneumatic pipe ramming tool and similar types; Prestressed wrapping machine operator; Rubber-tired earth-moving equipment operator (single engine, over 50 yds. struck); Rubber tired earth moving equipment operator (multiple engine, Euclid, caterpillar and similar over 25 yds. and up to 50 yds. struck), Tower crane repairman; Tractor loader operator (crawler and wheel type over 6-1/2 yds.); Woods mixer operator (and similar Pugmill equipment)

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

GROUP 12: Auto grader operator; Automatic slip form operator; Drilling machine operator, bucket or auger types (Calweld, auger 200 CA or similar types - Watson, auger 6000 or similar types - Hughes Super Duty, auger 200 or similar types - drilling depth of 175' maximum); Hoe ram or similar with compressor; Mass excavator operator less tha 750 cu. yards; Mechanical finishing machine operator; Mobile form traveler operator; Motor patrol operator (multi-engine); Pipe mobile machine operator; Rubber-tired earth- moving equipment operator (multiple engine, Euclid, Caterpillar and similar type, over 50 cu. yds. struck); Rubber-tired self- loading scraper operator (paddle-wheel-auger type self-loading - two (2) or more units)

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

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

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

GROUP 16: Rubber-tired earth-moving equipment operator, operating equipment with push-pull system (single engine, over 50 yds. struck); Rubber-tired earth-moving equipment operator, operating equipment with push-pull system

(multiple engine, Euclid, Caterpillar and similar, over 25 yds. and up to 50 yds. struck)

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

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

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

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

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

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

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

earth-moving equipment operator, operating with the tandem push-pull system (multiple engine, up to and including 25 yds. struck)

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

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

CRANES, PILEDRIVING AND HOISTING EQUIPMENT CLASSIFICATIONS

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

GROUP 2: Truck crane oiler

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

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

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

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

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

GROUP 8: Crane operator (up to and including 25 ton capacity); Crawler transporter operator; Derrick barge operator (up to and including 25 ton capacity); Hoist operator, stiff legs, Guy derrick or similar type (up to and including 25 ton capacity); Shovel, backhoe, dragline,

clamshell operator (over 7 cu. yds., M.R.C.)

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

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

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

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

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

TUNNEL CLASSIFICATIONS

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

GROUP 2: Power-driven jumbo form setter operator

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

GROUP 4: Bit sharpener; Equipment greaser (grease truck); Slip form pump operator (power-driven hydraulic lifting device for concrete forms); Tugger hoist operator (1 drum);

Tunnel locomotive operator (over 10 and up to and including 30 tons)

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

GROUP 6: Heavy Duty Repairman

GROUP 7: Tunnel mole boring machine operator

ENGINEERS ZONES

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

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

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

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

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

$2.00 additional per hour for INYO and MONO Counties and the

Northern portion of SAN BERNARDINO County as defined below:

That area within the following Boundary: Begin at the intersection of the northern boundary of Mono County and the California state line at the point which is the center of Section 17, T10N, R22E, Mt. Diablo Meridian. Continue S then SE along the entire western boundary of Mono County, until it reaches Inyo County at the point which is the NE corner of the Western half of the NW quarter of Section 2, T8S, R29E, MDM. Continue SSE along the entire western boundary of Inyo County, until the intersection with Kern County at the point which is the SW corner of the SE 1/4 of Section 32, T24S, R37E, MDM. Continue E along the Inyo and Kern County boundary until the intersection with San Bernardino County at that point which is the SE corner of section 34, T24S, R40E, MDM. Continue E along the Inyo and San Bernardino County boundary until the point which is the NE corner of the Western half of the NW quarter of Section 6, T25S, R42E, MDM. Continue S to that point which is the SW corner of the NW quarter of Section 6, T27S, R42E, MDM. Continue E in a straight line to the California and Nevada state border at the point which is the NW corner of Section 1, T17N, R14E, San Bernardino Meridian. Then continue NW along the state line to the starting point, which is the center of Section 18, T10N, R22E, MDM.

REMAINING AREA NOT DEFINED ABOVE RECIEVES BASE RATE

ENGI0012-004 08/01/2014

	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 07/01/2015

	Rates	Fringes
Ironworkers:		
Fence Erector	$ 27.08	20.21

Ornamental, Reinforcing
and Structural.....$ 33.50 28.85

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 07/01/2014

	Rates	Fringes
LABORER (BUILDING and all other Residential Construction)		
Group 1	$ 27.57	16.19
Group 2	$ 28.25	16.19
Group 3	$ 28.96	16.19
Group 4	$ 29.76	16.19
Group 5	$ 31.69	16.19
LABORER (RESIDENTIAL CONSTRUCTION - See definition below)		
(1) Laborer	$ 25.47	14.52
(2) Cleanup, Landscape, Fencing (Chain Link & Wood)	$ 24.18	14.52

RESIDENTIAL DEFINITION: Wood or metal frame construction of single family residences, apartments and condominums - excluding (a) projects that exceed three stories over a garage level, (b) any utility work such as telephone, gas, water, sewer and other utilities and (c) any fine grading work, utility work or paving work in the future street and

public right-of-way; but including all rough grading work at the job site behind the existing right of way

LABORER CLASSIFICATIONS

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

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

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

any and all other services; Rotary Scarifier or multiple head concrete chipping scaarifier; Steel header board man and guideline setter; Tampers, Barko, Wacker and similar type; Trenching machine, handpropelled

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

GROUP 5: Blasters Powderman-All work of loading holes, placing and blasting of all pwder and explosives of whatever type, regardless of method used for such loading and placing; Driller-all power drills, excluding jackhammer, whether core, diamond, wagon, track, multiple unit, and any and all other types of mechanical drills without regard to the form of motive power.

LABO0089-002 11/01/2012

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

LABO0089-004 07/01/2015

HEAVY AND HIGHWAY CONSTRUCTION

	Rates	Fringes
Laborers:		
Group 1.....	$ 27.57	16.19
Group 2.....	$ 28.25	16.19

Group 3	$ 28.96	16.19
Group 4	$ 29.76	16.19
Group 5	$ 31.69	16.19

LABORER CLASSIFICATIONS

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

GROUP 2: Asphalt abatement; Buggymobile; Cement dumper (on 1 yd. or larger mixers and handling bulk cement); Concrete curer, impervious membrane and form oiler; Chute man, pouring concrete; Concrete cutting torch; Concrete pile cutter; driller/Jackhammer, with drill steel 2 1/'2 feet or longer; Dry pak-it machine; Fence erector; Pipeline wrapper, gas, oil, water, pot tender & form man; Grout man; Installation of all asphalt overlay fabric and materials used for reinforcing asphalt; Irrigation laborer; Kettleman-Potman hot mop, includes applying asphalt, lay-klold, creosote, lime caustic and similar tyhpes of materials (dipping, brushing, handling) and waterproofing; Membrane vapor barrier installer; Pipelayer backup man (coating, grouting, making of joints, sealing caulkiing, diapering including rubber basket joints, pointing); Rotary scarifier, multiple head concrete chipper; Rock slinger; Roto scraper & tiller; Sandblaster pot tender; Septic tank digger/installer; Tamper/wacker operator; Tank scaler & cleaner; Tar man & mortar man; Tree climber/faller, chainb saw operator, Pittsburgh chipper & similar type brush shredders.

GROUP 3: Asphalt, installation of all frabrics; Buggy Mobile Man, Bushing hammer; Compactor (all types), Concrete Curer

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

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

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

LABO0300-005 01/01/2014

	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

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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 07/01/2015

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER		
GROUP 1	$ 26.47	17.32
GROUP 2	$ 28.12	17.32
GROUP 3	$ 30.75	17.27

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 07/01/2015

	Rates	Fringes
PLUMBER, PIPEFITTER, STEAMFITTER		
Camp Pendleton	$ 50.46	20.71
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	$ 45.96	20.71
Work ONLY on new additions and remodeling of commercial buildings, bars, restaurants, and stores not to exceed 5,000 sq. ft. of floor space	$ 44.51	19.73
Work ONLY on strip malls, light commercial, tenant improvement and remodel work	$ 35.16	18.06

PLUM0016-011 07/01/2015

	Rates	Fringes
PLUMBER/PIPEFITTER		
Residential	$ 37.17	16.63

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

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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.

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END OF GENERAL DECISION

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

Applicability

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

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

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

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

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

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

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

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards

Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

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

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

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

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

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

3. Payrolls and basic records. (i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work preserved for a period of 3 years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section l(b)(2)(B) of the Davis-bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has

found under 29 CFR 5.5 (a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section l(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

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

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

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. <u>Semiannual DBE Utilization Reporting:</u>

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. <u>Clean Water State Revolving Fund (CWSRF) Projects Only:</u>

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 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. 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.

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 1st and October 1st of each fiscal year on the Utilization Report form (UR-334).

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 30 Calendar Days. 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
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 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. 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._____

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
9. FORM UR 334: Utilization Report Form

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

United States Environmental Protection Agency

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 DBE[1] subcontractor[2] 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, frim, 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)

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

United States Environmental Protection Agency

Disadvantaged Business Enterprise (DBE) Program
DBE Subcontractor Participation Form

Please use the space below to report any concerns regarding the above EPA-funded project:

Subcontractor Signature	Print Name
Title	**Date**

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 6100-2 (DBE Subcontractor Participation Form)

OMB CONTROL NO. 2090-0030
APPROVED: 05/01/2008
APPROVAL EXPIRES: 12/22/2013

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) ☐ 1st (Oct-Dec) ☐ 2nd (Jan-Mar) ☐ 3rd (Apr-Jun) ☐ 4th (Jul-Sep) ☐☐☐Semi-Annual (Oct-Mar) ☐ Semi-Annual (Apr-Sep) ☐ Annual ☐ Check if this is the last report for the project (Project completed).
1C. REVISION OF A PRIOR REPORT? ☐Yes ☐No Year: _____ Quarter: _____	BRIEFLY DESCRIBE THE REVISIONS YOU ARE MAKING:

2A. 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. ☐☐☐	

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 ☐ No ☐ Were contracts issued under this assistance agreement ? Yes ☐ No ☐

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.)

	Construction	Equipment	Services	Supplies	Total
$MBE:					
$WBE:					

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 Effortwhenever procuring construction, equipment, services, and supplies under an EPA financial assistance agreement. These Good Faith Effortfor 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 Effortoutlined 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 t 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" repor 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 1

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

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

Form with information required to be submitted with the AOA package.

Clean Water State Revolving Fund Loan Program DBE Instructions
FORM 2

DISADVANTAGE BUSINESS ENTERPRISE (DBE)
"GOOD FAITH" EFFORT BIDS RECEIVED LIST

Contractor Name	Category (DBE)	Task Description	Bid Amount	Selected (Check)	Explanation for Not Selecting

Form with information required to be submitted with the AOA package.
January 2009

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			
☐ DBE _____% Ownership			
☐ Prime Contractor		☐ Supplier of Material/Service	
☐ Subcontractor		☐ Broker	
☐ Sole Ownership		☐ Corporation	
☐ Partnership		☐ 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)

<table>
<tr><td colspan="2">CONTRACT RECIPIENTS NAME:</td><td>CONTRACT NO. OR SPECIFICATION NO.:</td></tr>
<tr><td colspan="2">PROJECT DESCRIPTION:</td><td>PROJECT LOCATION:</td></tr>
<tr><td colspan="3">PRIME CONTRACTOR INFORMATION</td></tr>
<tr><td colspan="2">NAME AND ADDRESS (Include Zip Code, Federal Employer Tax ID #):

PHONE:</td><td>AMOUNT OF CONTRACT $</td></tr>
<tr><td colspan="3">DBE INFORMATION</td></tr>
<tr><td colspan="2">☐☐NONE*</td><td></td></tr>
<tr><td colspan="2">☐☐DBE</td><td rowspan="3">NAME AND ADDRESS (INCLUDE ZIP CODE)

PHONE:</td></tr>
<tr><td>☐☐ SUBCONTRACTOR
☐ ☐JOINT VENTURE</td><td>☐☐ SUPPLIER/SERVICE
☐☐ BROKER</td></tr>
<tr><td colspan="2">AMOUNT OF CONTRACT $</td></tr>
<tr><td colspan="3">WORK TO BE PERFORMED</td></tr>
<tr><td colspan="2">☐☐DBE</td><td rowspan="3">NAME AND ADDRESS (INCLUDE ZIP CODE)

PHONE:</td></tr>
<tr><td>☐☐ SUBCONTRACTOR
☐☐ JOINT VENTURE</td><td>☐☐ SUPPLIER/SERVICE
☐☐ BROKER</td></tr>
<tr><td colspan="2">AMOUNT OF CONTRACT $</td></tr>
<tr><td colspan="3">WORK TO BE PERFORMED</td></tr>
<tr><td colspan="2">☐☐DBE</td><td rowspan="3">NAME AND ADDRESS (INCLUDE ZIP CODE)

PHONE:</td></tr>
<tr><td>☐☐ SUBCONTRACTOR
☐☐ JOINT VENTURE</td><td>☐☐ SUPPLIER/SERVICE
☐☐ BROKER</td></tr>
<tr><td colspan="2">AMOUNT OF CONTRACT $</td></tr>
<tr><td colspan="3">WORK TO BE PERFORMED</td></tr>
<tr><td colspan="3">TOTAL DBE AMOUNT: $_____

SIGNATURE OF PERSON COMPLETING FORM:_____

TITLE:_____ PHONE:_____ DATE:_____</td></tr>
</table>

***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

Clean Water State Revolving Fund Loan Program DBE Instructions

FORM 5

SUMMARY OF BIDS RECEIVED FROM SUBCONTRACTOR, SUPPLIERS, AND BROKERS (DBE & NON-DBE)						
THIS SUMMARY IS PREPARED BY THE PRIME CONTRACTOR						
Type of Job	**Company Name**	**Selected**	**Bid Amount**	**DBE**	**NON-DBE**	**Explanation for Not Selecting**
List type of jobs alphabetically, from low to high in each category and selected low bidder.						

January 2009

STATE WATER RESOURCES CONTROL BOARD – DIVISION OF FINANCIAL ASSISTANCE
DISADVANTAGED BUSINESS ENTERPRISE (DBE) UTILIZATION
CLEAN WATER STATE REVOLVING FUND (CWSRF)
FORM UR-334

1. Grant/Finance Agreement Number:	2. Semi-Annual Reporting Period 04/10/__ through 09/30/__ 10/1/__ through 03/30/__	3. Purchase Period of Financing Agreement:
4. Total Payments Paid to Prime Contractor or Sub-Contractors During Current Reporting Period: $		
5. Recipients Name and Address:	6. Recipient's Contact Person and Phone Number:	

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

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

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

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

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

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

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

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 7:00 AM to 4:00 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 35% 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

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

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

Monument Preservation will be performed by City Public Works Field Engineering Division (PW-FED) Field Survey Section on all Projects, unless permission is obtained for these services in writing by PW-FED.

The Contractor shall submit to the Engineer a minimum of 7 Days prior to the start of the Work a list of controlling survey monuments which may be disturbed. The Agency (or the owner on a Private Contract) will:

a) set survey points outside the affected work area that reference and locate each controlling survey monument that may be disturbed,

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

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

2-14.3 **Coordination.** To the City Supplement, ADD the following:

Other City project(s) is (are) scheduled for construction for the same time period at the facility (MBC). Coordinate the Work with the adjacent project(s) as listed below:

a) MBC Dewatering Centrifuges Replacement, Project Manager I. M. da Rosa (619-533-4629)

b) MBC Chemical System Improvements Phase 2, Project Manager I. M. da Rosa (619-533-4629)

SECTION 4 - CONTROL OF MATERIALS

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 later than 5 Working Days after the determination of the Apparent Low Bidder** and on the City's Product Submittal Form available at.

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

SECTION 6 - PROSECUTION, PROGRESS AND ACCEPTANCE OF WORK

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

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

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

SECTION 7 - RESPONSIBILITIES OF THE CONTRACTOR

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

The insurance provisions herein 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:

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

7-3.2.2 Commercial Automobile Liability Insurance.

1. You 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 plus15% 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.

7-3.5.4.2 **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.

7-3.5.4.3 **Severability of Interest.** For Contractors Hazardous Transporters 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.

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

1. For contracts with required engineering services (e.g., Design-Build, preparation of engineered Traffic Control Plans (TCP), etc. by the Contractor) for all of your employees or Subcontractors who provide professional engineering services under this contract, you must keep or must require its Subcontractor keep in full force and effect, Professional Liability coverage with a limit of **$1,000,000** per claim and **$2,000,000** annual aggregate.

2. You must ensure both that: (a) the policy retroactive date is on or before the date of commencement of the Project; and (b) the policy will be maintained in force for a period of 3 years after completion of the Project or termination of this contract whichever occurs last. You agree that for the time period specified above, there will be no changes or endorsements to the policy that affect the specified coverage.

3. If professional engineering services are to be provided solely by the Subcontractor, you must (a) certify this to the City in writing and (b) agree in writing to require the Subcontractor to procure Professional Liability coverage in accordance with the requirements set forth above.

7-4 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:

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

3. By signing and returning the Contract you certify that you are aware of the provisions of §3700 of the Labor Code which 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.

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

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

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

7-20 **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."

ADD:

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 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.

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.

AREA 60 STRUCTURAL WORK

The contract lump sum price paid for "Area 60 Structural Work" includes full compensation for providing all labor, materials, supplies, tools, equipment and incidentals required for furnishing and installing the Area 60 access platforms and 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, 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 which include the plans, the Greenbook, the Whitebook, the Supplementary Special Provisions and the technical specifications.

WORK ASSOCIATED WITH AREA 60

The contract lump sum price paid for "All Other Work Associated with Area 60" includes full compensation for providing all labor, materials, supplies, tools, equipment and incidentals required for demolition as indicated in the plans and technical specifications, furnishing and installing the Area 60 improvements including but not limited to ductwork, mechanical and electrical equipment, and all work required for DCS modifications coordination, system coordination, startups and shutdowns, equipment and systems testing, training of Owner personnel, preparation of the O&M manual, and any other items required for completion of the WORK as indicated in the plans and technical specifications. All WORK shall be complete, in place and operable, in accordance with the requirements of the Contract Documents which include the plans, the Greenbook, the Whitebook, the Supplementary Special Provisions and the technical specifications.

WORK ASSOCIATED WITH AREA 76

The contract lump sum price paid for "All Other Work Associated with Area 76" includes full compensation for providing all labor, materials, supplies, tools, equipment and incidentals required for demolition as indicated in the plans and technical specifications, furnishing and installing the Area 76 improvements including but not limited to ductwork, mechanical and electrical equipment, and all work required for DCS modifications coordination, system coordination, startups and shutdowns, equipment and systems testing, training of Owner personnel, preparation of the O&M manual, and any other items required for completion of the WORK as indicated in the plans and technical specifications. All WORK shall be complete, in place and operable, in accordance with the requirements of the Contract Documents which include the plans, the Greenbook, the Whitebook, the Supplementary Special Provisions and the technical specifications.

WORK ASSOCIATED WITH AREA 86

The contract lump sum price paid for "All Work Associated with Area 86" includes full compensation for providing all labor, materials, supplies, tools, equipment and incidentals required for demolition as indicated in the plans and technical specifications, furnishing and installing the Area 86 improvements including but not limited to ductwork, mechanical and electrical equipment, and all work required for DCS modifications coordination, system coordination, startups and shutdowns, equipment and systems testing, training of Owner personnel, preparation of the O&M manual, and any other items required for completion of the WORK as indicated in the plans and technical specifications. All WORK shall be complete, in place and operable, in accordance with the requirements of the Contract Documents which include the plans, the Greenbook, the Whitebook, the Supplementary Special Provisions and the technical specifications.

AREA 94 STRUCTURAL WORK

The contract lump sum price paid for "Area 94 Structural Work" includes full compensation for providing all labor, materials, supplies, tools, equipment and incidentals required for furnishing and installing the Area 94 access platforms and 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, 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 which include the plans, the Greenbook, the Whitebook, the Supplementary Special Provisions and the technical specifications.

WORK ASSOCIATED WITH AREA 94

The contract lump sum price paid for "All Other Work Associated with Area 94" includes full compensation for providing all labor, materials, supplies, tools, equipment and incidentals required for demolition as indicated in the plans and technical specifications, furnishing and installing the Area 94 improvements including but not limited to ductwork, mechanical and electrical equipment, and all work required for DCS modifications coordination, system coordination, startups and shutdowns, equipment and systems testing, training of Owner personnel, preparation of the O&M manual, and any other items required for completion of the WORK as indicated in the plans and technical specifications. All WORK shall be complete, in place and operable, in accordance with the requirements of the Contract Documents which include the plans, the Greenbook, the Whitebook, the Supplementary Special Provisions and the 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.

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

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

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

PVC products as manufactured or distributed by J-M Manufacturing Company shall not be used on the Contract for pressurized pipe.

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

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

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

SECTION 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 Odor Control Facilities Upgrade, as referenced in the Contract Appendix. You must comply with all requirements of the Notice of Exemption as set forth in the Contract Appendix A.

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

END OF SUPPLEMENTARY SPECIAL PROVISIONS (SSP)

TECHNICALS

MBC ODOR CONTROL FACILITIES UPGRADE

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SECTION 01080

WORK SEQUENCE

PART 1 - GENERAL

1.1 CONTINUITY OF PLANT OPERATIONS

A. GENERAL: The existing facilities are continuously receiving and treating wastewater biosolids, and collecting and treating foul air. These functions shall not be interrupted except as specified herein. The Contractor shall coordinate the work to avoid any interference with normal operation of plant equipment and processes. Plant personnel shall be allowed access to all areas at all times.

B. DISCHARGES:

1. WASTEWATER: Discharges of untreated or partially treated wastewater, resulting during removal of chemical tanks and piping or other demolition activities, to surface waters or drainage courses is prohibited during construction. In the event accidental discharge is caused by the Contractor's operations, the Owner shall immediately be entitled to employ others to stop the discharges without giving written notice to the Contractor. Penalties imposed on the Owner by regulatory agencies as a result of the actions of the Contractor, its employees, or subcontractors, shall be borne in full by the Contractor, including legal fees and other expenses to the Owner resulting directly or indirectly from the discharges.

2. FOUL AIR: Discharging of untreated or partially treated foul air to the atmosphere is prohibited during construction. Should a discharge occur, the Contractor shall immediately employ means of temporary odor control and record the date, time, location, estimated air flow rate, and hydrogen sulfide concentration of the air flow. The data shall be submitted to the Resident Engineer and the Construction Manager. The data collected during the bypass period will be used by the Construction Manager to determine whether the violation was conclusively a result of the discharge. If conclusive, penalties imposed on the Owner by regulatory agencies as a result of any discharge caused by negligent actions of the Contractor, its employees, or subcontractors, shall be borne in full by the Contractor, including legal fees and other expenses to the Owner resulting directly or indirectly from the bypass.

C. SUBMITTAL: The Contractor shall submit a detailed outage plan and time schedule for operations which will make it necessary to remove a tank, pipeline, channel, electrical circuit, equipment, or structure from service. The schedule shall meet the restrictions and conditions specified in this section. The detailed plan shall describe the Contractor's method for preventing bypassing of other treatment units, the length of time required to complete said operation, and the necessary equipment which the Contractor shall provide in order to prevent bypassing of associated treatment units. Systems or individual equipment items shall be isolated, dewatered, decommissioned, deenergized, or depressurized in accordance with the detailed outage plan and schedule. The

Construction Manager shall be notified in writing at least two weeks in advance of the planned operation.

1.2 COMPLETION TIMES:

A. Complete the Work within the specified Contract Time in accordance with the contract conditions.

1.3 LIMITATIONS OF CONSTRUCTION

A. GENERAL: To permit continuous operation of the plant, the construction schedule shall provide for the following specific conditions:

1. Comply with discharge and air quality permit limitations stipulated in the Permit to Operate issued by the San Diego Air Pollution Control District for the Area 60 and Area 94 odor control facilities and process areas facility-wide. Maintain operation of existing odor control systems until modifications have been tested and are operational.

2. Maintain the necessary minimum number of air, liquid and solid stream process units in effective operation to ensure continued plant operation.

3. Maintain facility monitoring and control functions.

4. Maintain facility electrical power.

B. PLANNED OUTAGES AND CONSTRUCTION SCHEDULE:

1. OUTAGE: An outage is defined as taking out of service any process, or component of a process, including utility and control systems. Operating processes, systems, individual equipment items or controls shall be isolated, dewatered, decommissioned, de-energized, or depressurized only by the plant operations staff in accordance with the Contractor's detailed outage plan and schedule. The Resident Engineer and Construction Manager shall be notified in writing at least 14 days in advance of any planned outage in any area. If requested by plant staff, the Contractor shall send a representative to meet with plant operations and the Resident Engineer to plan activities during the requested outage. Outages shall not be scheduled for Fridays or weekends without prior approval. Except as approved by the Construction Manager, multiple outages required for the same system shall not occur less than seven (7) calendar days apart subject to the system being returned to normal operation after the first outage.

2. CONSTRUCTION SCHEDULE: The Contractor shall propose its own construction schedule and the order in which activities are to be performed for review and concurrence of the Resident Engineer and Construction Manager as part of the construction schedule. The proposed construction schedule and sequence that activities follow shall ensure that the frequency and duration of planned outages are not materially changed from the constraints specified in these Contract Documents. The Contractor shall provide a graphically represented construction schedule indicating the various subdivisions of work

and the dates for commencing and finishing each work item. The schedule shall show the time allowed for testing and other procedures that must be completed prior to the work being placed in operation.

3. SCHEDULE REVISIONS: Revisions to the accepted construction schedule may be made only with the written approval of the Contractor and the Construction Manager. A change affecting the contract value of any activity, the completion time, and sequence may only be made in accordance with the applicable provisions of this section.

1.4 WORK SEQUENCE AND CONSTRAINTS

A. GENERAL: The work sequences described below are intended to minimize interruption to continuous operation of foul air treatment systems and wastewater processes. This section describes one method to accomplish the required work. The construction techniques or sequences herein are presented to illustrate the principles involved, but other techniques and sequences could potentially be used. Disruptions may be required that are not itemized herein. The construction sequence outlined herein is not all inclusive and does not cover all work required by the contract documents. The Contractor is responsible for the coordination of all required work involving all trades. No extra payment will be approved for any disruptions not described herein, nor will extra payment be approved should the construction techniques or sequences described herein prove infeasible or more costly than alternative approaches. The use of any construction techniques or schedules described herein shall not relieve the Contractor of responsibility for detailed planning, coordination, scheduling, liabilities, and other responsibilities described in this Section.

B. COORDINATION: The Contractor shall be aware of other concurrent and ongoing projects in the vicinity of its work that may require coordination. Contractor shall make provisions in its construction schedule to accommodate these other projects and coordinate as needed to accomplish work.

C. WORK SEQUENCE – AREA 60: The following is one work sequence alternative for Area 60 modifications.

1. Existing odor control system (chemical scrubbers and carbon units) to remain online at all times (two trains operational).

2. Perform site work.

3. Install structural modifications, structural retrofits, and maintenance access platforms.

4. Demolish and replace ductwork as indicated on the drawings. Work shall be conducted only on one train at a time until ductwork modifications are in place and that train is restored to operation.

5. Demolish or remove unused hot water piping and other appurtenances indicated on the drawings.

6. Perform modifications to electrical systems and coordinate the work with other disciplines.

D. WORK SEQUENCE – AREA 76: The following is one work sequence alternative for Area 76 modifications.

1. Demolish foul air ductwork on the first floor as shown on drawings. Install new exhaust air registers in foul air ductwork on first floor.

2. Install structural framing and elements; perform structural modifications, then install FRP room partitions on first floor to isolate grit bins and other equipment from non-process room space as indicated on the drawings.

3. Install non-slip metal floor plate and horizontal FRP cover panels.

4. Temporarily block exhaust air registers on second floor ductwork to direct foul air withdrawal capacity to the first floor.

5. Install new window-mounted room ventilation fan on second floor.

6. Install in-line roof mounted booster fan but do not connect to foul air withdrawal system.

7. Perform electrial work indicated for this area including installation of VFDs for fans servicing this area.

8. Once ductwork installation in Area 86 is complete, demolish foul air ductwork on second floor as indicated on drawings.

9. Complete the connection of the roof mounted booster fan to the existing foul air withdrawal system.

10. Install access hatch and observation lighting in the Centrifuge Room.

E. WORK SEQUENCE – AREA 86: The following is one work sequence alternative for Area 86 modifications.

1. Cap supply air registers as indicated and install new supply air ductwork and registers.

2. Relocate conduits, equipment, and instruments as required to accommodate new ductwork and FRP panels and structural framing or supports.

3. Install structural framing and elements required for supporting FRP cover panels.

4. Install new FRP ductwork within the area, and on the roof as indicated on drawings. Modify skylights to accommodate ductwork as indicated. Make connection to the roof mounted in-line fan in Area 76, but do not connect fan to existing Area 76 foul air withdrawal system until all work in Area 86 is complete. One biosolids truck loading lane shall remain operational at all times.

5. Demolish portions of existing foul air withdrawal ductwork and replace with new ductwork as indicated on the drawings. Work shall be conducted only on one biosolids truck loading lane at a time.

6. Install non-slip metal floor plate and horizontal FRP cover panels on second floor. Install removable panels where indicated on drawings.

7. Once all work in Area 86 has been completed, connect in-line fan on Area 76 roof to the Area 76 foul air withdrawal system

8. Balance airflow rates from Areas 76 and 86 by conducting measurements at Area 76 and 86 foul air registers and openings, and major duct branches in both areas.

F. WORK SEQUENCE – AREA 94: The following is one work sequence alternative for Area 94 modifications.

1. Existing odor control system (scrubbers and carbon units) to remain online at all times (one train operational).

2. Demolish and remove abandoned chemical day tanks and piping as indicated on the drawings.

3. Remove and replace motorized valves with hand-operated valves on scrubber recirculation pumps. Install tie-in piping for connecting suction and discharge lines on recirculation pumps.

4. Install structural modifications, structural retrofits, and maintenance access platforms.

5. Demolish and replace ductwork as indicated on the drawings. Work shall be conducted only on one train at a time until ductwork modifications are in place and that train is restored to operation.

6. Demolish or remove unused hot water piping, heat exchangers and other appurtenances indicated on the drawings. Work shall be conducted only on one train at a time until modifications are in place and the train is operational.

7. Perform modifications to electrical systems and coordinate the work with other disciplines.

8. Modify railing in wet well area, install housekeeping pad and new water cannon. Connect water cannon to existing reclaimed water piping and conduct testing.

G. WORK SEQUENCE – ALL SYSTEMS: The following is one work sequence alternative for the foul air withdrawal and treatment systems.

1. Test and balance complete system serviced by the Area 60 odor control system.

2. Test and balance complete system serviced by the Area 94 odor control system.

1.5 CONTRACTOR QUALIFICATIONS

A. GENERAL: Prior to the pre-construction meeting the Contractor shall submit documentation to show its qualifications and experience with work of similar nature, comparable size and scope, conducted within the United States for the work items listed. Documentation shall include subcontractor qualifications as well as that of key personnel assigned to this Project. Documentation submitted shall include project name, location, duration, facility type and size, and owner contact information to include name, title, telephone number, and email address. The work items are as follows:

1. Treatment Plant Experience – work of similar nature at a treatment facility of similar size as MBC – at least three facilities within the past five years.

2. Structural Work Experience – experience with structural modifications and retrofits to existing structures – at least three facilities within the past five years.

3. Electrical Systems – experience with electrical system modifications and installations of a nature similar to this Project – at least three facilities within the past five years.

4. FRP Ductwork and Fabrications – experience with modifications to, and installation of FRP ductwork of various sizes and FRP fabrications – at least three facilities within the past five years.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

****END OF SECTION****

SECTION 01680

PHYSICAL CHECKOUT; SHOP, FIELD, AND FUNCTIONAL TESTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. The physical inspection and testing requirements in this Section are in addition to those requirements defined in Division 2 through 16 of the Technical Specifications. This testing shall be performed prior to substantial completion.

B. Provide the following checkout and testing activities:

1. Physical checkout and inspection of equipment and materials to verify conformance of the installed equipment and materials as indicated and as specified.

2. Shop Testing of equipment as specified in Divisions 2 through 16 and as specified herein.

3. Field Testing of equipment as specified in Divisions 2 through 16 and as specified herein.

4. Functional Testing of equipment as specified in Divisions 2 through 16 and as specified herein.

C. Provide a Checkout Plan covering the entire checkout and testing process as specified herein.

1.2 DEFINITIONS:

A. Shop Testing: Defined as testing that is done by the Supplier either at the place of manufacture, the place of assembly, or at another location where the required testing apparatus is located, for the purpose of proving that the Products meet the requirements of the pertinent technical specification(s). The administrative procedures for shop testing are specified in paragraph 1.7 of this Section, while the technical requirements are included in the pertinent technical specification(s). The minimum acceptable test criteria are specified in paragraph 1.5 of this Section.

B. Field Testing: Defined as testing that is performed by the CONTRACTOR, and/or Sub Contractors with Supplier assistance, on Products after they have been installed, and after the performance of physical checkout, for the purpose of proving that the tested Products meet the requirements of the pertinent technical specifications. Field testing is required regardless of whether or not shop testing was performed on the same piece of equipment or material. The administrative requirements for field testing are specified in paragraph 1.8 of this Section, while the technical requirements are contained in the pertinent technical specification(s). The minimum acceptable test criteria are specified in paragraph 1.5 of this Section.

C. Physical Checkout: Defined as the process of physically inspecting Products after they have been installed to determine if the Products have been properly and completely installed, and are ready for Field and for Functional Testing. The requirements for Physical Checkout are contained in the pertinent technical specification(s) (if applicable) and in paragraph 1.9 of this Section.

D. Functional Testing: Defined as testing performed by the CONTRACTOR on a "system" normally comprised of two or more pieces of equipment, after the equipment has been installed, and after Physical Checkout and Field Testing have been completed, for the purpose of proving that the system meets requirements as specified and as indicated. The administrative requirements for Functional Testing are specified in paragraph 1.10 of this Section, while the technical requirements are specified in Appendix A of this Section if applicable.

E. The Supplier's Representative or Manufacturer's Representative: Defined as a person, or persons provided by the Supplier, who is qualified by having the training and experience, to provide technical and/or process related advice, and/or assistance, relating to the installation or utilization of the Products provided by that same Supplier. Such training and experience shall include a minimum of three years participation in similar work including no less than three similar projects during this three year period.

F. The Testing and Checkout Coordinator: Defined as the person provided by the CONTRACTOR to coordinate and oversee the total spectrum of testing and inspection activities required by the Contract Documents. The Testing and Checkout Coordinator shall have been in responsible charge of at least two similar projects in the last four years.

1.3 ROLES and RESPONSIBILITIES:

A. The CONTRACTOR shall provide all outside services, materials, labor, supplies, test equipment and other items necessary to perform the testing specified herein. In addition the CONTRACTOR shall arrange for and provide the participation or assistance of survey crews, engineers, quality control technicians, Suppliers' representative(s), and required governmental agency representatives.

B. The CONTRACTOR shall provide the services of the Supplier's representative(s) as follows:

1. Assistance during installation as specified in the specifications in Divisions 2 through16.

2. Shop Testing as specified in the specifications in Divisions 2 through 16, and as specified herein.

3. Field Testing as specified in the specifications in Divisions 2 through 16, and as specified herein.

4. Functional Testing as specified in the specifications in Divisions 2 through 16, and as specified herein.

C. The Supplier's representative activities required by this Section are in addition to the requirements for vendor training and other services specified elsewhere in the Contract

Documents. Timing for the performance of these services shall be defined in the Checkout Plan, specified herein.

D. The OWNER'S REPRESENTATIVE will review and comment on the CONTRACTOR's deliverables, participate in the physical inspection activities, witness the shop and field testing, witness functional testing, and provide verification of conformance to the specifications.

1.4 CHECKOUT PLAN

A. The CONTRACTOR shall submit a Checkout Plan based upon the requirements defined herein to the OWNER'S REPRESENTATIVE. Six copies of the preliminary Checkout Plan shall be submitted for review not later than 90 days prior to the proposed date of the first test, whichever occurs first. The plan shall define:

1. The logical and systematic performance of physical inspections, shop, field and functional tests including:

a. A chronological schedule of all testing and inspection activities.

b. A checklist of all inspection and testing activities broken down by location, discipline, system, and device or item.

c. All blank forms proposed by the CONTRACTOR for verification or recording of the shop testing.

d. An index which cross references the forms to their intended application(s).

e. A list of all shop tests, and supplier certifications, including those required by the applicable technical specifications. Provisions shall also be included for re- testing, in the event it is required.

2. Participants in the testing.

3. Special test equipment.

4. Sources of the test media (water, power, air.)

5. The proposed method of delivery of the media to the equipment to be tested.

6. Temporary or interim connections for the sequencing of multiple units.

7. Ultimate disposal of the test media.

B. The plan will be reviewed by the OWNER'S REPRESENTATIVE, modified or revised as necessary by the CONTRACTOR, then approved by the OWNER'S REPRESENTATIVE. The CONTRACTOR shall continue to update the Checkout Plan, working in conjunction with the OWNER'S REPRESENTATIVE prior to the start of the scheduled equipment checkout and functional testing activities. Each specific element of

the plan must receive written approval by the OWNER'S REPRESENTATIVE at least two weeks prior to the actual commencement of testing.

C. The CONTRACTOR shall designate, in the Checkout Plan, a Testing and Checkout Coordinator, to coordinate and manage the activities defined in the checkout plan, as approved by the OWNER'S REPRESENTATIVE.

1.5 MINIMUM SHOP AND FIELD TESTING REQUIREMENTS

A. In the event of no reference to procedures are made, or no procedures for shop and field testing are contained in a technical specification for the following test parameters, the following shall be the acceptable checkout requirements. Should these requirements conflict with the Supplier's recommendations or in any way be less stringent than the Supplier's requirements, they shall be superseded by the Supplier's requirements for checkout and testing.

B. Measurement of wearing ring clearances for all pumps requiring assembly, so equipped: (Not Used)

C. Measurement of Impeller Bore for all pumps requiring assembly: (Not Used)

D. Measurement of shaft run out for all rotating equipment requiring assembly:

1. Remove bearings from the shaft. Support shaft on pedestal rollers or in a lathe.

2. Check each shoulder on the shaft.

3. Take a minimum of two readings for each shoulder, opposed to each other by 90".

4. All measured clearances shall be within Supplier's specifications for new installations. Replace and recheck shafts found to be out of round or out of specified tolerance.

E. Vibration Measurement:

1. Conduct a torsional and vibration analysis of equipment in accordance with the requirements of Section 11000 and of the individual equipment specifications.

F. Coupling/Shaft Alignment: (Not Used)

G. Measurement of Noise (dB)

1. Eliminate noise sources generated by adjacent construction activity prior to testing.

2. Establish a background noise level prior to testing.

3. Perform noise level testing on each installed device as required by the technical specifications.

H. Hydrostatic Testing:

1. AWWA C600 standards latest edition are the minimum acceptable standards for all hydrostatic testing.

2. Visually inspect all welds prior to testing, for cracks, undercut on surface greater than 1 /32"deep, lack of fusion on surface, reinforcement greater than Table 127.4.2 located in ANSI B3 1.1 Power Piping, and incomplete penetration (when accessible). Repair or rework as directed by the OWNER'S REPRESENTATIVE.

3. At no time during hydrostatic testing shall any part of the piping system be subjected to a stress greater than 90% of its yield strength at test temperature.

4. After at least 10 minutes of full hydrostatic test pressures, make an examination for leakage of all joints, connections, and all regions of high stress, such as around openings and thickness transition sections.

5. Unless otherwise specified, the minimum required hydrostatic test pressure shall be 1.5 times the design pressure as specified and as indicated.

6. Unless otherwise specified, the minimum pressure holding time shall be 10 minutes plus the time required to inspect for leakage.

7. Maximum pressure shall not exceed the maximum rated pressure for any component in the system being tested.

I. Electrical Equipment

1. The testing standards for electrical components are those contained in the pertinent technical specification(s) and in Appendix A of this Section.

2. Functional and field testing shall follow the Physical Checkout and are contained in the pertinent technical specification(s) and in Appendix A of this Section.

1.6 WITNESSING OF TESTS

A. Unless otherwise noted, provide a minimum of 45 days written notice to the OWNER'S REPRESENTATIVE so that the OWNER'S REPRESENTATIVE, the OWNER, or its representatives may witness the Shop, Field, and Functional tests. The OWNER'S REPRESENTATIVE and the OWNER may witness the performance of any or all tests, at their option. The OWNER'S REPRESENTATIVE'S or OWNER'S witnessing of tests does not relieve the CONTRACTOR of its obligation to comply with the requirements of the Contract Documents.

1.7 SHOP TESTING

A. When required by the Technical Specifications, perform shop testing prior to delivery of the equipment or material. Unless otherwise noted, provide 45 days written notice indicating the time and place of testing. Submit the following for approval thirty days prior to this notice:

1. Description of the test, specifically outlining how tests will conform to the requirements in the Technical Specifications.

2. Testing devices that will be used in the tests. Description must state what portion of the tests that the devices will perform or measure, and device accuracy. Submit sample measurement results and catalog cuts.

3. Personnel used to perform the tests. Resumes, qualifications, and experience shall be submitted. As a minimum, personnel shall have three years experience with the manufacture and operation of the equipment to be tested and will have participated in 5 similar tests during this period of experience.

4. Schedule for testing. Schedule shall include frequency of measurements, personnel present and contingency plans for equipment and/or test failure.

5. Test forms. Submit all forms used to record and report on Shop Test data, for approval prior to the test. Forms shall include description of test, equipment used, personnel present, equipment specification numbers, and measurements made. Forms shall have a place for signature by the chief testing person, and an officer of the company that the tests performed are true, accurate, have met the required criteria, and that the equipment will operate as indicated and as specified.

B. Shop test procedures will be reviewed and returned by the OWNER'S REPRESENTATIVE within 30 days of receipt. Incorporate minor comments on the procedures, equipment, or personnel prior to testing. Major comments by the OWNER'S REPRESENTATIVE will require a resubmittal of the shop test procedure and proposed test date. The CONTRACTOR will be notified, in writing by the OWNER'S REPRESENTATIVE, if a formal resubmittal is required with the transmittal of the review comments.

C. Submit the following within one week after completion of the tests for approval:

1. Completed test forms, for each device tested, on forms as approved prior to the test.

2. Completed certification, the content of which was approved prior to the tests.

3. A written summary of testing, reporting on the results and summarizing the entire procedure.

4. A schedule for retesting, if necessary. Perform any retesting required to fulfill the intent of the Technical Specification test requirements at no additional cost to the OWNER. Additional travel required by the OWNER'S REPRESENTATIVE and

the OWNER personnel to witness retesting shall be paid by the CONTRACTOR, at no additional cost to the OWNER. Reimbursement for travel expenses required for retesting will be applied as a debit against the CONTRACTOR's subsequent Application for Payment.

1.8 FIELD TESTING OF EQUIPMENT

A The CONTRACTOR shall provide the services of an experienced and authorized representative of the manufacturer of each item of equipment indicated in the equipment schedules (excluding manually-operated valves smaller than 24-inches in size, injectors, tanks, batch-type disc meters, and rotometers, and any other minor items of equipment specifically exempted in writing by the OWNER'S REPRESENTATIVE), who shall visit the site of the WORK and inspect, check, adjust if necessary, and approve the equipment installation. In each case, the CONTRACTOR shall arrange to have the manufacturer's representative revisit the job site as often as necessary until any and all trouble is corrected and the equipment installation and operation are satisfactory to the OWNER'S REPRESENTATIVE.

B. The CONTRACTOR shall require that each manufacturer's representative furnish to the OWNER'S REPRESENTATIVE a written report addressed to the OWNER certifying that the equipment has been properly installed and lubricated, is in accurate alignment, is free from any undue stress imposed by connecting piping or anchor bolts and has been operated satisfactorily under full-load conditions. The manufacturer's representative shall also provide written authorization that the equipment can be operated.

C. The CONTRACTOR shall be responsible for scheduling all operating testing. The CONTRACTOR is advised that the OWNER'S REPRESENTATIVE and the OWNER's operating personnel will witness operations testing and that the manufacturer's representative shall be required to instruct the OWNER's operating personnel in correct operation and maintenance procedures. Such instruction shall be scheduled at a time arranged with the OWNER at least 2 weeks in advance and shall be provided while the respective manufacturer's equipment is fully operational. On-site instruction shall be given by qualified persons who have been made familiar in advance with the equipment and systems in the plant. Prior to scheduling any operations testing, the CONTRACTOR shall have previously furnished the OWNER's Manuals required under Section 01300.

D. Prior to field-testing of the equipment, the CONTRACTOR shall make all supporting systems operational.

E. The CONTRACTOR shall furnish all personnel, power, water, chemicals, fuel, oil, grease, and all other necessary equipment, facilities, and services required for conducting the tests.

F. Field testing shall be in addition to, and not in lieu of, shop testing. Perform field testing as a part of the overall physical and functional testing process defined herein and in accordance with the approved Checkout Plan. However, the following specific instructions shall also apply. The CONTRACTOR shall provide ninety days written notice indicating the date and time for testing each piece of equipment, or a series of equipment pieces. The CONTRACTOR shall submit with this notice, the following for approval by the OWNER'S REPRESENTATIVE:

1. Description of the tests, specifically outlining how the test will conform to the requirements in the Technical Specifications.

2. Testing devices that will be used in the tests. Description shall state what portion of the tests that the devices will perform or measure, and device accuracy. Submit sample measurement results and catalog cuts.

3. Personnel used to perform the tests. Submit resumes, qualifications, and experience. As a minimum, personnel must have three years experience with the manufacture and operation of the equipment to be tested and will have participated in five similar tests during this period of experience.

4. Schedule of Testing. Schedule shall include frequency of measurements, personnel present and contingency plans for equipment and /or test failure.

5. Test forms. Review and comment on all forms provided by the OWNER'S REPRESENTATIVE for recording and reporting on the Field Test data, prior to the test.

6. Material and equipment required for the test. This material and equipment shall be supplied at no additional cost to the OWNER.

7. Water and Power requirements. Water and power requirements shall be identified in the plan by the CONTRACTOR and will be supplied by the CONTRACTOR for field testing purposes only. The CONTRACTOR shall provide all temporary piping and wiring required for field testing; and equipment and labor for the reuse of the test water.

8. Operational requirements. Include valve positions, set-ups, and gate positions, including temporary arrangements that are required to run the tests so that the OWNER'S REPRESENTATIVE can anticipate and plan for the testing situation.

G. Field test procedures will be reviewed and returned by the OWNER'S REPRESENTATIVE within 30 days of receipt. Incorporate minor comments on the procedures, equipment, or personnel prior to testing. Major comments by the OWNER'S REPRESENTATIVE will require a resubmission of the field test procedure and proposed test date. The CONTRACTOR will be notified, in writing, by the OWNER'S REPRESENTATIVE if a formal resubmission is required with the transmittal of the review comments.

H. Provide seven days written notice to the OWNER'S REPRESENTATIVE prior to the actual start of any testing. This will include a statement by the CONTRACTOR that the equipment and facilities to be tested have been thoroughly inspected and cleaned of construction debris or other extraneous materials and all lubrication, materials, and preparations are completed.

I. Submit within one week after completion of the tests, the following to the OWNER'S REPRESENTATIVE for approval:

1. Completed test forms, for each device tested, on forms provided prior to the tests.

2. Completed certification documentation, the content of which was approved prior to the tests.

3. A written summary of testing, reporting on the results and summarizing t he entire procedure.

4. A schedule for retesting, if necessary. Perform any retesting required to fulfill the intent of the technical specification test requirements at no additional cost to the OWNER.

1.9 PHYSICAL CHECKOUT AND INSPECTIONS

A. Physical Checkout and inspections provide verification of conformance to the requirements of the Technical Specifications and Contract Drawings for physical presence; dimensions; and location, for proper materials, parts, and items; and for integrity of materials, equipment and systems to determine their condition and readiness for field and for functional testing. Inspection includes the following elements, as applicable

1. Exterior areas for backfill, grading, surfacing, drainage, landscaping, roadways, fencing, gates, and signage.

2. Building structural integrity, masonry, architectural, mechanical systems, electrical/lighting, communications, and HVAC systems.

3. Concrete structures for structural integrity, finish, tolerance, durability, appearance, embedded and inserted items, painting and surface applications.

4. Steel structures for member alignment, connection bolts torque, connection welds integrity, painting, fire proofing and surface applications.

5. Mechanical systems and items for installation, alignment and securing, adjustments of packing and seals, lubrication, drive connection and alignment, motor rotation, belt/chain tension, painting or surface applications, and tagging for identification.

6. Piping systems for material, size, components, direction, alignment of joints and bolting/welding, valves, packing and seals, screens, filters and strainers, painting, identification labeling and color coding, hangers, anchors, supports, and expansion provisions.

7. Electrical and control/instrumentation systems for conduit and tray installation, wire/cable material and size, circuit identification, terminal installation and identification, major switches, circuit breakers and components, and labeling for system identification.

8. Communication systems including telephone, fire/smoke alarm, security, page/party, and closed circuit TV; similar to electrical above.

9. Computer systems by station, function, and network interface.

B. Inspection will verify that tanks, pipes, conduits, vessels, equipment, systems, buildings, areas and other items provided under the Contract are clean and free from debris or materials which will interfere with subsequent testing requirements or routine operations. Correct unsatisfactory conditions prior to testing or acceptance.

C. Upon completion of the inspection, submit to the OWNER'S REPRESENTATIVE six copies of each completed inspection form, signed by an authorized representative of the CONTRACTOR who participated in the inspection. The OWNER'S REPRESENTATIVE will review and approve the contents of the forms. Should a re-inspection be required, it shall be performed at no additional cost to the OWNER.

1.10 FUNCTIONAL TESTING

A. Specific functional tests shall be performed in addition to the requirement for shop, field, and other tests called for in the Technical Specifications.

B. Provide 30 days written notice indicating the date and time during which the specific functional test is proposed. Submit with this notice, the following to the OWNER'S REPRESENTATIVE for approval:

1. Changes to the test procedures (if any) outlined in Appendix A to this Section.

2. Testing devices that will be used in the tests: Description must state what portion of the tests that the devices will perform or measure, and device accuracy. Submit sample measurement results and catalog cuts.

3. Personnel used to perform the tests: Submit resumes, and qualifications. As a minimum, personnel must have three years experience with the operation of the equipment and or system to be tested and have participated in five similar tests during this period of experience.

4. Schedule for Testing: Schedule shall include frequency of measurements, personnel present, and contingency plan s for equipment and or system test failure.

5. Test forms: Provide test forms for recording and reporting on the test data.

6. Provide material and equipment required for the test.

7. Water and Power requirements: Water and power will be supplied by the CONTRACTOR for functional testing purposes.

8. Operational requirements: Include valve positions, set-ups, and gate positions that are required to run the tests in the written request so that the CM can anticipate and plan for the testing. Provide all temporary piping, connections or other temporary requirements related to performance of the functional tests.

C. The OWNER'S REPRESENTATIVE and the OWNER may witness the performance of these tests, at their option.

D. Approval of the functional test package by the OWNER'S REPRESENTATIVE will be made within two weeks of the test date. Incorporate minor comments on the procedures, equipment, and personnel prior to testing. Major comments by the OWNER'S REPRESENTATIVE will require a resubmission of the functional test package and test date.

E. Provide seven (7) days written notice to the OWNER'S REPRESENTATIVE prior to the actual start of any testing. This will include a statement by the CONTRACTOR that the equipment and facilities to be tested have been thoroughly inspected and cleaned of construction debris or other extraneous materials and all lubrication, materials, and preparations are completed.

F. Submit within one week after completion of the tests, the following to the OWNER'S REPRESENTATIVE for approval:

1. Completed test form, for each device, or system tested, on forms approved prior to the test.

2. Completed certification, the content of which was approved prior to the tests.

3. A written summary of testing, reporting on the results and summarizing the entire procedure.

4. A schedule for retesting, if necessary, including changes to procedures, testing devices, or personnel. Any retesting required to fulfill the intent of the test requirements outlined in Appendix A of this Section, due to negligence, poor workmanship, or Products that fail to meet the Contract requirements, shall be at no additional cost to the OWNER.

5. Provide operational and pump efficiency test prior to final pump station acceptance. The CONTRACTOR shall subcontract with Pump Check or other qualified vendor for this service. Submit system head curves following the pump test.

1.11 CORRECTIONS TO THE WORK

A. Correct any items of work failing to meet the specified requirements, at no additional cost to the OWNER. Correct the nonconforming items by re-work, modification, or replacement, to the option of the OWNER'S REPRESENTATIVE. This includes the provision of all required labor, materials, and requirements for retesting as specified herein, to verify that the items conform with Contract Documents. Warranty periods shall not begin until final startup and operation.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

SECTION 01680 - APPENDIX A

FUNCTIONAL TESTING

Functional testing shall be conducted on the following systems:

1. To be completed by the CONTRACTOR and report submitted for approval by the OWNER as part of the CONSTRUCTION DOCUMENTS. At a minimum, the functional testing plan shall cover all components of the WORK and demonstrated satisfactory operation over the full operating range of all systems.

**** END OF SECTION ****

SECTION 01999

REFERENCE FORMS

The forms listed below and included in this section are referenced from other Specification Sections within Attachment E – Technicals:

Form No.	Title
11000-A	Manufacturer's Installation Certification Form
11000-B	Manufacturer's Instruction Certification Form
11000-C	Unit Responsibility Certification Form
13300-A	Loop Wiring and Insulation Resistance Test Data Form
13300-G	Field Switch Calibration Test Data Form
13300-I	Miscellaneous Instrument Calibration Test Data Form
13300-J	Individual Loop Test Data Form
13300-K	Loop Commissioning Test Data Form
16040-A	Motor Data Form
16050-A	Wire and Cable Resistance Test Data Form
16050-B	Installed Motor Test Data Form

11000-A. MANUFACTURER'S INSTALLATION CERTIFICATION FORM

Contract No: _____ Specification section: _____

Equipment name: _____

Contractor: _____

Manufacturer of equipment item: _____

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

Comments: _____

_____

_____

_____

_____

_____ _____

Date Manufacturer

_____

Signature of Authorized Representative

_____ _____

Date Contractor

_____

Signature of Authorized Representative

11000-B. MANUFACTURER'S INSTRUCTION CERTIFICATION FORM

Contract No: _____ Specification section: _____

Equipment name: _____

Contractor: _____

Manufacturer of equipment item: _____

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

Operations Check List (check appropriate spaces)	
Start-up procedure reviewed	
Shutdown procedure reviewed	
Normal operation procedure reviewed	
Others:	
Maintenance Check List (check appropriate spaces)	
Described normal oil changes (frequency)	
Described special tools required	
Described normal items to be reviewed for wear	
Described preventive maintenance instructions	
Described greasing frequency	
Others:	

_____ _____

Date Manufacturer

_____

Signature of Authorized Representative

_____ _____

Date Signature of Owner's Representative

_____ _____

Date Signature of Contractor's Representative

(Project Title)

CERTIFICATE OF UNIT RESPONSIBILITY
for Specification Section _____

_____
(Section title)

In accordance with paragraph 11000-1.02 C of the contract documents, the undersigned manufacturer of driven equipment ("manufacturer") accepts unit responsibility for all components of equipment furnished to the Project under specification Section_____ ,and for related equipment manufactured under Sections_____, _____, and _____ .

We have reviewed the requirements for Sections 11000 (and 11050 where applicable) and all sections referencing this (these) section(s), including but not limited to drivers, supports for driving and driven equipment and all other specified appurtenances to be furnished to the Project by manufacturer. And, we have further reviewed, and modified as necessary, the requirements for associated variable speed drives and motor control centers. We hereby certify that all specified components are compatible and comprise a functional unit suitable for the specified performance and design requirements whether or not the equipment was furnished by us. We will make no claim nor establish any condition that problems in operation for the product provided under this specification Section _____ are due to incompatibility of any components covered by this Certificate of Unit Responsibility. Nor will we condition or void any warranty for the performance of the product of this specification Section _____ due to incompatibility of any components covered under this Certificate of Unit Responsibility.

Our signature on this Certificate of Unit Responsibility does not obligate us to take responsibility for, nor to warrant the workmanship, quality, or performance of related equipment provided by others under specification Sections _____, _____, and _____. Our obligation to warranty all equipment provided by us shall remain unaffected.

_____
Notary Public

_____
Commission expiration date

Seal:

_____
Name of Corporation

_____
Address

By: _____
Duly Authorized Official

_____
Legal Title of Official

Date: _____

13300-A. LOOP WIRING AND INSULATION RESISTANCE TEST DATA FORM

Loop No.: _____

List all wiring associated with a loop in table below. Make applicable measurements as indicated after disconnecting wiring.

Wire No.	Panel Tie	Field TB	Continuity Resistance[a]		Insulation Resistance[b]			
			Cond./ Cond.	Cond./ Shield	Shield/ Gnd.	Shield/ Cond.	Cond./ Gnd.	Shield/ Shield
A			--	(A/SH)				
B			(A/B)	--				
C			(A/C)	--				
D			(A/D)	--				
etc.								

NOTES:

a. Continuity Test. Connect ohmmeter leads between wires A and B and jumper opposite ends together. Record resistance in table. Repeat procedure between A and C, A and D, etc. Any deviation of ±2 ohms between any reading and the average of a particular run indicates a poor conductor, and corrective action shall be taken before continuing with the loop test.

b. Insulation Test. Connect one end of a 500 volt megger to the panel ground bus and the other sequentially to each completely disconnected wire and shield. Test the insulation resistance and record each reading.

CERTIFIED _____ Date _____
Contractor's Representative

WITNESSED _____ Date _____
Owner's Representative

13300-G. FIELD SWITCH CALIBRATION TEST DATA FORM

Tag No. and Description: _____

Make & Model No.: _____ Serial No: _____

Input: _____

Range: _____

Set Point(s): _____

Simulate process variable (flow, pressure, temperature, etc.) and set desired set point(s). Run through entire range of switch and calculate deadband.

Set Point	Incr. Input Trip Point	Decr. Input Trip Point	Calc. Deadband	Required Deadband

CERTIFIED _____ Date _____
Contractor's Representative

WITNESSED _____ Date _____
Owner's Representative

13300-I. MISCELLANEOUS INSTRUMENT CALIBRATION TEST DATA FORM

(For instruments not covered by any of the preceding test forms, the Contractor shall create a form containing all necessary information and calibration procedures.)

CERTIFIED _____ Date _____
Contractor's Representative

WITNESSED _____ Date _____
Owner's Representative

13300-J. INDIVIDUAL LOOP TEST DATA FORM

Loop No.: _____

Description: (Give complete description of loop's function using tag numbers where appropriate.)

P&ID No.: (Attach copy of P&ID.)

a. Wiring tested:
(Attach test form 13300-A)

b. List step-by-step procedures for testing loop parameters. Test loop with instruments, including transmitters and control valves, connected and functioning. If it is not possible to produce a real process variable, then a simulated signal may be used with the Construction Manager's approval.

CERTIFIED _____ Date _____
Contractor's Representative

WITNESSED _____ Date _____
Owner's Representative

13300-K. LOOP COMMISSIONING TEST DATA FORM

Loop No.: _____

a. Loop tested:
(Attach test form 13300-J)

b. Controlled or connected equipment tests confirmed:

c. Give complete description of loop's interface with process.

d. With associated equipment and process in operation, provide annotated chart trace of loop response to changes in set points for verification of performance. This chart should demonstrate 1/4-amplitude damping as output adjusts to set point change. Show set points, starting and finishing times on chart, as well as any other pertinent data.

Connect 2-pen recorder to process variable (PV) and to controller output. Use 1 inch/second chart speed.

Pen 1 - PV - Connections:

Pen 2 - Output - Connections:

CERTIFIED _____ Date _____
Contractor's Representative

WITNESSED _____ Date _____
Owner's Representative

16040-A. MOTOR DATA FORM

Equipment Name: _____ Equipment No(s): _____

Project Site Location: _____

Nameplate Markings

Mfr:		Mfr Model:		Frame:		Horsepower:	
Volts:		Phase:		RPM:		Service Factor:	
FLA:		LRA:		Frequency:		Amb Temp Rating:	℃
Time rating:				Design Letter:			
	(NEMA MG1-10.35)				(NEMA MG-1.16)		
KVA Code Letter:				Insulation Class:			

The following information is required for explosion-proof motors only:

A. Approved by UL for installation in Class _____, Div _____, Group _____

B. UL frame temperature code ____ (NEC Tables 500-8B)

The following information is required for all motors 1/2 horsepower and larger:

A. Guaranteed minimum efficiency _____
(Paragraph 11060-2.04 G)

B. Nameplate or nominal efficiency _____

Data Not Necessarily Marked on Nameplate

Type of Enclosure:			Enclosure Material:		
Temp Rise:	℃ (NEMA MG1-12.41,42)				
Space Heater included?	☐ Yes	☐ No	If Yes:	Watts	Volts
Type of motor winding over-temperature protection, if specified:					

Provide information on other motor features specified:

_____

16050-A. WIRE AND CABLE RESISTANCE TEST DATA FORM

Wire or Cable No.:_____ Temperature, °F: _____

Location of Test	Insulation resistance, megohms
1.	
2.	
3.	
4.	
5.	
6.	
7	

CERTIFIED _____ Date _____
Contractor's Representative

WITNESSED _____ Date _____
Owner's Representative

16050-B. INSTALLED MOTOR TEST FORM

Motor Equipment Number: _____ Date of test: _____

Equipment Driven: _____

MCC Location: _____

				Ambient temp	°F
Resistance:					
Insulation resistance phase-to-ground megohms:					
Phase A		Phase B		Phase C	
Current at Full Load:					
Phase		Current, amps			
Phase		Current, amps			
Phase		Current, amps			
Thermal Overload Device:	Manufacturer/catalog #		Amperes		
Circuit breaker (MCP) setting:					

Motor Nameplate Markings:

Mfr		Mfr Model		Frame		HP	
Volts		Phase		RPM		Service factor**	
Amps		Freq		Ambient temp rating			°C
Time rating				Design letter**			
	(NEMA 1-10.35)				(NEMA MG-1.16)		
Code letter				Insulation class			

**Required for 3-phase squirrel cage induction motors only.

CERTIFIED _____ Date _____
Contractor's Representative

WITNESSED _____ Date _____
Owner's Representative

****END OF SECTION****

SECTION 02050

DEMOLITION AND SALVAGE

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section includes materials and procedures for the demolition and disposal of chemical metering pumps, chemical service piping, instrumentation, and miscellaneous fiberglass-reinforced plastic structures including chemical storage tanks. Contractor shall provide all labor, materials, equipment, and services necessary.

B. Contractor shall provide measures that allow for the removal of existing structures with no leakage or spillage of chemicals. The Contractor is cautioned that certain appurtenances removed from service may need to be treated as, and transported as hazardous waste. Transportation of such materials shall comply with all applicable federal, state, and local regulations.

C. DEFINITIONS:

1. EXISTING CONDITIONS: Contractor shall visit the site and inspect the nature and condition of all facilities to be demolished, partially demolished, modified, or altered in any way prior to submittal of its Bid. No increase in cost or extension of Contract time will be considered for failure to know the conditions of the site and structures.

2. DEMOLITION AND DISPOSAL: All materials removed under demolition work, including dismantled equipment and materials, piping, pumps, fittings, valves, machinery, gates, concrete equipment pads, miscellaneous and structural metals, masonry, and other construction debris shall become the property of the Contractor and be removed from the site as trash. Trash and debris shall be disposed legally, off site, by the Contractor. Upon removal from site, Contractor shall have the rights of salvage of materials.

3. ABANDON IN PLACE: Facilities to be abandoned shall remain in place and be abandoned in accordance with procedures as shown and specified in the Contract Documents. Abandonment shall be limited to the items shown on the Contract Drawings and those required by the Construction Manager. All abandonment methods shall be discussed and approved by the Construction Manager.

4. SALVAGE: Equipment and appurtenances to be salvaged shall be removed without damage and delivered to Owner as shown and specified in the Contract Documents.

D. REFERENCE SPECIFICATIONS: The following referenced sections of the Standard Specifications for Public Works Construction (SSPWC, herinafter, the Greenbook) apply to the work of this section:

1. Greenbook Section 5

2. Greenbook Section 306

1.2 QUALITY ASSURANCE

A. PROTECTION OF EXISTING FACILITIES: The Contractor shall diligently protect existing structures and property of the Owner while proceeding with Work of this section and the entire Contract. All damage shall be repaired at once to the satisfaction of the Owner. All such repairs shall be at the expense of the Contractor and no claims for additional payment will be accepted.

1.3 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the City Supplement to the Greenbook (hereinafter Whitebook) , and shall include the following information:

1. Submit copy of permits required by regulatory agencies for demolition Work and handling of hazardous materials.

1.4 PROJECT CONDITIONS

A. Owner assumes no responsibility for actual condition of structures to be demolished.

1.5 DEMOLITION OF EXISTING FACILITIES

A. Comply with environmental regulations for removal and disposal of hazardous material components.

1.6 GRAVITY SEWER MANHOLE ABANDONMENT SCHEDULE (NOT USED)

1.7 GRAVITY TRUNK SEWER PIPELINE ABANDONMENT SCHEDULE (NOT USED)

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. All demolition, salvage, and renovation Work shall be conducted in a manner which will protect the environment, promote public health and safety, and preclude nuisance conditions.

B. Erect and maintain security devices as necessary, including fencing and gates, for protection of the public and Owner. Do not close or obstruct roadways, sidewalks, or hydrants without applicable permits.

C. Protect existing improvements and facilities not to be demolished, including but not limited to adjacent structures; walls; fences; sidewalks and roadways not designated

to be demolished; utilities not designated to be abandoned, removed, or salvaged; and any other items not designated to be abandoned, removed, or salvaged.

D. Remove materials from site as Work progresses. Do not allow materials to accumulate on-site.

E. Accurately record actual locations of capped utilities for record documents.

3.2 INSPECTION

A. The Contractor shall inspect existing structures prior to beginning abandonment procedures.

3.3 REPAIR AND RESTORATION

A. GENERAL: The Contractor shall alter or rework existing structures as shown and specified. Generally, when items of equipment and piping are removed, the areas and surfaces from which items were removed shall be left with a neat appearance and finish compatible with surrounding areas, colors, and surfaces. The Contractor shall do all painting, sanding, grouting, sacking, resurfacing, and other Work as necessary to comply with the above requirements. Prior to structural modifications, all surfaces shall be subject to inspection by the Construction Manager. Colors shall match existing colors as closely as possible. For replacement, repair of restoration of work removed, comply with the specifications for the type of Work to be done.

B. PIPING MODIFICATIONS: Where necessary or required for the purpose of making piping connections, cut existing pipelines and provide suitable plugs, bulkheads, or other means to hold back the flow of water or other liquids, all as required in the performance of the Work under this Contract. The remaining open ends of all piping, valves, fittings, and appurtenances that are removed shall be plugged with standard pipe plugs or closed with flanges so that there will be no leakage through the closure.

3.4 REMOVAL OF MANHOLE FRAME AND COVER (NOT USED)

3.5 DEMOLITION OF EXISTING STRUCTURES

A. Structures that are in the way of new construction shall be removed completely, regardless of whether they are above or below existing or proposed ground or grade.

B. This Work may be done in any manner selected by the Contractor, and reviewed by the Construction Manager, that does not endanger adjacent structures and property. The use of explosives will not be permitted for any purposes.

C. Structural steel members shall be cut into sections of such weight and size as will permit convenient handling, hauling, and storage. Concrete to be demolished and removed shall be broken into pieces not greater than 24-inches in any dimension by methods reviewed by the Construction Manager.

3.6 ABANDONMENT OF GRAVITY SEWER MANHOLES AND STRUCTURES (NOT USED)

3.7 ABANDONMENT OF GRAVITY SEWER PIPES (NOT USED)

3.8 ABANDONMENT OR REMOVAL OF POTABLE WATER AND RECYCLED WATER FACILITIES (NOT USED)

3.9 ABANDONMENT OR REMOVAL OF CHEMICAL PIPES

A. Prior to capping chemical pipes as indicated on the contract documents, Contractor shall flush the abandoned piping with water up to the nearest upstream isolation valve.

B. Pipe to be abandoned shall be flushed with water for no less than 10 minutes, and at least until the pH of the wastewater is between 6.5 and 7.5.

C. All wastewater generated by the flushing process shall be collected, treated, and discharged in accordance with applicable regulations. Wastewater shall not be discharged to the sewer without the approval of the Construction Manager.

3.10 SALVAGE

A. When the Contractor is required to remove existing pipe and appurtenances, or portions thereof, such material may, at the discretion of the Engineer, be considered salvage. All materials identified as salvage are considered property of the City.

B. The Contractor shall remove and temporarily stockpile all materials identified as salvage in a safe location that will not disrupt traffic or shall deliver salvage to the City's Field Operations Yard as directed by the Construction Manager.

C. The Contractor shall legally dispose of all other materials in an appropriate manner. Disposal is the responsibility of the Contractor. Obtain concurrence from the agency having disposal jurisdiction with respect to disposal sites and transportation methods.

**** END OF SECTION ****

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.2 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. PRODUCT DATA: For each type of product indicated.

2. DESIGN MIXTURES: For each concrete mixture.

3. STEEL REINFORCEMENT SHOP DRAWINGS: Placing drawings that detail fabrication, bending, and placement.

4. WELDING CERTIFICATES.

5. MATERIAL CERTIFICATES.

6. MATERIAL TEST REPORTS.

7. FLOOR SURFACE FLATNESS AND LEVELNESS MEASUREMENT.

1.4 QUALITY ASSURANCE

A. MANUFACTURER QUALIFICATIONS:

1. A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.

2. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. TESTING AGENCY QUALIFICATIONS: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

C. ACI PUBLICATIONS: Comply with the following unless modified by requirements in the Contract.

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.

2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

D. CONCRETE TESTING SERVICE: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. SMOOTH-FORMED FINISHED CONCRETE: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. ROUGH-FORMED FINISHED CONCRETE: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.2 STEEL REINFORCEMENT

A. REINFORCING BARS: ASTM A 615, Grade 60, deformed. Reinforcing steel shall not be welded.

B. BAR SUPPORTS: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.3 CONCRETE MATERIALS

A. CEMENTITIOUS MATERIAL: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. PORTLAND CEMENT: ASTM C 150, Type II/V, gray. Supplement with the following:

a. FLY ASH: ASTM C 618, Class F.

b. GROUND GRANULATED BLAST-FURNACE SLAG: ASTM C 989, Grade 100 or 120.

B. NORMAL-WEIGHT AGGREGATES: ASTM C 33, graded.

1. MAXIMUM COARSE-AGGREGATE SIZE: 1 inch. Free of materials with deleterious reactivity to alkali in cement.

2. FINE AGGREGATE: Free of materials with deleterious reactivity to alkali in cement.

C. WATER: ASTM C 94 and potable.

2.4 ADMIXTURES

A. AIR-ENTRAINING ADMIXTURE: ASTM C 260.

B. CHEMICAL ADMIXTURES: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. WATER-REDUCING ADMIXTURE: ASTM C 494, Type A.

2. RETARDING ADMIXTURE: ASTM C 494, Type B.

3. WATER-REDUCING AND RETARDING ADMIXTURE: ASTM C 494, Type D.

4. HIGH-RANGE, WATER-REDUCING ADMIXTURE: ASTM C 494, Type F.

5. HIGH-RANGE, WATER-REDUCING AND RETARDING ADMIXTURE: ASTM C 494, Type G.

6. PLASTICIZING AND RETARDING ADMIXTURE: ASTM C 1017, Type II.

2.5 WATERSTOPS

A. FLEXIBLE RUBBER WATERSTOPS: CE CRD-C 513, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

2.6 VAPOR RETARDERS (NOT USED)

2.7 CURING MATERIALS

A. EVAPORATION RETARDER: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. ABSORPTIVE COVER: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. MOISTURE-RETAINING COVER: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. WATER: Potable.

E. CLEAR, WATERBORNE, MEMBRANE-FORMING CURING COMPOUND: ASTM C 309, Type 1, Class B, dissipating.

2.8 RELATED MATERIALS

A. EXPANSION- AND ISOLATION-JOINT-FILLER STRIPS: ASTM D 1751, asphalt-saturated cellulosic fiber.

2.9 CONCRETE MIXTURES

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

B. CEMENTITIOUS MATERIALS: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 15 percent.

C. ADMIXTURES: Use admixtures according to manufacturer's written instructions.

1. Use plasticizing admixture in concrete, as required, for placement and workability.

2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

3. Use water-reducing admixture in all concrete.

D. Proportion normal-weight concrete mixture as follows:

1. MINIMUM COMPRESSIVE STRENGTH: 3000 psi at 28 days.

2. MAXIMUM WATER-CEMENTITIOUS MATERIALS RATIO: 0.45.

3. SLUMP LIMIT: 4 inches before adding water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

2.10 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.11 CONCRETE MIXING

A. READY-MIXED CONCRETE:

1. Measure, batch, mix, and deliver concrete according to ASTM C 94 and furnish batch ticket information.

2. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR RETARDERS (NOT USED)

3.4 STEEL REINFORCEMENT

A. GENERAL:

1. Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

2. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

A. GENERAL: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. CONSTRUCTION JOINTS: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved.

C. CONTRACTION JOINTS IN SLABS-ON-GRADE: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. GROOVED JOINTS: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. SAWED JOINTS: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. ISOLATION JOINTS IN SLABS-ON-GRADE: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

E. WATERSTOPS: Install in construction joints and at other joints indicated according to manufacturer's written instructions.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

C. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

D. COLD-WEATHER PLACEMENT: Comply with ACI 306.1.

E. HOT-WEATHER PLACEMENT: Comply with ACI 301.

3.7 FINISHING FORMED SURFACES

A. ROUGH-FORMED FINISH:

1. As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove all fins and other projections.

2. Apply to concrete surfaces not exposed to view.

B. SMOOTH-FORMED FINISH:

1. As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove all fins and other projections that exceed specified limits on formed-surface irregularities.

2. Apply to concrete surfaces exposed to view.

C. RUBBED FINISH (NOT USED)

D. RELATED UNFORMED SURFACES: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. GENERAL: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. SCRATCH FINISH (NOT USED)

C. FLOAT FINISH (NOT USED)

D. TROWEL FINISH (NOT USED)

E. BROOM FINISH: Apply a broom finish to exterior concrete platforms, steps, ramps, and slab as indicated.

3.9 CONCRETE PROTECTING AND CURING

A. GENERAL: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. EVAPORATION RETARDER: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. CURE CONCRETE:

1. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

a. MOISTURE CURING: Keep surfaces continuously moist for not less than seven days.

b. MOISTURE-RETAINING-COVER CURING: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

c. CURING COMPOUND: Apply curing compound with fugitive dye uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Apply two coats minimum. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

(1) REMOVAL: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.

3.10 CONCRETE SURFACE REPAIRS

A. DEFECTIVE CONCRETE: Repair and patch defective areas as approved. Remove and replace concrete that cannot be repaired and patched to Owner's satisfaction.

3.11 FIELD QUALITY CONTROL

A. TESTING AND INSPECTING: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

**** END OF SECTION ****

SECTION 05120

STRUCTURAL STEEL

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This Section describes the requirements for furnishing and installing structural steel.

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

C. DESIGN OF MEMBERS AND CONNECTIONS: Details are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site.

1.2 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. SHOP DRAWINGS:

a. Furnish shop drawings prepared under the supervision of a registered professional engineer, including complete details and schedules for fabrication and assembly of structural steel members, procedures and diagrams.

b. Include details of cuts, connections, camber, holes, and other pertinent data. Indicate welds by standard AWS symbols, and show size, length, and type of each weld.

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

d. Prepare erection drawings with sequencing in compliance with all current OSHA requirements.

2. 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.

3. SURVEYS: Furnish certified copies of each survey conducted by a registered professional engineer, showing elevations and locations of existing actuators, beams and columns in the vicinity of the platform, and final elevations and locations for new members. Show discrepancies between actual installation, as-built documents and contract documents.

1.3 QUALITY ASSURANCE

A. WELDING QUALIFICATIONS: Prior to commencing welding, welding procedures, welding operations, all welders shall be qualified in accordance with AWS D1.1.

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

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to site at intervals to ensure uninterrupted progress of the work.

B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry.

C. Store materials to permit easy access for inspection and identification.

D. Keep structural steel members off ground, using pallets, platforms, or other supports.

E. Protect steel members and packaged materials from erosion and deterioration.

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

PART 2 - PRODUCTS

2.1 MATERIALS:

A. 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.

B. STRUCTURAL STEEL SHAPES: ASTM A992.

C. STRUCTURAL STEEL PLATES, BARS AND ANGLES: ASTM A36, ASTM A572 if noted on plans or AISI Type 316 stainless steel if noted on plans.

D. COLD-FORMED STEEL TUBING: ASTM A500, Grade B.

E. HOT-FORMED STEEL TUBING : ASTM A501.

F. STEEL PIPE: ASTM A53, Type E or S, Grade B; or ASTM A501.

1. FINISH: Black, except where indicated to be galvanized

G. STEEL CASTINGS: ASTM A27, Grade 65-35, medium-strength carbon steel.

H. ANCHOR BOLTS: AISI Type 316 stainless steel per referenced ICC ESR.

I. 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.

J. WELDING ELECTRODES: Comply with AWS Code. AWS Code E70XX min.

K. STRUCTURAL STEEL PRIMER PAINT: VOC complaint rust-inhibitive primer; Tnemec Series 18 Enviro-Prime or approved equal acrylic emulsion primer.

L. NONMETALLIC NON-SHRINK 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

A. SHOP FABRICATION AND ASSEMBLY:

1. Fabricate and assembly structural assemblies in shop where possible.

2. Fabricate items in accordance with AISC Specifications and as indicated on approved shop drawings.

3. Provide camber in structural members where indicated.

4. Mark and match-mark materials for field assembly.

5. Fabricate for delivery sequence, which will expedite erection and minimize field handling.

6. 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.

B. CONNECTIONS:

1. Weld or bolt shop connections as indicated.

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

3. Provide high-strength threaded fasteners for all bolted connections.

a. HIGH-STRENGTH BOLTED CONNECTIONS: Install in accordance with AISC "Specifications for Structural Joints Using ASTM A325 Bolts", (RCRBSJ).

C. 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.

D. HOLES FOR OTHER WORK:

1. 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. Punch, drill, or cut holes perpendicular to metal surfaces.

3. Do not flame cut holes or enlarge holes by burning.

4. Drill holes in bearing plates.

2.3 SHOP PAINTING:

A. GENERAL:

1. Shop paint structural steel, except members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on exposed portions and initial 2-inches of embedded areas only.

2. Do not paint surfaces which are to be field welded or high-strength bolted with friction-type connections.

3. Do not paint surfaces which are to receive sprayed on fire proofing.

4. Apply 2 coats of paint to surfaces inaccessible after assembly or erection. Each coat shall be a different color.

B. 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. Clean steel concealed in finish work in accordance with SP-3.

C. PAINTING: Immediately after surface preparation, apply primer at dry film thickness of not less than 1.5 mils, in accordance with manufacturer's instructions. Use painting methods which result in full coverage of joints, corners edges and exposed surfaces.

PART 3 - EXECUTION

3.1 ERECTION:

A. SURVEYS: Check elevations of existing actuators, beams and columns as well as new beams and columns, before erection proceeds. Do not proceed with erection until corrections have been made.

B. 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.

C. SETTING BASES AND BEARING PLATES:

1. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve surface bond.

2. Clean bottom surfaces of base and bearing plates.

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

4. 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.

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

D. FIELD ASSEMBLY:

1. Set structural frames to lines and elevations indicated. Align and adjust members before permanently fastening.

2. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly.

3. Adjust for discrepancies in elevations and alignment.

4. Level and plumb individual members within specified AICS 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.

   a. ERECTION BOLTS: Remove erection bolts on exposed welded construction. Fill holes with plug welds and grind smooth.

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

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

E. TOUCH-UP PAINTING:

1. Clean field welds, bolted connections, and abraded areas of shop paint.

2. Apply paint by brush or spray to exposed areas using same material and thickness as used for shop painting.

3. Apply by brush or spray, minimum dry film thickness of 1.5 mils.

3.2 FIELD QUALITY CONTROL:

A. The Owner's Testing Laboratory will:

1. Review certificates of compliance.

2. Inspect high strength bolted connections as required by CBC Section 2228 and Section 1701.5.6.

3. Visually inspect all welding while operators are making welds and after work is completed as required by CBC Section 2228 and Section 1701.5.5.

4. 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 DI.1 for welds subject to tensile stress.

**** END OF SECTION ****

SECTION 05500

MISCELLANEOUS METALWORK

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

A. The WORK of this Section includes providing miscellaneous metalwork and appurtenances including the following:

1. Anchor Bolts
2. Bolts
3. Post Installed Adhesive Anchors
4. Seat Angles, Supports and Brackets
5. Non-Slip Metal Plate

1.2 RELATED SECTIONS

A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 05120 Structural Steel
2. Section 05521 Pipe and Tube Railings
3. Section 09900 Coating Systems

1.3 STANDARD SPECIFICATIONS

A. Except as otherwise indicated in this Section of the Specifications, comply with the Standard Specifications for Public Works Construction (SSPWC).

1.4 SPECIFICATIONS AND STANDARDS

A. The current editions of the following apply to the WORK of this Section:

1. Commercial Standards:

Reference	Title
AISC MO11	Manual of Steel Constructions
AASHTO HS-20	Truck Loading
ASTM A36	Specification for Structural Steel (Angles, channels, etc.)

Reference	Title
ASTM A276	Specification for Stainless Steel Bars and Shapes, Grade A, Type 316
ASTM A283	Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars
ASTM A489	Carbon Steel Eyebolts
ASTM A 569	Specification for Steel, Carbon, (0.15 Maximum Percent) Hot Rolled, Sheet and Strip, Commercial Quality
ASTM A572	Specification for Structural Steel (Grade 50)
ASTM A 575	Specification for Steel Bars, Carbon, Merchant Quality, M-Grades
ASTM A666	Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar for Structural Applications, Grade A, Type 316
ASTM A992	Structural Steel Shapes
ASTM B221	Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
ASTM B 221	Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes
ANSI/AWS	Structural Welding Code
NFPA 101	Life Safety Code

1.5 SUBMITTALS AND SHOP DRAWINGS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. Shop drawings of miscellaneous metalwork including seat angles, supports and guides.

2. Shop drawings showing proposed use of post installed adhesive anchors with proposed products.

3. Welding procedures and welder qualifications.

PART 2 - PRODUCTS

2.1 MISCELLANEOUS METALWORK

A. MATERIALS: Products fabricated of structural steel shapes shall comply with the requirements of ASTM A572, or A9920, and structural steel angles, channels, plates, and bars shall comply with the requirements of ASTM A 36.

B. CORROSION PROTECTION: Miscellaneous metalwork of fabricated steel, which will be used in a corrosive environment or will be submerged shall be stainless steel. Other miscellaneous steel metalwork shall be primed and top coated after fabrication.

C. STAINLESS STEEL: Stainless steel metalwork shall be of Type 316 unless otherwise noted in design plans. Stainless steel shall not be torch heated for welding. Submit welding methods and procedures. All welded stainless steel shall be passivated after welding by immersing in a pickling solution of 6 percent nitric acid and 3 percent hydrofluoric acid. Temperature and detention time for passivation shall be sufficient for removal of oxidation and ferrous contamination without etching of surface. The passivated steel shall undergo a complete neutralization by immersion in a detergent rinse followed by clean water wash, or shall be buffed with Scotch Brite EXL (or equal) for removal of weld discoloration and heat tint.

D. WELDING:

1. Welding shall be by the metal-arc method or gas-shielded arc method as described in the American Welding Society's "Welding Handbook" and supplemented by other standards of the AWS. Qualification of welders shall be in accordance with the AWS Standards.

2. In assembly and during welding, the component parts shall be adequately clamped, supported and restrained to minimize distortion and for control of dimensions. Weld reinforcement shall comply with the AWS Code. Upon completion of welding, weld splatter, flux, slag, and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance, with uniform weld contours and dimensions. Sharp corners of material which is to be painted or coated shall be ground to a minimum of 1/32-inch on the flat.

2.2 ANCHOR BOLTS

A. GENERAL: All anchor bolts shall be AISI Type 316 stainless steel.

1. Anchor bolt holes in equipment support frames shall not exceed the bolt diameters by more than 25 percent, up to a maximum oversizing of 1/4 inch. Unless otherwise indicated, minimum anchor bolt diameter shall be 1/2 inch. Anchor bolts for equipment shall be 316 stainless steel and shall be provided with leveling nuts which shall be tightened against flat surfaces to not less than 10 percent of the bolt's safe tensile stress.

2. Tapered washers shall be provided where mating surface is not square with the nut.

3. Post installed adhesive anchors set in holes drilled in the concrete after the concrete is placed is not permitted as substitution for anchor bolts except where otherwise indicated. Upset threads shall not be acceptable.

4. ASTM A307 anchor bolts are prohibited.

B. ADHESIVE ANCHORS:

1. Unless otherwise indicated, drilled concrete or masonry anchors shall be adhesive anchors. Substitutions will not be considered. Adhesive anchors shall comply with the following:

2. Epoxy adhesive anchors shall be provided for drilled anchors where exposed to weather, in submerged, wet, splash, overhead, and corrosive conditions, and for anchoring handrails, reinforcing bars, etc. Threaded rod shall be stainless steel Type 316.

3. Glass capsule, polyester resin adhesive anchors shall not be permitted.

2.3 BOLTS

A. BOLT REQUIREMENTS: Bolts shall comply with the following:

1. The nuts shall be capable of developing the full strength of the bolts. Threads shall be Coarse Thread Series conforming to the requirements of the American Standard for Screw Threads. Bolts and cap screws shall have hexagon heads and nuts shall be Heavy Hexagon Series.

2. The length of all bolts shall be such that after joints are made up, each bolt shall extend through the entire nut, but in no case more than 1/2-inch beyond the nut.

B. STANDARD SERVICE BOLTS (NOT BURIED OR INSIDE TANKS OR CHANNELS): Steel for bolts, anchor bolts and cap screws shall be in accordance with the requirements of ASTM A 325, or threaded parts of ASTM A 36.

C. BOLTS BURIED OR INSIDE TANKS OR CHANNELS: Bolts, anchor bolts, nuts and washers which are buried, submerged, or below the top of the wall inside any hydraulic structure shall be of Type 316 stainless steel.

2.4 SEAT ANGLES, SUPPORTS AND BRACKETS

A. Seat angles for supporting floor plates and hatches shall be Type 316 stainless steel unless indicated otherwise. Supports and brackets for piping and equipment shall be painted steel.

2.5 NON-SLIP METAL PLATE

A. Non-slip safety metal plate shall be formed of a coarse aluminum textured non-slip surface bonded to an aluminum substrate. Non-slip metal plate shall have the following properties:

1. SURFACE TEXTURE: A coarse surface texture suitable for high pedestrian traffic and suitable for environments bearing high viscosity fluids and substances.

2. SURFACE: All metal plasma stream deposition process bonds surface to substrate. Anti-slip aluminum surface consisting of a random hatch matrix.

3. BOND STRENGTH, SURFACE TO SUBSTRATE, ASTM C 633: Minimum of 2,000 psi.

4. COEFFICIENT OF FRICTION, ANTI-SLIP SURFACE: Minimum of 0.6.

5. THICKNESS: 1/8-inch, unless indicated otherwise on the drawings or by the Construction Manager.

B. SHOP COATING: Factory recommended paint or protective coating suitable for corrosive environments.

C. FASTENERS: Material for fasteners to be used for attaching non-slip metal plate to grating and other surfaces shall be as per factory recommendations.

2.6 MANUFACTURERS

A. Products of the type or model (if any) indicated shall be manufactured by one of the following (or equal):

1. EPOXY ADHESIVE ANCHORS:

a. Sika/FI System with Sikadur Injection Gel Epoxy

b. Masterbuilders Concresive Epoxy Cartridge Dispensing System and Concresive Paste LPL

c. Hilti Hit HY150 ICBO ER-5193

2. NON-SLIP METAL PLATE: SlipNot Metal Safety Flooring, Surface Grade 3, Molnar Company.

PART 3 - EXECUTION

3.1 GENERAL

A. FABRICATION AND ERECTION: Fabrication and erection of miscellaneous steel fabrications shall conform to the requirements of the American Institute of Steel Construction "Manual of Steel Construction."

B. GENERAL:

1. Dissimilar metals shall be protected from galvanic corrosion by means of pressure tapes, coatings or isolators. Grouting of anchor bolts with nonshrink or epoxy grouts, where indicated.

2. Drilling of bolts or enlargement of holes to correct misalignment will not be allowed.

3. Metalwork to be embedded in concrete shall be placed accurately and held in correct position while the concrete is placed or, if indicated, recesses or blockouts shall be formed in the concrete. The surfaces of metalwork in contact with or embedded in concrete shall be cleaned. Recesses may be neatly cored in the concrete after it has attained its design strength and the metalwork grouted in place.

4. Holes shall be punched 1/16 inch larger than the nominal size of the bolts, unless otherwise indicated. Whenever needed, because of the thickness of the metal, holes shall be subpunched and reamed or shall be drilled.

3.2 INSTALLATION OF ANCHOR BOLTS

A. After anchor bolts have been embedded, their threads shall be protected by grease and the nuts run on.

B. Installation of post installed, drilled-in adhesive anchors shall comply with the following:

1. Installation recommendations by the anchor system manufacturer shall be followed, including maximum hole diameter.

2. Use shall be limited to applications where exposure to fire or exposure to concrete or rod temperature above 120 degrees F is not indicated.

3. Use shall be limited to locations where exposure to acid concentrations higher than 10 percent, to chlorine gas, or to machine or diesel oils, is not indicated.

4. Concrete temperature (not air temperature) shall be compatible with curing requirements recommended by adhesive manufacturer. Anchors shall not be placed in concrete below 25 degrees F.

5. Anchor diameter and grade of steel shall comply with equipment supplier specifications. Anchor shall be threaded or deformed full length of embedment and shall be free of rust, scale, grease, and oils.

6. Holes shall have rough surfaces, such as can be achieved using a rotary percussion drill.

7. Holes shall be blown clean with compressed air and be free of dust or standing water prior to installation.

8. Anchor shall be left undisturbed and unloaded for full adhesive curing period.

3.3 INSTALLATION OF NON-SLIP METAL PLATE

A. Non-slip metal plate shall be field measured for proper cutouts and proper sizes. Welding and fastening of plate shall be as per manufacturer recommendations.

**** END OF SECTION ****

SECTION 05503

ACCESS HATCH

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES: Access hatch.

1.2 REFERENCES

A. "Welding Stainless Steel" published by American Welding Society (AWS).

1.3 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. PRODUCT DATA: Fully describe all items proposed for use.

2. SHOP DRAWINGS: Show dimensions, attachments, inserts and relationship of work to adjoining construction.

1.4 QUALITY ASSURANCE

A. REGULATORY REQUIREMENTS:

1. Applicable Occupational Safety and Health Regulations.

2. California Building Code, latest Edition.

1.5 GUARANTEE

A. Furnish a written guarantee effective for a period of 1 year after final acceptance of the project that floor hatch will not leak and will be free of defects in materials and workmanship.

PART 2 - PRODUCTS

2.1 ACCESS HATCH

A. GENERAL: Access hatch shall be single-leaf as indicated and the hatch cover shall be rated for a live load of 105 pounds per square foot (psf).

B. FRAME AND COVER: Cover shall be aluminum or stainless steel with a diamond pattern. The frame shall be an angle frame with an internal mounting flange and pre-drilled anchor holes.

C. GASKET: A heavy extruded EPDM rubber gasket shall be permanently attached to the access hatch cover to provide a gas-tight seal.

D. HINGES AND STRUT: Hinges and hinge pins shall be of Type 316 stainless steel. The hatch cover shall be provided with a gas-filled strut lifting mechanism to aid in lifting the cover, and retarding downward motion of the cover. The mechanism shall allow for smooth movement of the cover over the entire arc.

E. HARDWARE: All hardware, including snaplock, handle, and hold-open pin or arm shall be of Type 316 stainless steel unless otherwise specified.

F. MANUFACTURER: Hatch shall be Type J-AL-R, by The Bilco Company, or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. GENERAL: Access hatch shall be installed per Manufacturer's recommendations.

**** END OF SECTION ****

SECTION 05521

PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES: Aluminum pipe and tube railings.

1.2 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. PRODUCT DATA: For the following:

a. Manufacturer's product lines of mechanically connected railings.

b. Railing brackets.

c. Grout, anchoring adhesive, and paint products.

2. SHOP DRAWINGS: Include plans, elevations, sections, details, and attachments to other work.

3. SAMPLES: For each type of exposed finish required.

4. DELEGATED-DESIGN SUBMITTAL: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

5. PRODUCT TEST REPORTS: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

1.4 RELATED SECTIONS

A. Section 05500 Miscellaneous Metalwork, post installed adhesive anchors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. ALUMINUM PIPE AND TUBE RAILINGS:

1. BASIS-OF-DESIGN PRODUCT: Subject to compliance with requirements, match existing railings in field.

2.2 PERFORMANCE REQUIREMENTS

A. DELEGATED DESIGN: Engage a qualified professional engineer, registered in the state of California, to design railings, including attachment to building construction.

B. STRUCTURAL PERFORMANCE: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. HANDRAILS AND TOP RAILS OF GUARDS:

a. Uniform load of 50 lbf/ ft. applied in any direction.

b. Concentrated load of 200 lbf applied in any direction.

c. Uniform and concentrated loads need not be assumed to act concurrently.

2. INFILL OF GUARDS:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.

b. Infill load and other loads need not be assumed to act concurrently.

C. Guardrail post bases, top and side mounted, shall be manufacturers standard, heavy duty, 4-bolt fabrications.

2.3 METALS, GENERAL

A. BRACKETS, FLANGES, AND ANCHORS:

1. Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.4 ALUMINUM

A. ALUMINUM, GENERAL: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.

B. EXTRUDED BARS AND TUBING: ASTM B 221, Alloy 6063-T5/T52.

C. EXTRUDED STRUCTURAL PIPE AND ROUND TUBING: ASTM B 429, Alloy 6063-T6

D. DRAWN SEAMLESS TUBING: ASTM B 210, Alloy 6063-T832.

E. PLATE AND SHEET: ASTM B 209, Alloy 6061-T6.

F. DIE AND HAND FORGINGS: ASTM B 247, Alloy 6061-T6.

G. CASTINGS: ASTM B 26, Alloy A356.0-T6.

2.5 FASTENERS

A. GENERAL: Provide the following:

1. ALUMINUM RAILINGS: Type 304 stainless-steel fasteners

B. POST-INSTALLED ANCHORS: Stainless steel post installed adhesive anchors per Section 05500.

2.6 MISCELLANEOUS MATERIALS

A. WELDING RODS AND BARE ELECTRODES: Select according to AWS specifications for metal alloy welded.

B. LOW-EMITTING MATERIALS: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

C. NONSHRINK, NONMETALLIC GROUT: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.7 FABRICATION

A. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

B. Form work true to line and level with accurate angles and surfaces.

C. WELDED CONNECTIONS:

1. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

2. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

3. Obtain fusion without undercut or overlap.

4. Remove flux immediately.

5. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

D. WELDED CONNECTIONS FOR ALUMINUM PIPE: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

E. NONWELDED CONNECTIONS:

1. Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

2. Form changes in direction by bending or by inserting prefabricated elbow fitting

3. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

4. Close exposed ends of railing members with prefabricated end fittings.

F. BRACKETS, FLANGES, FITTINGS, AND ANCHORS:

1. Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

2. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

2.8 ALUMINUM FINISHES

A. APPEARANCE OF FINISHED WORK: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast. Match existing.

B. MILL FINISH: AA-M12, nonspecular as fabricated.

C. CLEAR ANODIC FINISH: AAMA 611.

PART 3 - EXECUTION

3.1 INSTALLATION

A. GENERAL

1. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

2. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

3. Set posts plumb within a tolerance of 1/16 inch in 3 feet.

4. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

B. CONTROL OF CORROSION:

1. Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

2. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.

3.2 ANCHORING POSTS

A. Use stainless steel adhesive anchors into concrete.

B. Anchor posts to metal surfaces with stainless steel bolts.

3.3 ATTACHING RAILINGS

A. Secure railing end flanges to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in stainless steel adhesive anchors.

**** END OF SECTION ****

SECTION 06730

FIBERGLASS-REINFORCED PLASTIC (FRP) GRATING AND PLATE

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes, but is not limited to, new fiberglass reinforced plastic grating for elevated platforms and walkways, and plate for partitions and covers.

1.2 REFERENCES

A. GENERAL:

1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.

2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.

a. ASTM International applicable standards.

1.3 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. Submit shop detail drawings and calculations prepared by a structural engineer licensed in the State of California.

2. Submit manufacturer's specifications and installation instructions.

3. 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.

4. Copies of shop drawings, including erection drawings, shall be submitted 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 omission. Do not fabricate any members until all dimensions have been verified and resolved.

1.4 QUALITY ASSURANCE

A. MANUFACTURER'S QUALIFICATIONS: The manufacturer shall be experienced in the manufacture of fiberglass reinforced plastic grating of equivalent type, size, and complexity.

B. DESIGN LOADS:

1. LIVE LOAD: 125 pounds per square foot (minimum), 2000 pounds concentrated load with 1/4 inch or less deflection for grating and 20 pounds per square foot for plate.

1.5 DELIVERY, STORAGE, AND HANDLING

A. 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

A. FRP GRATING:

1. Grating shall be pultruded using vinylester or polyester with a Class I fire rating per ASTM E84, manufactured by Strongwell, or equal.

2. Grating shall be 1.5 inches in depth and 60% open.

B. FASTENERS AND SADDLE CLIPS: 316 stainless steel (S.S.)

C. FRP PLATE: Plate shall be made from isophthalic polyester or vinyl ester resin with fire retardant additives to meet a flame spread rating of less than 25 per ASTM E-84, the flammability characteristics of UL 94 V0, and meet the self-extinguishing requirements of ASTM D-635. Pultruded profiles shall satisfy the visual requirements of ASTM D4385. Plate thickness shall be 1/2-inch unless indicated otherwise on the contract documents and drawings or by the Construction Manager. Plate shall be Extren or Safplank, manufactured by Strongwell, or equal.

2.2 FABRICATION

A. Fasteners and accessories for gratings and plate shall be shop fabricated in accordance with applicable ASTM standards.

B. Materials furnished shall be within the standard industry tolerances for that material as specified by the manufacturer.

C. 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.

D. 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".

E. All FRP grating and plate that is 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.

F. Fabrication and installation of all FRP 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.

PART 3 - EXECUTION

3.1 ERECTION

A. 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 has accepted existing conditions.

B. Erect grating, plate and accessory items in accordance with manufacturer's erection drawings and as directed by manufacturer's written recommendations.

C. All grating work shall be true to line, level, and plumb.

D. Completed grating and plate shall comply with approved erection tolerances and shop drawing requirements.

E. 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. Plate shall be fastened as indicated on the plans.

3.2 CLEANING

A. Upon completion of work contained in these specifications, leave all work and premises clean and in satisfactory condition.

3.3 INSPECTION

A. 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.

**** END OF SECTION ****

SECTION 07100

WATERPROOFING

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

A. The DESIGN/BUILDER shall provide waterproofing and moistureproofing of concrete surfaces.

1.2 RELATED SECTIONS

A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.

1. Section 07920 Sealants and Caulking

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. The Work of this Section shall comply with the current edition of the Uniform Building Code (UBC) as adopted by the City of San Diego.

B. Except as otherwise indicated, the current editions of the following apply to the Work of this Section:

Reference	Title
ASTM D 41	Specification for Asphalt Primer Used in Roofing and Waterproofing
ASTM D 226	Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D 312	Specification for Asphalt Used in Roofing

1.4 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. Manufacturer's product data including catalogue cuts.

2. Manufacturer's installation instructions.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. DELIVERY OF MATERIALS: Products shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer.

B. STORAGE: Products shall be carefully stored in a manner that will prevent damage and in an area that is protected from the elements.

PART 2 - PRODUCTS

2.1 GENERAL

A. Only products certified as complying with the indicated requirements shall be provided.

B. Products shall be new, of current manufacture, and shall be the products of reputable manufacturers specializing in the manufacture of such products.

C. Products shall be recommended by the manufacturer for the application indicated.

2.2 WATERPROOFING COATING

A. Waterproofing coating shall be a coal tar epoxy resin.

2.3 MOISTUREPROOFING COATING

A. Moistureproofing coating shall be a coal tar solution.

2.4 WATERPROOFING MEMBRANE

A. Waterproofing membrane shall be minimum 60-inchwide sheets of bituminous and synthetic resins reinforced with an inert material for puncture resistance of at least 200 pounds. Thickness of the sheet shall be 60 mils, minimum.

2.5 MOISTUREPROOFING UNDERLAY

A. Plastic membrane for moistureproofing underlay shall be polyethylene film with a thickness of 10 mils.

2.6 MOISTUREPROOFING UNDERLAY TAPE

A. Pressure sensitive tape shall be 2-inch wide polyethylene tape.

2.7 MANUFACTURERS

A. Products shall be of the type and manufacture as indicated below (or equal):

1. WATERPROOFING COATING:

a. Kopper's Bitumastic 300-M

b. Porter Maxi Build II

2. MOISTUREPROOFING COATING:

a. Kopper's Bitumastic 50

b. Porter Tarmastic 100

3. WATERPROOFING MEMBRANE:

a. W.R. Grace and Company's "Bituthene"

b. Protecto Wrap Co.'s "Jiffy Seal"

4. WATERPROOFING PROTECTIVE BOARD: Celotex Insulation Board.

PART 3 - EXECUTION

3.1 GENERAL

A. Products shall be installed in accordance with the manufacturer's installation instructions.

3.2 WATERPROOFING COATING

A. LOCATION: Waterproofing coating shall be applied to the water side of walls and bottoms of channels or tanks which are common with rooms, tunnels or galleries to be occupied by equipment, piping, conduit, or personnel.

B. SURFACE PREPARATION: New concrete to be waterproofed shall have aged at least 28 days and allowed to dry to a moisture content recommended by the coating manufacturer. Concrete surfaces shall be sandblasted. Voids and cracks shall be repaired.

C. APPLICATIONS: Prime coat shall be thinned and applied at the rate of approximately 200 to 300 square feet per gallon depending on surface condition. Finish coats shall be applied at the rate of 100 square feet per gallon. Final coat shall be black. Total dry film thickness shall be minimum 20 mils. Drying time between coats shall be as recommended by the coating manufacturer.

3.3 MOISTUREPROOFING COATING

A. Moistureproofing coating shall be applied to exterior of outside concrete walls which are below grade and are common with rooms, tunnels or galleries to be occupied by equipment, piping or personnel, unless a "below-grade waterproofing" system is indicated.

B. SURFACE PREPARATION: Masonry surfaces shall be allowed to age for at least 28 days. Holes or other joint defects shall be filled with mortar and repointed. Loose or splattered mortar shall be removed by scrapping and chipping. Masonry surfaces shall be cleaned with clear water by washing and scrubbing. Muriatic acid shall not be used. After cleaning, masonry surfaces shall be sealed or filled with sealer or block filler compatible with the indicated primer.

C. APPLICATION: Each prime and finish coat shall be applied at the rate of 70 square feet per gallon. The number of finish coats shall be sufficient to produce a dry film

thickness of at least 15 mils. Drying time between coats shall be as recommended by the coating manufacturer.

3.4 WATERPROOFING MEMBRANE

A. LOCATION: Waterproofing membrane shall be applied to surfaces indicated.

B. SURFACE PREPARATION: Concrete surfaces shall be clean, dry and free of voids, spalled areas, loose aggregate, and sharp protrusions, with no coarse aggregate visible.

C. APPLICATION: Waterproofing membrane shall be applied in accordance with the manufacturer's recommendations. Surfaces shall be clean and primed before application of the membrane.

D. Pipes or conduits entering structures shall be watertight. The protective board shall be placed directly against membrane before backfilling. Where the membrane is turned up from the base of the walls, at angles in walls, and at any other place where the membrane may be subjected to unusual strain, strips, consisting of two additional plies of membrane shall be applied.

**** END OF SECTION ****

SECTION 07600

FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 WORK IN THIS SECTION

A. SECTION INCLUDES: Manufactured reglets and counterflashing.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.3 DEFINITIONS

A. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association

B. CDA: Copper Development Association

1.4 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. PRODUCT DATA: For each type of product indicated.

2. SHOP DRAWINGS:

a. Show installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.

b. Include details for forming, joining, supporting, and securing sheet metal flashing and trim, including pattern of seams, termination points, fixed points, expansion joints, expansion-joint covers, edge conditions, special conditions, and connections to adjoining work.

3. SAMPLES:

a. For each exposed product and for each finish specified.

b. Maintenance data.

4. WARRANTY: Special warranty.

1.5 QUALITY ASSURANCE

A. SHEET METAL FLASHING AND TRIM STANDARD: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

B. PREINSTALLATION CONFERENCE: Conduct conference at Project site.

1.6 WARRANTY

A. SPECIAL WARRANTY ON FINISHES: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. GENERAL: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. METALLIC-COATED STEEL SHEET: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

1. ZINC-COATED (GALVANIZED) STEEL SHEET: ASTM A 653/A 653M, G90 coating designation; structural quality.

2. ALUMINUM-ZINC ALLOY-COATED STEEL SHEET: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40; structural quality.

3. SURFACE: Mill phosphatized for field painting.

4. COLOR: As selected by Architect from manufacturer's full range.

2.2 UNDERLAYMENT MATERIALS

A. POLYETHYLENE SHEET: A 6-mil- thick polyethylene sheet complying with ASTM D 4397.

B. FELT: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

C. SELF-ADHERING, HIGH-TEMPERATURE SHEET: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. THERMAL STABILITY: ASTM D 1970; stable after testing at 240 deg F.

2. LOW-TEMPERATURE FLEXIBILITY: ASTM D 1970; passes after testing at minus 20 deg F.

D. SLIP SHEET: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

2.3 MISCELLANEOUS MATERIALS

A. GENERAL: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. FASTENERS: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.

1. GENERAL: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. EXPOSED FASTENERS: Heads matching color of sheet metal using plastic caps or factory-applied coating.

b. BLIND FASTENERS: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

2. FASTENERS FOR ALUMINUM SHEET: Aluminum or Series 300 stainless steel.

3. FASTENERS FOR STAINLESS-STEEL SHEET: Series 300 stainless steel.

4. FASTENERS FOR ALUMINUM-ZINC ALLOY-COATED STEEL SHEET: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.

C. SOLDER:

1. FOR STAINLESS STEEL: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.

2. FOR ZINC-COATED (GALVANIZED) STEEL: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.

D. SEALANT TAPE: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. ELASTOMERIC SEALANT: ASTM C 920, elastomeric polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. BUTYL SEALANT: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. EPOXY SEAM SEALER: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

H. BITUMINOUS COATING: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 REGLETS

A. REGLETS: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with interlocking counterflashing on exterior face, of same metal as reglet.

1. MATERIAL: Stainless steel, 0.019 inch thick.

2. FINISH: Mill

2.5 FABRICATION- GENERAL

A. GENERAL: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

1. Obtain field measurements for accurate fit before shop fabrication.

2. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

3. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. SEALED JOINTS: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.

C. EXPANSION PROVISIONS:

1. Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

2. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

D. SEAMS: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

E. SEAMS: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

F. SEAMS FOR ALUMINUM: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

2.6 WALL SHEET METAL FABRICATIONS

A. THROUGH-WALL FLASHING: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12-foot- long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 2-inch- high, end dams where flashing is discontinuous. Fabricate from the following materials:

1. Stainless Steel: 0.016 inch thick.

B. OPENING FLASHINGS IN FRAME CONSTRUCTION: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch- high, end dams. Fabricate from the following materials:

1. Galvanized Steel: 0.022 inch thick.

2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

PART 3 - EXECUTION

3.1 INSTALLATION

A. GENERAL:

1. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement so that completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

2. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

3. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

4. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.

5. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

6. Install sealant tape where indicated.

7. Torch cutting of sheet metal flashing and trim is not permitted.

B. METAL PROTECTION:

1. Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.

2. Coat back side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.

C. UNDERLAYMENT: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.

D. EXPANSION PROVISIONS: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

E. FASTENER SIZES:

1. Use fasteners of sizes that will penetrate wood sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

2. Seal joints as shown and as required for watertight construction.

F. SOLDERED JOINTS:

1. Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.

2. Do not solder metallic-coated steel and aluminum sheet.

3. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

a. STAINLESS-STEEL SOLDERING: Tin edges of uncoated sheets using solder recommended for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and

soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

b. COPPER SOLDERING: Tin edges of uncoated copper sheets using solder for copper.

G. RIVETS: Rivet joints in uncoated aluminum where indicated and where necessary for strength.

3.2 UNDERLAYMENT INSTALLATION

A. POLYETHYLENE SHEET: Install polyethylene sheet with adhesive for anchorage. Apply in shingle fashion to shed water, with lapped and taped joints of not less than 2 inches.

B. FELT UNDERLAYMENT: Install felt underlayment with adhesive for temporary anchorage. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

C. SELF-ADHERING SHEET UNDERLAYMENT: Install self-adhering sheet underlayment, wrinkle free. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

3.3 ROOF DRAINAGE SYSTEM INSTALLATION

A. GENERAL: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

3.4 ROOF FLASHING INSTALLATION

A. GENERAL: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

B. ROOF EDGE FLASHING: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.

C. COPINGS:

1. Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated.

2. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 24-inch centers.

3. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.

D. PIPE OR POST COUNTERFLASHING: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

E. COUNTERFLASHING: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant.

F. ROOF-PENETRATION FLASHING: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.5 WALL FLASHING INSTALLATION

A. GENERAL: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. THROUGH-WALL FLASHING: Installation of through-wall flashing is specified in Division 4 Section "Unit Masonry Assemblies."

C. OPENING FLASHINGS IN FRAME CONSTRUCTION: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.6 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturers written installation instructions.

**** END OF SECTION ****

SECTION 07920

SEALANTS AND CAULKING

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

A. The WORK of this Section includes providing sealants, caulking, and accessories.

1.2 RELATED SECTIONS

A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1.3 SPECIFICATIONS AND STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

1. FED. SPEC. TT-S-001543A: Sealing Compound, Silicone Rubber Base, (For Caulking, Sealing and Glazing in Buildings and Other Structures).

2. FED. SPEC. TT-S-00230C(2): Sealing Compound, Elastomeric Type, (For Caulking, Sealing, and Glazing in Buildings and Other Structures).

1.4 SUBMITTALS AND SHOP DRAWINGS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. Manufacturer's product data including catalogue cuts.

2. Manufacturer's installation instructions.

3. Certification that products comply with indicated requirements.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. DELIVERY OF MATERIALS: Products shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer.

B. STORAGE: Products shall be carefully stored in a manner that will prevent damage and in an area that is protected from deleterious elements.

PART 2 - PRODUCTS

2.1 GENERAL

A. GENERAL: Only products certified as complying with the indicated requirements shall be provided.

B. PRODUCTS: Products shall be new, of current manufacture, and shall be the products of reputable manufacturers specializing in the manufacture of such products.

C. MANUFACTURER'S RECOMMENDATIONS: Products shall be recommended by the manufacturer for the application indicated.

2.2 SEALANTS AND CAULKING MATERIALS

A. Caulking and sealing materials shall conform to the following requirements:

1. Sealant for exterior and interior use shall be 2-part polyurethane, gun grade.

2. Fire-resistant penetration sealants shall be a medium density fire-resistant foam that retains form and stability at high temperature and meets UL test requirements for fire rating required at location used.

3. Caulking tapes shall be of the butyl-base, vulcanized type.

4. Filler material shall be resilient, closed-cell polyethylene foam and/or bond breakers of proper size for joint widths and shall be compatible with sealant manufacturer's product.

5. Primers shall be as recommended by the manufacturer for caulking and sealants.

6. Cleaning and cleanup solvents shall be as recommended by the manufacturer for caulking and sealants.

2.3 MANUFACTURERS

A. Products shall be of the type and manufacture as indicated below (or equal):

1. Sealant for Exterior and Interior Use:

a. Products Research Corp. "210"

b. Progress Unlimited "Iso-Flex 2000"

2. Sealant for Interior Use:

a. Tremco's "Mono"

b. Dap "One-Part Acrylic"

3. Fire-resistant Penetration Sealant:

a. Dow-Corning Corporation's "3-6548 Silicone RTV" foam

b. 3M Corporation's "Fire Barrier Caulk CP 25"

c. Putty Corporation's "Fire Barrier Caulk CP 25"

d. Putty Corporation's "303"

PART 3 - EXECUTION

3.1 GENERAL

A. GENERAL: Products shall be installed in accordance with the manufacturer's installation instructions.

B. AUTHORIZED INSTALLERS: Caulking and sealants shall be complete systems, and shall be installed only by installers authorized and approved by the manufacturer.

C. ACOUSTIC PARTITION JOINTS: Acoustic partition joints shall be made air and sound-tight with acoustic caulking material.

3.2 SEALANT FILLED JOINTS

A. MANUFACTURER'S REPRESENTATIVE: The WORK includes the services of the sealant manufacturer's representative (prior to sealant work) for inspection of the joints and for instructing the installer in the proper use of the materials.

B. SURFACE PREPARATION: Joints and spaces to be sealed shall be clean, dry, and free of dust, loose mortar, and other foreign materials. Ferrous metal surfaces shall be cleaned of rust, mill scale, and other coatings by wire brush, grinding, or sandblasting. Oil and grease shall be removed by cleaning in accordance with sealant manufacturer's recommendations. Protective coatings shall be removed from aluminum surfaces against which caulking or sealing compound is to be placed. Bituminous or resinous materials shall be removed from surfaces to receive caulking or sealants.

C. SEALANT DEPTH: Sealant depth in joints shall be 1/2 the width of joint, but not less than 1/8-inch deep and 1/4-inch wide nor more than 1/2-inch deep and 1-inch wide. Joints shall have a rigid filler material installed to proper depth prior to application of sealant.

D. JOINTS IN POROUS MATERIALS: Where required by the manufacturer, sides of joints of porous materials shall be primed immediately prior to caulking or sealing.

E. APPLICATIONS: A full bead of sealant shall be applied to the joint under sufficient pressure, with the nozzle drawn across sealant, to completely fill the void space and to ensure complete wetting of contact area to obtain uniform adhesion. During application, the tip of the nozzle shall be kept at the bottom of the joint to ensure forcing the sealant to fill from the bottom to the top. Sealants shall be tooled

immediately after exposure with caulking tool or soft bristled brush moistened with solvent. The finished sealant filled joint shall be slightly concave unless otherwise indicated.

F. CLEANING: After application of sealant and caulking materials, adjacent materials which have been soiled shall be cleaned and left in a neat, clean, undamaged or unstained condition. On porous surfaces, excess sealant shall be removed in accordance with the sealant or caulking manufacturer's printed instructions.

3.3 ACOUSTIC CAULKING

A. PREPARATION: Joints and surfaces shall be clean, dry, and free of loose materials.

B. CONCEALED JOINTS: Concealed joints in acoustic partitions including perimeters, intersections of walls and penetrations through finish work, and at conduit ends with boxes shall be sealed with acoustic caulking compound. Backs of electrical boxes shall be sealed with acoustic sheet caulking installed over holes and knock-outs.

**** END OF SECTION ****

SECTION 08220

FIBERGLASS-REINFORCED DOOR AND DOOR FRAME SYSTEMS

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

A. The contractor shall furnish and install all fiberglass reinforced door and door frame systems and related items, complete and operable, including all finish hardware and all appurtenant work, all in accordance with the contract documents.

1.2 SECTION INCLUDES

A. FIBERGLASS REINFORCED PLASTIC (FRP) DOORS

B. FIBERGLASS DOOR FRAMES

C. FIBERGLASS LOUVERS

D. FIBERGLASS REINFORCED PLASTIC (FRP) TRANSOMS

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Comply with the current provisions of the following Standards.

Reference	Title
ASTM D 523	Standard Test Method for Specular Gloss.
ASTM D 635	Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position.
ASTM E 84	Standard Test Method for Surface Burning Characteristics of Building Materials.
ASTM E 152	Standard Methods of Fire Tests of Door Assemblies.
NFPA 252	Standard Methods of Fire Tests of Door Assemblies.
SDI-100	Recommended Specifications for Steel Doors and Frames.
UL 10B	Standard for Fire Tests of Door Assemblies.
UL 305	Standard for Panic Hardware.

1.4 SYSTEM DESCRIPTION

A. PERFORMANCE REQUIREMENTS:

1. DOOR OPENING ASSEMBLIES:

a. Maximum flame spread 25 in accordance with ASTM E 84, self-extinguishing in accordance with ASTM D 635.

b. USDA accepted.

2. FIRE RATED ASSEMBLIES: Comply with requirements of UL10B, NFPA 252, and ASTM E 152; UL B (1½ hour for 2 hour walls) rating, with doors and frames bearing rating labels.

3. FIRE RATED ASSEMBLIES: Comply with requirements of UL10B, NFPA 252, and ASTM E 152; UL ratings indicated on drawings, with doors and frames bearing rating labels.

1.5 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. PRODUCT DATA: Manufacturer's printed product data indicating characteristics of products specified in this section.

2. SHOP DRAWINGS:

a. Plans: Indicate location of each door opening assembly in project.

b. Elevations: Dimensioned elevation of each type door opening assembly in project; indicate sizes and locations of door hardware, and lites and louvers, if specified.

c. Details: Installation details of each type installation condition in project; indicate installation details of glazing, if specified.

d. Schedule: Indicate each door opening assembly in project; cross-reference to plans, elevations, and details.

3. SELECTION SAMPLES:

a. Submit one each of the following samples for review. Samples shall be full size and show gauges, configuration, construction and finish proposed for the various components. Resubmit new samples until approval is obtained.

(i). Door corner construction; 6-inches by 6-inches.

(ii). Door frame construction; 6-inch legs.

b. Manufacturer's standard color chips.

4. VERIFICATION SAMPLES: Two (2) samples to verify color match.

5. MANUFACTURER'S INSTRUCTIONS: Printed installation instructions for door opening assemblies.

6. WARRANTY DOCUMENTS: Manufacturer's standard warranty documents, executed by manufacturer's representative, countersigned by the CONTRACTOR.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling and Unloading: Package door opening assemblies in manufacturer's standard containers.

B. Store door assemblies in manufacturer's standard containers, on end, to prevent damage to face corners and edges.

1.7 WARRANTY

A. Manufacturer's Warranty:

1. Manufacturer's 10-year warranty against failure due to corrosion from specified environment.

2. The hardware manufacturer's warranty shall be included with the hardware installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. ACCEPTABLE MANUFACTURERS:

1. FIB-R-DOR Division of Advance Fiberglass, Inc.; Chem-Pruf Door Company; Lorrim Door Systems; Corrosion Door Systems or equal.

2. Requests for substitutions will be considered in accordance with provisions of the General Requirements.

2.2 MATERIALS

A. FIBERGLASS MAT: Minimum 1.5 ounces per square foot.

B. RESINS: Manufacturer's formulation for fabricating units to meet specified requirements.

C. ANCHORS: Manufacturer's standard stainless steel expansion anchors for existing openings, and new concrete.

1. Bolt and nut fasteners shall be fiberglass reinforced plastic, Fibrebolt by Morrison Molded Fiberglass Company, equal by IMCO, or equal.

a. Stainless steel fasteners shall be used to fasten frames to other materials where it is not possible to use fiberglass reinforced plastic.

D. FASTENERS: Stainless steel.

E. GLAZING: Not Used.

2.3 MANUFACTURED UNITS

A. NON-RATED FIBERGLASS REINFORCED PLASTIC (FRP) DOORS:

1. THICKNESS: 1-3/4 inches.

2. THERMAL INSULATING VALUE: 'R' factor 11.

3. CONSTRUCTION:

a. CORE: All voids between the door plates shall be completely filled with the equivalent of 4-6 pounds of expanded polyurethane foam, having a flame spread of 25 or less per ASTM E-84. A phenolic-coated kraft honeycomb may be substituted for urethane when approved by the ENGINEER.

b. DOOR PLATES: Molded in one continuous piece, resin reinforced with hand-laid glass fiber mat, nominal 1/8 inch thick, minimum 15 mil gel-coated surface.

c. DOOR EDGES: Minimum three (3) layers resin-reinforced glass fiber mat, nominal 3/8 inch thick, machine tooled.

4. SIZES: Indicated on drawings.

5. FINISH: Minimum 15 mil gel-coated smooth gloss surface with a minimum value 88 in accordance with ASTM D 523.

6. COLOR: White gelcoated.

B. NON-RATED FIBERGLASS FRAMES:

1. CONSTRUCTION: One-piece pultruded fiberglass reinforced plastic, minimum 1/4 inch wall thickness, jamb-to-head joints mitered and reinforced with FRP clips and stainless steel fasteners; conforming to SDI requirements for performance equivalent to 16 gage steel frames.

2. FRAME PROFILE: 5-3/4 inches deep, 2 inches wide face; double rabbeted with 5/8 inch high stop.

3. SIZES: Indicated on drawings.

4. FINISH: Minimum 15 mil gel-coated smooth gloss surface with a minimum value 88 in accordance with ASTM D 523.

5. COLOR: White gelcoated.

C. FIRE-RATED FRAMES: UL approved, and as follows:

1. CONSTRUCTION: Type 304 stainless steel.

2. SIZES: For door sizes and frame profiles indicated on drawings.

D. FRAME ANCHORS: Types recommended by manufacturer for project conditions.

E. LOUVERS IN NON-RATED DOORS:

1. CONSTRUCTION: Molded solid vanes; pultruded fiberglass reinforced plastic construction.

2. SIZES: Indicated on drawings.

3. FINISH: Minimum 15 mil gel-coated smooth gloss surface with a minimum value 88 in accordance with ASTM D 523.

4. COLOR: To match the door color.

F. LOUVERS IN FIRE-RATED DOORS: UL approved for indicated fire resistance rating. Provide fire rated dampers.

G. LITES IN NON-RATED DOORS:

1. STOPS: Pultruded fiberglass reinforced plastic construction.

2. GLAZING: (Not Used).

3. SIZES: Indicated on drawings.

4. FASTENERS: Stainless steel screws.

H. DOOR HARDWARE: All hardware and fasteners, including screws, nuts and bolts, hinges, locksets, closers, kickplates, panic bars and foot and head bolts, shall be completely fabricated of stainless steel.

1. Door hardware templates are to be supplied by the hardware supplier.

2. Do not fabricate doors until the approved hardware templates are received.

3. Provide a conduit through the center of the door from the hinge to the lock on electronic locking doors. Coordinate requirements with the electronic lock supplier.

4. Provide conduits of both doors of double doors, if required.

5. Incorporate provisions for the electronic lock system with the electronic lock supplier for electronic locking doors.

2.4 FABRICATION

A. FIBERGLASS REINFORCED PLASTIC (FRP) DOORS:

1. Minimum glass fiber to resin ratio: 30 percent.

2. Mortise for lockset, and recess for strike plate in lock stile.

3. Embed steel reinforcement for hinges, door closers, locksets exist devices and other specified hardware in fiberglass matrix; provide for hinge leaf recesses in hinge stile.

B. FIBERGLASS FRAMES:

1. Mortise for lock strike, and recess for strike plate in lock jamb.

2. Reinforce for hinges and other indicated hardware.

PART 3 - EXECUTION

3.1 EXAMINATION

A. VERIFICATION OF CONDITIONS:

1. Openings are correctly prepared to receive doors and frames.

2. Openings are correct size and depth in accordance with shop drawings.

B. INSTALLER'S EXAMINATION:

1. Have installer examine conditions under which construction activities of this section are to be performed and submit written report if conditions are unacceptable.

2. Transmit two copies of installer's report to the ENGINEER within 24 hours of receipt.

3. Beginning construction activities of this section before unacceptable conditions have been corrected is prohibited.

4. Beginning construction activities of this section indicates installer's acceptance of conditions.

5. Verify that glazing has been factory-installed.

3.2 INSTALLATION

A. Install door opening assemblies in accordance with shop drawings, SDI-100, and manufacturer's printed installation instructions, using installation methods and materials specified in installation instructions.

B. INSTALLATION OF DOOR HARDWARE:

1. Finish hardware shall be installed in accordance with hardware manufacturer's standard templates and printed instructions. Operable parts shall be adjusted for correct function.

2. All hardware shall be installed at the door manufacturing plant.

3. Install door hardware in accordance with manufacturer's printed instructions, using through-bolts to secure surface applied hardware.

4. Site Tolerances: Maintain plumb and level tolerances specified in manufacturer's printed installation instructions.

3.3 ADJUSTING

A. Adjust doors in accordance with door manufacturer's maintenance instructions to swing open and shut without binding, and to remain in place at any angle without being moved by gravitational influence.

B. Adjust door hardware to operate correctly in accordance with hardware manufacturer's maintenance instructions.

3.4 CLEANING

A. Clean surfaces of door opening assemblies and sight-exposed door hardware in accordance with manufacturer's maintenance instructions.

3.5 PROTECTION OF INSTALLED PRODUCTS

A. Protect door opening assemblies and door hardware from damage by subsequent construction activities until final inspection.

**** END OF SECTION ****

SECTION 09900

COATING SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. SCOPE:

1. This Section 09900 specifies coating systems, surface preparations, and application requirements for coating systems. This work shall include all surface preparation, pretreatment, coating application, touch-up of factory-coated surfaces, protection of surfaces not to be coated, cleanup, and appurtenant work, in accordance with the requirements of the Contract Documents.

2. Materials and supplies provided shall be the standard products of the manufacturer. Materials in each coating system shall be the products of a single manufacturer.

3. The coating system schedules summarize the surfaces to be coated, the required surface preparation, and the coating systems to be applied. Coating notes on the drawings are used to show exceptions to the schedules, to show or extend the limits of coating systems, or to clarify or show details for application of the coating systems.

B. DEFINITIONS: Specific coating terminology used in this Section 09900 is in accordance with definitions contained in ASTM D16, ASTM D3960, and the following definitions:

1. ABRASIVE: Material used for blast cleaning, such as sand, grit or shot.

2. ABRASIVE BLAST CLEANING: Cleaning/surface preparation by abrasive propelled at high speed.

3. ANCHOR PATTERN: Profile or texture of prepared surface(s).

4. ANSI: American National Standards Institute.

5. BUG HOLES: Small cavities, usually not exceeding 15 mm in diameter, resulting from entrapment of air bubbles in the surface of formed concrete during placement and compaction.

6. COATING/PAINT/LINING THICKNESS: The total thickness of primer, intermediate and/or finish coats.

7. COATING SYSTEM APPLICATOR (CSA): A generic reference to the specialty subcontractor or subcontractors retained by the Contractor to install the coating systems specified in this Section 09900.

8. COATING SYSTEM MANUFACTURER (CSM): Refers to the acceptable coating system manufacturer, abbreviated as the CSM.

9. COATING SYSTEM MANUFACTURER'S TECHNICAL REPRESENTATIVE(S) (CTR): Refers to the technical representative(s) of the acceptable Coating System Manufacturer and is abbreviated as CTR.

10. DEW POINT: Temperature of a given air/water vapor mixture at which condensation starts.

11. DRY FILM THICKNESS (DFT): Depth of cured film, usually expressed in mils (0.001 inch).

12. DRYING TIME: Time interval between application and curing of material.

13. DRY TO RECOAT: Time interval between application of material and ability to receive next coat.

14. DRY TO TOUCH: Time interval between application of material and ability to touch lightly without damage.

15. FEATHER EDGING: Reducing the thickness of the edge of paint.

16. FEATHERING: Operation of tapering off the edge of a point with a comparatively dry brush.

17. FIELD COAT: The application or the completion of application of the coating system after installation of the surface at the site of the work.

18. HOLD POINT: A defined point, specified in this Section 09900, at which work shall be halted for inspection.

19. HOLIDAY: a discontinuity, skip, or void in coating or coating system film that exposes the substrate.

20. HONEYCOMB: Segregated condition of hardened concrete due to non-consolidation.

21. ICRI: International Concrete Repair Institute.

22. INCOMPATIBILITY: Inability of a coating to perform well over another coating because of bleeding, poor bonding, or lifting of old coating; inability of a coating to perform well on a substrate.

23. LAITANCE: A layer of weak, non-durable concrete containing cement fines that is brought to the surface through bleed water because of concrete finishing and/or over-finishing.

24. MIL: 0.001 inch.

25. NACE: National Association of Corrosion Engineers.

26. OVERSPRAY: Dry spray, particularly such paint that failed to strike the intended surface.

27. PINHOLE: A small diameter discontinuity in a coating or coating system film that is typically created by outgassing of air from a void in a concrete substrate resulting in exposure of the substrate or a void between coats.

28. POT LIFE: Time interval after mixing of components during which the coating can be satisfactorily applied.

29. RESURFACER/RESURFACING MATERIAL: A layer of cementitious and/or resin-base material used to fill or otherwise restore surface continuity to worn or damaged concrete surfaces.

30. SHELF LIFE: Maximum storage time for which a material may be stored without losing its usefulness.

31. SHOP COAT: One or more coats applied in a shop or plant prior to shipment to the site of the work, where the field or finishing coat is applied.

32. SPREADING RATE: Area covered by a unit volume of paint at a specific thickness.

33. SSPC: The Society for Protective Coatings, formerly the Steel Structures Painting Council.

34. STRIPE COAT: A separate coat of paint applied to all weld seems, pits, nuts/bolts/washers and edges by brush. This coat shall not be applied until any previous coat(s) have cured and, once applied, shall be allowed to cure prior to the application of the subsequent coat(s).

35. SURFACE SATURATED DRY (SSD): Refers to concrete surface condition where the surface is saturated (damp) without the presence of standing water.

36. TIE COAT: An intermediate coat used to bond different types of paint coats. Coatings used to improve the adhesion of a succeeding coat.

37. TOUCH-UP PAINTING: The application of paint on areas of painted surfaces to repair marks, scratches, and areas where the coating has deteriorated to restore the coating film to an unbroken condition.

38. TPC: Technical Practice Committee.

39. VOLATILE ORGANIC COMPOUND (VOC) CONTENT: The portion of the coating that is a compound of carbon, is photochemically reactive, and evaporates during drying or curing, expressed in grams per liter (g/l) or pounds per gallon (lb/gal).

40. IMMERSION: Refers to a service condition in which the substrate is below the waterline or submerged in water or wastewater at least intermittently if not constantly.

41. WELD SPLATTER: Beads of metal scattered near seam during welding.

42. WET FILM THICKNESS (WFT): The primer or coating film's thickness immediately following application. Wet film thickness is measured in mils or thousandths of an inch (0.001 inch) and is abbreviated WFT.

1.2 QUALITY ASSURANCE

A. REFERENCES:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of commencement of the Work. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued, or replaced.

Reference	Title
ANSI/ASC 29.4 Exhaust Systems	Abrasive Blasting Operations – Ventilation and Safe Practice
ANSI A13.1	Scheme for Identification of Piping Systems
ANSI/NSF 61	Drinking Water System Componenets Health Effects
ANSI/AWWA C105	Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids
ANSI/AWWA C203	Coal-Tar protective Coatings and Linings for Steel Water Pipelines – Enamel and Tape-Hot-Applied
ANSI/AWWA D102	Painting Steel Water-Storage Tanks
TT-P-28F	Paint, Aluminum, Heat Resisting (1200F)
ANSI B74.18	Grading of Certain Abrasive Grain on Coated Abrasive Material
ASTM D16	Standard Terminology for Paint, Related Coatings, Materials, and Applications

Reference	Title
ASTM D2200 (SSPC-VIS1)	Pictorial Surface Preparation Standards for Painting Steel Surfaces
ASTM D3960	Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
ASTM D4262	Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces
ASTM D4263	Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
ASTM D4414	Standard Practice for Measurement of Wet Film Thickness by Notch Gages
ASTM D4417	Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
ASTM D4541	Standard Test Methods for Pull-Off Strength of Coatings On Metal Substrates Using Portable Adhesion Testers
ASTM D4787	Standard Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates
ASTM D5162	Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates
ASTM D7234	Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Adhesion Testers.
ASTM E337	Standard Test Method for Measuring Humidity With a Psychrometer
ASTM F1869	Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
FS 595b	Federal Standard Colors
ICRI 03732	Guideline for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays
NACE Publication 6D-163	A Manual for Painter Safety
NACE Publication 6F-163	Surface Preparation of Steel or Concrete Tank/Interiors
NACE Publication 6G-164 A	Surface Preparation Abrasives for Industrial Maintenance Painting
NACE Standards	January 1988 Edition of the National Association of Corrosion Engineers, TPC.
NACE Standard RP0188	Standard Recommended Practice – Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates

Reference	Title
NACE Standard RP0288	Standard Recommended Practice, Inspection of Linings on Steel and Concrete
NACE Standard RP0892	Standard Recommended Practice, Linings Over Concrete in Immersion Service
NACE Publication TPC2	Coatings and Linings for Immersion Service
NAPF 500-03	Surface Preparation Standard for Ductile Iron Pipe and Fittings in Exposed Locations Receiving Special External Coatings and/or Special Internal Linings
NAPF 500-03-04	Abrasive Blast Cleaning for Ductile Iron Pipe
NAPF 500-03-05	Abrasive Blast Cleaning for Cast Ductile Iron Fittings
OSHA 1910.144	Safety Color Code for Marking Physical Hazards
OSHA 1915.35	Standards – 29CFR - Painting
SSPC	Paint Application Specification No. 1.
SSPC-AB 1	Mineral and Slag Abrasives
SSPC-PA 1	Shop, Field, and Maintenance Painting of Steel
SSPC-PA 2	Measurement of Dry Coating Thickness with Magnetic Gages
SSPC-PA 9	Measurement of Dry Coating Thickness on Cementitious Substrates Using Ultrasonic Gages
SSPC-PA Guide 1	Guide for Illumination of Industrial Painting Project
SSPC-PA Guide 3	A Guide to Safety in Paint Application
SSPC-PA Guide 6	Guide for Containing Debris Generated During Paint Removal Operations
SSPC-PA Guide 11	Guide for Coating Concrete
SSPC SP1	Solvent Cleaning
SSPC SP2	Hand Tool Cleaning
SSPC SP3	Power Tool Cleaning
SSPC SP5	White Metal Blast Cleaning
SSPC SP6	Commercial Blast Cleaning
SSPC SP7	Brush-Off Blast Cleaning
SSPC SP10	Near-White Blast Cleaning
SSPC SP11	Power Tool Cleaning to Bare Metal
SSPC SP12	Surface Preparation and Cleaning of Steel and Other Hard Materials by High and Ultra-High Pressure Water Jetting Prior to Recoating
SSPC SP13	Surface Preparation of Concrete

Reference	Title
SSPC-TR2	Wet Abrasive Blast Cleaning
SSPC-TU-3	Overcoating
SSPC-TU-4	Field Methods for Retrieval and Analysis of Soluble Salts on Substrates.
SSPC V2	Systems and Specifications: Steel Structures Painting Manual, Volume 2
SSPC-VIS 1	Visual Standard for Abrasive Blast Cleaned Steel
SSPC-VIS 3	Visual Standard for Power and Hand – Tool Cleaned Steel
SSPC-VIS 4	Visual Standards (Waterjetting)
SSPC-VIS 5	Visual Standards (Wet Abrasive Blast Cleaning)
WPCF Manual of Practice No. 17	Paints and Protective Coatings for Wastewater Treatment Facilities. Guide and Paint Application Specifications.

B. STANDARD:

1. Materials and supplies provided shall be the standard products of CSMs. Materials in each coating system shall be the products of a single CSM.

2. The standard products of CSMs other than those specified may be acceptable when it is demonstrated to the Construction Manager that they are equal in composition, durability, usefulness, and convenience for the purpose intended. Requests for consideration of CSMs other than those specified in this Section 09900 will be considered, provided the following minimum conditions are met. Such requests are not a substitution for submittals after the alternative CSMs have been considered and accepted.

   a. The proposed coating system shall use an equal or greater number of separate coats to achieve the required total dry film thickness.

   b. The proposed coating system shall use coatings of the same generic type as that specified including curing agent type.

   c. Requests for consideration of products from CSMs other than those specified in this Section 09900 shall include information listed in paragraph 09900-1.04, Items 1, 2, and 3, demonstrating that the proposed CSM's product is equal to the specified coating system.

   d. The Contractor and the proposed alternative CSM shall provide a list of references for the proposed product where the coating of the same generic type has been applied. The reference list shall include the project name, city, state, owner, phone number of owner; coating system reference and number from this Section 09900; type of facility in which it was used, generic type, and year coating was applied.

C. QUALITY CONTROL REQUIREMENTS:

1. The CONTRACTOR shall give the ENGINEER a minimum of 3 days advance notice of the start of any field surface preparation work of coating application work, and a minimum of 7 days advance notice of the start of any shop surface preparation work.

2. Evaluation of cleaned surface preparation work will be based upon comparison of the blasted surfaces with the standard samples available from the NACE, using NACE standard TM-01-70. The CONTRACTOR shall provide samples for comparison.

3. The Contractor is responsible for the workmanship and quality of the coating system installation. Inspections by the Construction Manager or the CTR will not relieve or limit the Contractor's responsibilities.

4. The Contractor's methods shall conform to requirements of this specification and the standards referenced in this Section 09900. Changes in the coating system installation requirements will be allowed only with the written acceptance of the Construction Manager before work commences.

5. Only personnel who are trained by the CTR specifically for this contract or who are approved by the CSM specifically for this contract shall be allowed to perform the coating system installation specified in this Section 09900.

6. Contaminated, outdated, diluted materials, and/or materials from previously opened containers shall not be used.

7. For repairs, the Contractor shall provide the same products, or products recommended by the CSM, as used for the original coating.

8. The Contractor shall identify the points of access for inspection by the Owner or the Construction Manager. The Contractor shall provide ventilation, ingress and egress, and other means necessary for the Construction Manager's personnel to access safely the work areas.

9. The Contractor shall conduct the work so that the coating system is installed as specified and shall inspect the work continually to ensure that the coating system is installed as specified. Coating system work that does not conform to the specifications or is otherwise not acceptable shall be corrected as specified.

10. The Contractor shall complete the Coating System Inspection Checklist, Form 09900-A, included later in this Section, for coating system installations. Follow the sequential steps required for proper coating system installation as specified and as listed in the Coating System Inspection Checklist. For each portion of the work, install the coating system and complete sign-offs as specified prior to proceeding with the next step. After completing each step as indicated on the Coating System Inspection Checklist, the Contractor shall sign the checklist indicating that the work has been installed and inspected as specified.

11. The Contractor shall provide written daily reports that present, in summary form, test data, work progress, surfaces covered, ambient conditions, quality control inspection test findings, and other information pertinent to the coating system installation.

D. INSPECTION AT HOLD POINTS: The Contractor shall conduct inspections at Hold Points during the coating system installation and record the results from those inspections on Form 09900-A. The Contractor shall coordinate such Hold Points with the Construction Manager such that the Construction Manager may observe Contractor's inspections on a scheduled basis. The Contractor shall provide the Construction Manager a minimum of two (2) hours of notice prior to conducting Hold Point Inspections. The Hold Points shall be as follows:

1. ENVIRONMENT AND SITE CONDITIONS: Prior to commencing an activity associated with coating system installation, the Contractor shall measure, record, and confirm acceptability of ambient air temperature and humidity as well as other conditions such as proper protective measures for surfaces not to be coated and safety requirements for personnel. The acceptability of the weather and/or environmental conditions within the structure shall be determined by the requirements specified by the CSM of the coating system being used.

2. CONDITIONS PRIOR TO SURFACE PREPARATION: Prior to commencing surface preparation, the Contractor shall observe, record, and confirm that oil, grease, and/or soluble salts have been eliminated from the surface.

3. MONITORING OF SURFACE PREPARATION: Spot checking of degree of cleanliness, surface profile, and surface pH testing, where applicable. In addition, the compressed air used for surface preparation or blow down cleaning shall be checked to confirm it is free from oil and moisture.

4. POST SURFACE PREPARATION: Upon completion of the surface preparation, the Contractor shall measure and inspect for proper degree of cleanliness and surface profile as specified in this Section 09900 and in the CSM's written instructions.

5. MONITORING OF COATINGS APPLICATION: The Contractor shall inspect, measure, and record the wet film thickness and general film quality (visual inspection) for lack of runs, sags, pinholes, holidays, etc. as the application work proceeds.

6. POST APPLICATION INSPECTION: The Contractor shall identify defects in application work including pinholes, holidays, excessive runs or sags, inadequate or excessive film thickness and other problems as may be observed.

7. POST CURE EVALUATION: The Contractor shall measure and inspect the overall dry film thickness. The Contractor shall conduct a DFT survey, as well as perform adhesion testing, holiday detection, or cure testing as

required based on the type of project and the specific requirements in this Section 09900 and/or in the CSM's written instructions.

8. FOLLOW-UP TO CORRECTIVE ACTIONS AND FINAL INSPECTION: The Contractor shall measure and reinspect corrective coating work performed to repair defects identified at prior Hold Points. This activity also includes final visual inspection along with follow-up tests such as holiday detection, adhesion tests, and DFT surveys.

1.3 DELIVERY AND STORAGE

A. Materials shall be delivered to the job site in their original, unopened containers. Each container shall be properly labeled. Materials shall be handled and stored to prevent damage to or loss of label.

B. Labels on material containers shall show the following information:

1. Name or title of product.

2. CSM's batch number.

3. CSM's name.

4. Generic type of material.

5. Application and mixing instructions.

6. Hazardous material identification label.

7. Shelf life expiration date.

C. Materials shall be stored in enclosed structures and shall be protected from weather and excessive heat or cold in accordance with the CSM's recommendations. Flammable materials shall be stored in accordance with state and local requirements.

D. Containers shall be clearly marked indicating personnel safety hazards associated with the use of or exposure to the materials.

E. Material Safety Data Sheets (MSDS) for each material shall be provided to the Construction Manager.

F. The Contractor shall store and dispose of hazardous waste according to federal, state and local requirements. This requirement specifically addresses waste solvents and coatings.

1.4 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. A copy of this specification section, with addendum updates included, and referenced and applicable sections, with addendum updates included, with each paragraph check-marked (□) to indicate specification compliance or marked to indicate requested deviations from specification requirements or those parts which are to be provided by the Contractor or others. Check marks shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Construction Manager shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined shall signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for requested deviations to the specification requirements shall be cause for rejection of the entire submittal and no further submittal material will be reviewed.

2. Complete data on each type and kind of paint, primer and materials shall be submitted for review. Acceptance shall be received from the ENGINEER before the paint is delivered to the jobsite. This procedure must be followed whether or not the paint that the CONTRACTOR proposes to use is named in the Contract Documents. Submitted data shall show where and for what uses each paint product is proposed with cross-reference made to sections of these Specifications. Each proposed type and kind of paint shall include data to show that it meets the detailed requirements of these Specifications.

3. All conditions, procedures, and qualities that may adversely affect the paint or final coating; or that may cause the paint not to protect the covered material from corrosion, shall be clearly and completely stated in the instructions. As a minimum, the following shall be addressed relative to optimum coating performance:

    a. Volatile organic compound (VOC) data.

    b. Ingredients including percent solids.

    c. Surface preparation recommendations.

    d. Primer type, where required.

    e. Maximum dry and wet-mil thickness per coat.

    f. Minimum and maximum curing time between coats, including atmospheric conditions for each.

    g. Curing time before submergence in liquid.

    h. Thinner to be used with each coating.

    i. Ventilation requirements.

j. Minimum atmospheric conditions during which the paint shall be applied.

k. Methods of application.

(1) Number of coats

(2) Thickness of each coat

(3) Total thickness

(4) Drying time of each coat, including primer

(5) Primer requirements

(6) Temperature and moisture requirements during and after application

(7) Protection from sun

l. Maximum allowable moisture content.

m. Maximum shelf life.

4. Affidavits signed and sealed by an officer of the CSM's corporation, attesting to full compliance of each coating system component with current and promulgated federal, state, and local air pollution control regulations and requirements.

5. Material Safety Data Sheets (MSDS) for materials to be delivered to the job site, including coating system materials, paints, solvents, thinners, cleaners, and abrasive blast media.

6. The manufacturer's published instructions for use as a guide in specifying and applying the proposed materials with complete instructions for the application in the environment and for the conditions for which the paint is intended as shown in the Contract Documents.

7. List of cleaning and thinner solutions allowed by the CSMs.

8. Storage requirements including temperature, humidity, and ventilation for Coating System Materials as recommended by the CSMs.

9. CSM's detailed, written instructions for coating system treatment and graphic details for coating system terminations in the structures to be coated including pipe penetrations, metal embedments, gate frames, and other terminations to be determined from the contract drawings. This information shall also include detail treatment for coating system at joints in concrete.

10. The Contractor and CSA shall provide a minimum of five project references each including contact name, address, and telephone number where similar coating work has been performed by their companies in the past five years.

11. SAMPLES: The CONTRACTOR shall submit samples of all paint, finishes, and other coating materials specified herein, in accordance with the General Requirements. Paint or coating samples shall be submitted on 8-1/2-inch by 11 inch sheet metal. Each sample shall be completely coated over its entire surface with one protective coating material, type, and color.

12. COATING MATERIALS LIST: The CONTRACTOR shall provide 8 copies of a coating materials list which indicates the manufacturer and the coating number, keyed to the coating systems herein, prior to or at the time of submittal of samples.

13. PAINT MANUFACTURER'S INFORMATION: For each paint system to be used the CONTRACTOR shall submit the following listed data at least 30 days prior to painting.

    a. Paint manufacturer's data sheet for each product used, including statements on the suitability of the material for the intended use.

    b. Paint manufacturer's instructions and recommendations on surface preparation and application.

    c. Colors available for each product (where applicable).

    d. Compatibility of shop and field applied coatings (where applicable).

    e. An MSDS for each product used.

    f. Two sets of color samples to match each color selected by the ENGINEER from the manufacturer's standard color sheets. If custom mixed colors are required by this section, the color samples shall be made using color formulations prepared to match the color samples furnished by the ENGINEER. The color formula shall be shown on the back of each color sample.

14. MANUFACTURER'S CERTIFICATION: For submerged and severe service coating systems, the CONTRACTOR shall require the paint manufacturer to certify to the following:

    a. The manufacturer's representative has provided at least 6 hours of on-site instruction in the proper surface preparation, use, mixing, application, and curing of the coating systems.

    b. The manufacturer's representative has personally observed the start of surface preparation, mixing, and application of the coating materials.

15. The CONTRACTOR shall submit all such certificates to the ENGINEER within 7 days of completion of each paint system.

16. APPLICATOR'S CERTIFICATE AND REPORT: For submerged and severe service coating systems, the CONTRACTOR shall require the applicator of the protective paint coatings to certify to the following:

    a. Immediately before painting, surfaces conformed to the specified preparation; they were in the specified condition; and were clean, dry, and free of dust, rust, and mill scale.

    b. Surface preparation and coating use, mixing, application, and curing were done in accordance with the current printed instructions and recommendations of the protective coating manufacturer, and these Specifications.

    c. The products specified were used and a listing of the names of the products and their manufacturer.

    d. The products were used within the shelf-life dates, stating the shelf-life dates of each container of each product used.

    e. The specified dry film thickness of coatings are on the items.

    f. The quantities of each product used with copies of paint manufacturer's invoice.

    g. Compatible paints were used where shop or field applied coatings are applied over previously-applied coatings.

    h. The applicator's certificate shall list the dates and locations that the coating work was completed for the various surfaces coated, and shall also list the dry film thickness obtained for each coat. The CONTRACTOR shall submit said paint applicator's certificates to the ENGINEER within 7 days after completion of each paint system.

1.5 RESPONSIBILITIES OF THE CTR

A. The Contractor shall retain or obtain the services of the CTR to be on site to perform the Contractor and/or CSA application training and to routinely inspect and verify in writing that the application personnel have successfully performed surface preparation, filler/surface application, coating system application, and Quality Control Inspection in accordance with this Section 09900 and to warrantable level of quality. This must include checking the required degree of cleanliness, surface pH for concrete substrates, surface profile of substrates, proper mixing of coating materials, application (including checking the wet and dry film thickness of the coating systems), proper cure of the coating systems, and proper treatment of coating systems at terminations, transitions, and joints and cracks in substrates. Refer to Paragraph 1.05 B. for further details on these CTR requirements. This inspection is in addition to the inspection performed by the Contractor in accordance with this Section 09900.

B. COATING SYSTEM INSTALLATION TRAINING:

1. Provide a minimum of 8 hours of classroom and off site training for application and supervisory personnel (both the Contractor's and CSA's). Provide training to a minimum of two supervisory personnel from the CSA and one supervisor from the Contractor. Alternatively, the CTR shall provide a written letter from the CSM stating that the application personnel (listed by name) who shall perform coating work are approved by the CSM without further or additional training.

2. One CTR can provide training for up to fourteen application personnel and three supervisory personnel at one time. The training shall include the following as a minimum:

   a. A detailed explanation of mixing, application, curing, and termination details.

   b. Hands-on demonstration of how to mix and apply the coating systems.

   c. A detailed explanation of the ambient condition requirements (temperature and humidity) and surface preparation requirements for application of the coating system as well as a detailed explanation of re-coat times, cure times, and related ambient condition requirements.

   d. When training is performed, the CTR shall provide a written letter stating that training was satisfactorily completed by the personnel listed by name in the letter.

C. COATING SYSTEM INSPECTION: While on site to routinely inspect and verify, the CTR shall perform the following activities to confirm acceptability and conformance with the specifications:

1. Inspect ambient conditions during various coating system installation at hold points for conformance with the specified requirements.

2. Inspect the surface preparation of the substrates where the coating system will terminate or will be applied for conformance to the specified application criteria.

3. Inspect preparation and application of coating detail treatment (for example, terminations at joints, metal embedments in concrete, etc.).

4. Inspect application of the filler/surface materials for concrete and masonry substrates.

5. Inspect application of the primers and finish coats including wet and dry film thickness of the coatings.

6. Inspect coating systems for cure.

7. Review adhesion testing of the cured coating systems for conformance to specified criteria.

8. Review coating system continuity testing for conformance to specified criteria.

9. Inspect and record representative localized repairs made to discontinuities identified via continuity testing.

10. Conduct a final review of completed coating system installation for conformance to the specifications.

11. Prepare and submit a site visit report following each site visit that documents the acceptability of the coating work in accordance with the CSM's recommendations.

D. FINAL REPORT: Upon completion of coating work for the project, the CTR shall prepare a final report. That report shall summarize daily test data, observations, drawings, and photographs in a report to be submitted in accordance with paragraph 09900-2.02. Include substrate conditions, ambient conditions, and application procedures, observed during the CTR's site visits. Include a statement that the completed work was performed in accordance with the requirements of this Section 09900 and the CSM's recommendations.

1.6 MAINTENANCE

A. WARRANTY INSPECTION: A warranty inspection may be conducted during the eleventh month following completion of all coating and painting work. The CONTRACTOR and a representative of the coating material manufacturer shall attend this inspection. All defective work shall be repaired in accordance with these specifications and to the satisfaction of the ENGINEER. The ENGINEER may, by written notice to the CONTRACTOR, reschedule the warranty inspection, or may cancel the warranty inspection altogether. If a warranty inspection is not held the CONTRACTOR is not relieved of its responsibilities under the Contract Documents.

1.7 SAFETY AND HEALTH REQUIREMENTS

A. In accordance with the requirements of the OSHA Regulations for Construction, the CONTRACTOR shall provide and require the use of personal protective and lifesaving equipment for all persons working in or about the project.

B. Head and face protection and respiratory devices shall include protective helmets conforming to the requirements of ANSI Z 89.2-1971 which shall be worn by all persons at all times while in the vicinity of the work. In addition, workers engaged in or near the work during sandblasting shall wear eye and face protection devices meeting the requirements of ANSI Z 87.1-1968 and a respirator with appropriate filter.

C. Where ventilation is used to control potential exposures to workers, as set forth in Section 1910.94 of the OSHA Regulations for Construction, ventilation shall be adequate to reduce the concentration of the air contaminant to the degree that a

hazard to the worker does not exist. Methods of ventilation shall meet the requirements set forth in ANSI Z 9.2-1960.

PART 2 - PRODUCTS

2.1 GENERAL

A. DEFINITIONS: Definitions are provided in Section 1.01 B of this specification.

B. GENERAL:

1. Coating materials shall be sealed in containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer, all of which shall be plainly legible at the time of use.

2. The CONTRACTOR shall use coating materials suitable for the intended use and recommended by their manufacturer for the intended service.

C. COMPATIBILITY: In any coating system only compatible materials from a single manufacturer shall be used in the work. Particular attention shall be directed to compatibility of primers and finish coats. If necessary, subject to the approval of the ENGINEER, a barrier coat shall be applied between existing prime coat and subsequent field coats to ensure compatibility.

D. COLORS: All colors and shades of colors of all coats of paint shall be as selected or specified by the ENGINEER. Each coat shall be of a slightly different shade, to facilitate inspection of surface coverage of each coat

E. PROTECTIVE COATING MATERIALS:

1. Products shall be standard products produced by recognized manufacturers who are regularly engaged in production of such materials for essentially identical service conditions. Where requested, the CONTRACTOR shall provide the ENGINEER with the names of not less than 10 successful applications of the proposed manufacturer's products demonstrating compliance with this specification requirement.

2. The cost of all testing and analyzing of the proposed substitute materials that may be required by the ENGINEER shall be paid by the CONTRACTOR. If the proposed substitution requires changes in the contract work, the CONTRACTOR shall bear all such costs involved and the costs of allied trades affected by the substitution.

2.2 MATERIALS

A. Notwithstanding the listing of product names in this Section 09900, the Contractor shall provide affidavits, signed and sealed by an officer of the CSM's corporation, attesting to full compliance of each coating system component with current and promulgated federal, state, and local air pollution control regulations and requirements. No coatings shall be applied to a surface until the specified affidavits

have been submitted and have been reviewed and accepted. Failure to comply with this requirement shall be cause for rejection and removal of such materials from the site.

B. The following list specifies the material requirements for coating systems. Coating systems are categorized by generic name followed by an identifying abbreviation. If an abbreviation has a suffix number, it is for identifying subgroups within the coating system. Coating Systems E-5 and E-6 shall be NSF 61 certified.

All of U.S. Except California
(Not Used)

California Except SCAQMD

Coating System	Manufacturer	First Coat(s)	Finish Coat(s)
Epoxy Coatings			
E-1	PPG PMC	Amerlock 2/400 Series	Amerlock 2/400 Series
	Carboline	Carboguard 890	Carboguard 890
	International Paint/ICI	Devran 224 HS	Devran 224 HS
	Sherwin Williams	Macropoxy 646 CA	Macropoxy 646 CA
	Tnemec	Series V69	Series V69

Coating System	Manufacturer	First Coat(s)	Finish Coat(s)
E-1-G	PPG PMC	Amerlock 2/400 Series	Amerlock 2/400 Series
	Carboline	Carboguard 890	Carboguard 890
	International Paint/ICI	Devran 224 HS	Devran 224 HS
	Sherwin Williams	Macropoxy 646 CA	Macropoxy 646 CA
	Tnemec	Series V69	Series V69
E-2	PPG PMC	Amerlock 2/400 Series	Amerlock 2/400 Series
	Carboline	Carboguard 890	Carboguard 890
	International Paint/ICI	Bar-Rust 236	Bar-Rust 236
	Sherwin Williams	Macropoxy 646-100	Macropoxy 646-100
	Tnemec	Series V69	Series V69
E-3	PPG PMC	Amerlock 2/400 Series	Amerlock 2/400 Series
	Carboline	Carboguard 890	Carboguard 890
	International Paint/ICI	Bar-Rust 236	Bar-Rust 236
	Sherwin Williams	Macropoxy 646	Macropoxy 646
	Tnemec	Series V69	Series V69
E-4	PPG PMC	Amerlock 2/400 Series	Amerlock 2/400 Series
	Carboline	Carboguard 890	Carboguard 890
	International Paint/ICI	Bar-Rust 236	Bar-Rust 236
	Sherwin Williams	Macropoxy 646	Macropoxy 646
	Tnemec	Series V69	Series V69
E-5	PPG PMC	Amercoat 333	Amercoat 333
	Carboline	Carboguard 691	Carboguard 691
	International Paint/ICI	Bar-Rust 233H	Bar-Rust 233H
	Sherwin Williams	Macropoxy 646	Macropoxy 646
	Tnemec	Series V69	Series V69
E6	PPG PMC	Amercoat 333	Amercoat 333
	Carboline	Carboguard 691	Carboguard 691
	International Paint/ICI	Bar-Rust 233H	Bar-Rust 233H
	Sherwin Williams	Macropoxy 646	Macropoxy 646
	Tnemec	Series V69	Series V69

Coating System	Manufacturer	First Coat(s)		Finish Coat(s)
E7	PPG PMC	Amerlock 400		Amerlock 400
	Carboline	Sanitile 120		Sanitile 120
	International Paint/ICI	Bar-Rust 236		Bar-Rust 236
	Sherwin Williams	Macropoxy 646		Macropoxy 646
	Tnemec	Series V69		Series V69
E8	PPG PMC	Amerlock 400		Amerlock 400
	Carboline	Carboguard 1340		Carboguard 1340
	International Paint/ICI	UH Gripper 3210		Tru-Glaze 4408
	Sherwin Williams	Macropoxy 646 CA		Macropoxy 646 CA
	Tnemec	Series 201		Series 201
E-9	PPG PMC	Amercoat 253		Amercoat 253
	Carboline	Carboguard 890		Carboguard 890
	International Paint/ICI	Bar-Rust 231		Bar-Rust 231
	Sherwin Williams	CorCote HCR-FF		CorCote HCR-FF
	Tnemec	Series 104		Series 104
E-9-C	PPG PMC	Amercoat 253		Amercoat 253
	Carboline	Carboguard 890		Carboguard 890
	International Paint/ICI	Bar-Rust 231		Bar-Rust 231
	Sherwin Williams	CorCote HCR-FF		CorCote HCR-FF
	Tnemec	Series 104		Series 104
E-10	PPG PMC	Amerlock 400		Amerlock 400
	Carboline	Carboguard 890		Carboguard 890
	International Paint/ICI	Bar-Rust 236		Bar-Rust 236
	Sherwin Williams	Macropoxy 646		Macropoxy 646
	Tnemec	Series V69		Series V69
Specialty Epoxy Linings				
EA-1	Carboline	Plasite 4550S		Plasite 4550S
	Sauereisen	Sewergard 210S		Sewergard 210S
	Tnemec	Series 435		Series 435
EA-2	Carboline	Semstone 501 optional	Filler Surfacer – Carboguard 510	Plasite 4550S
	Sauereisen	Sewergard 210S	Filler Surfacer - 209 HB	Sewergard 210S

Coating System	Manufacturer	First Coat(s)		Finish Coat(s)
	Tnemec	Series 435	Filler Surfacer – Series 218	Series 435
EA-3	Carboline	Semstone 501 optional	Filler Surfacer – Carboguard 510	Plasite 5371
	Sauereisen	Sewergard 210T	Filler Surfacer - 209 HB	Sewergard 210T
	Tnemec	Series 435	Filler Surfacer – Series 218	Series 434

Coating System	CSM	Primer	Base Coat	Glaze Coat
EA-4	Carboline	N/A	Plasite 5371	Plasite 4500S
	Sauereisen	N/A	Sewergard 210T	Sewergard 210G
	Tnemec	N/A	Series 434	Series 435

Coating System	CSM	Primer	Filler/ Surfacer	Base Coat w/Scim Cloth	Saturation Coat w/Silica Sand	Finish Coats
EA-5	Tnemec	Series 201	Series 218	Series 239	Series 239	Series 282
	Carboline	Semstone 110/110EP	Carboguard 510	Semstone 145	Semstone 145	Semstone 145

Coating System	Manufacturer	First Coat(s)	Finish Coat(s)
Elastomeric Coatings			
EC-1	Carboline	Carboguard 954	Policlad 708
	Sherwin Williams	Corobond 100	Envirolastic 170
	Tnemec	Series V69	Series 406 (2 coats)
EC-2	Carboline	Carboguard 954	Polyclad 708/Polibrand 705
	Sherwin Williams	Corobond 100	Envirolastic 520 PW
	Tnemec	Series V69	Series 264

Coating System	Manufacturer	Primer	Intermediate Coat	Finish Coat
Epoxy Flooring Systems				
EF-1	Stonhard	Stonhard Standard Primer	Stonshield Undercoat and Broadcoat	Stoneshield Sealer
	Tnemec	Series 238	Series 238 with Broadcoat	Series 284 Clear
EF-2	Stonhard	Stonhard Standard	Stonclad GS	Stonkote GS-4

Coating System	Manufacturer	Primer	Intermediate Coat	Finish Coat
		Primer		
	Tnemec	Series 238	Series 238	Series 280
Epoxy Polyurethane				
EU-1	Ameron	N/A	Amerlock 400	Amershield VOC
	Carboline	N/A	Carboguard 890	Carbothane 134 VOC
	Sherwin Williams	N/A	Macropoxy 646 100	Hi Solids Polyurethane 100
	Tnemec	N/A	Series V69	Series 1075

Coating System	Manufacturer	First Coat(s)	Finish Coats
EU-1-FRP	Ameron	Amercoat 400	Amershield VOC
	Carboline	Carboguard 890	Carbothane 134 VOC
	Sherwin Williams	Macropoxy 646-100	VOC Hi Solids
	Tnemec	Series V69	Polyurethane 100 Series 1075
Grease			
G	Texaco	N/A	Rush Inhibiteve Grease
	Chevron	N/A	E.P. Roller Grease
High Heat			
HH-1	High Temperature Coatings, Inc.	Hi Temp 1027	1000 VS (any color)
HH-2	High Temperature Coatings, Inc.	Hi Temp 1027	1000 VS (black or aluminum)
Latex Acrylic			
L-1	PPG PMC	Amercoat 148	Amercoat 220
	Carboline	Sanitile 120	Carbocrylic 3359 DTM
	International Paint/ICI	Prep and Prime Gripper	Ultrahide 250-1406
	Sherwin Williams	Loxon Acrylic Primer	Sher Cryl
	Tnemec	Series 1028 or 1029	Series 1028 or 1029

Coating System	Manufacturer	First Coat(s)	Finish Coats
L-2	PPG PMC	Amercoat 220	Amercoat 220
	Carboline	Sanitile 120	Carbocrylic 3359 DTM
	International Paint/ICI	UH Gripper 3210	Dulux Pro 4206
	Sherwin Williams	Sher Cryl	Sher Cryl
	Tnemec	Series 1028 or 1029	Series 1028 or 1029
L-3	PPG PMC	Amercoat 148	Amercoat 220
	Carboline	Carbocrylic 3359 DTM	Carbocrylic 3359 DTM
	International Paint/ICI	Devflex 4020 PF	Dulux Pro 1406
	Sherwin Williams	Procryl Primer	Sher Cryl
	Tnemec	Series 1028 or 1029	Series 1028 or 1029
L-4	PPG PMC	Amercoat 148	Amercoat 220
	Carboline	Carbocrylic 3359 DTM	Carbocrylic 3359 DTM
	International Paint/ICI	Prep and Prime Gripper	Ultrahide 250-146
	Sherwin Williams	Prep Rite ProBlock	Sher Cryl
	Tnemec	Series 1028 or 1029	Series 1028 or 1029
Misellaneous			
M-1	Carboline	Carbowrap Tape Paste	Carbowrap Petrolatum Tape
	Denso	Denso Paste	Densyl Tape
	Trenton	Waxtape Primer	#1 Wax Tape
M-2	PPG PMC	Amerlock 400	Amerlock 400
	Carboline	Carbomastic 615 HS	Carbomastic 615 HS
	International Paint/ICI	Bar-Rust 231	Bar-Rust 231
	Sherwin Williams	Macropoxy 646-100	Macropoxy 646-100
	Tnemec	Series 135	Series 135
Penetrating Stain			
S-1	Tnemec	Series 617	Series 617
S-2	Tnemec	N/A	Series 636 Dur A Pell 20
	Curecrete Chemical Company	N/A	Ashford Formula
S-3	Tnemec	N/A	Series V626 Dur A Pell GS

Coating System	Manufacturer	First Coat(s)	Finish Coats
S-4	Tnemec	N/A	Series V626 Dur A Pell GS
	Professional Products of Kansas	N/A	PWS-15 Super
***See CSM's Product Data Sheets for acceptable thinners for VOC compliance or do not thin.**			

SCAQMD

(Not Used)

2.3 PRODUCT DATA

A. Prior to application of coatings, submit letter(s) from the CTR(s) identifying the application personnel who have satisfactorily completed training as specified in paragraph 09900-1.05 or a letter from the CSM stating that personnel who shall perform the work are approved by the CSM without need for further or additional training.

B. Submit reports specified in paragraph 09900-1.02 C.10 and 09900-1.05 B.12 when the work is underway.

C. Submit the Coating System Inspection Checklists, using Form 09900-A, included later in this Section, for the coating work.

D. CTR final report in accordance with paragraph 09900-1.05 C.

PART 3 - EXECUTION

3.1 COATINGS

A. GENERAL: Coating products shall not be used until the Construction Manager has accepted the affidavits specified in paragraph 09900-1.04 and 2.01, the Construction Manager has inspected the materials, and the CTR has trained the Contractor and CSA in the surface preparation, mixing and application of each coating system.

B. SHOP AND FIELD COATS:

1. SHOP APPLIED PRIME COAT: Except as otherwise specified, prime coats may be shop-applied or field-applied. Shop-applied primer shall be compatible with the specified coating system and shall be applied at the minimum dry film thickness recommended by the CSM. Data sheets identifying the shop primer used shall be provided to the on-site coating application personnel. Adhesion tests shall be performed on the shop primer as specified in paragraph 09900-3.01B.3. Damaged, deteriorated and poorly applied shop coatings that do not meet the requirements of this Section

09900 shall be removed and the surfaces recoated. If the shop primer coat meets the requirements of this Section 09900, the field coating may consist of touching up the shop prime coat and then applying the finish coats to achieve the specified film thickness and continuity.

2. FIELD COATS: Field coats shall consist of one or more prime coats and one or more finish coats to build up the coating to the specified dry film thickness. Unless otherwise specified, finish coats shall not be applied until other work in the area is complete and until previous coats have been inspected.

3. ADHESION CONFIRMATION: The Contractor shall perform an adhesion test after proper cure in accordance with ASTM D3359 to demonstrate that (1) the shop applied prime coat adheres to the substrate, and (2) the specified field coatings adhere to the shop coat. Test results showing an adhesion rating of 5A on immersed surfaces and 4A or better on other surfaces shall be considered acceptable for coatings 5 mils or more in thickness (Method A). Test results showing an adhesion rating of 5B on immersed surfaces and 4B or better on other surfaces shall be considered acceptable for coating thicknesses less than 5 mils.

C. APPLICATION LOCATION REQUIREMENTS:

1. EQUIPMENT, NONIMMERSED: Items of equipment, or parts of equipment that are not immersed in service, shall be shop primed and then finish coated in the field after installation with the specified or acceptable color. If the shop primer requires topcoating within a specified period, the equipment shall be finish coated in the shop and then touch-up painted after installation. If equipment removal and reinstallation is required for the project, touch-up coating work shall be performed in the field following installation.

2. EQUIPMENT, IMMERSED: Items of equipment, or parts and surfaces of equipment that are immersed when in service, with the exception of pumps and valves, shall have surface preparation and coating work performed in the field. Coating systems applied to immersed equipment shall be pinhole free.

D. Erect and maintain protective enclosures as stipulated per SSPC-Guide 6 Guide for Containing Debris Generated During Paint Removal Operations.

3.2 PREPARATION

A. GENERAL:

1. Surface preparations for each type of surface shall be in accordance with the specific requirements of each coating specification sheet (COATSPEC) and the following. In the event of a conflict, the COATSPEC sheets shall take precedence.

2. Surfaces to be coated shall be clean and dry. Before applying coating or surface treatments, oil, grease, dirt, rust, loose mill scale, old weathered

coatings, and other foreign substances shall be removed. Oil and grease shall be removed before mechanical cleaning is started. Where mechanical cleaning is accomplished by blast cleaning, the abrasive used shall be washed, graded and free from contaminants that might interfere with the adhesion of the coatings. The air used for blast cleaning shall be sufficiently free of oil and moisture so as not to cause detrimental contamination of the surfaces to be coated.

3. Where deemed necessary by the Owner's representative, a NACE International certified coatings inspector, provided by the Owner, will inspect and approve surfaces to be coated before application of a coating. Surface defects identified by the inspector shall be corrected by the Contractor at no additional cost to the Owner.

4. Cleaning and painting shall be scheduled so that dust and spray from the cleaning process shall not fall on wet, newly coated surfaces. Hardware, hardware accessories, nameplates, data tags, machined surfaces, sprinkler heads, electrical fixtures, and similar uncoated items which are in contact with coated surfaces shall be removed or masked prior to surface preparation and painting operations. Following completion of coating, removed items shall be reinstalled. Equipment adjacent to walls shall be disconnected and moved to permit cleaning and painting of equipment and walls and, following painting, shall be replaced and reconnected.

B. BLAST CLEANING: When abrasive blast cleaning is required to achieve the specified surface preparation the following requirements for blast cleaning materials and equipment shall be met:

1. HAND TOOL CLEANING (SSPC-SP2):

   a. Removal of loose rust, loose mill scale, and loose paint to degree specified, by hand chipping, scraping, sanding, and wire brushing.

   b. All mill scale, rust, and paint may not be removed by this process, but loose mill scale, loose rust, loose paint, and other detrimental foreign matter present shall be removed.

2. POWER TOOL CLEANING (SSPC-SP3):

   a. Removal of loose rust, loose mill scale, and loose paint to degree specified by power tool chipping, descaling, sanding, wire brushing, and grinding.

   b. All mill scale, rust, and paint may not be removed by this process, but loose mill scale, loose rust, loose paint, and other detrimental foreign matter present shall be removed.

3. COMMERCIAL BLAST CLEANING (SSPC-SP6):

   a. Preparing metal surfaces for painting or coating by removing all mill scale, rust, rust-scale, paint, or foreign matter by the use of abrasives propelled through nozzles or by centrifugal wheels.

   b. A commercial blast cleaned surface finish is defined as one from which all oil, grease, dirt, rust scale and foreign matter have been completely removed and all rust, mill scale, and old paint have been completely removed except for slight shadows, streaks, or discolorations caused by rust stain, mill scale oxides or slight, tight residues of paint or coating that may remain; if the surface is pitted, slight residues of rust or paint may be found in the bottom of pits; at least two thirds of each square inch of surface area shall be free of all visible residues and the remainder shall be limited to the light discoloration, slight staining or tight residues mentioned above.

4. BRUSH-OFF BLAST CLEANING (SSPC-SP7): Blast cleaning of all except tightly adhering residues of mill scale, rust, and coatings, exposing numerous evenly distributed flecks of underlying metal.

5. NEAR-WHITE BLAST CLEANING (SSPC-SP10-63):

   a. Blast cleaning nearly to White Metal Cleanliness, until at least 95 percent of each element of surface area is free of all visible residues.

   b. Near white blast cleaned surface finish is defined as one from which all oil, grease, dirt, mill scale, rust, corrosion products, oxides, paint or other foreign matter have been completely removed from the surface except for very light shadows, very slight streaks, or slight discolorations caused by rust stain, mill scale oxides, or slight, tight residues of paint or coating that may remain. At least 95 percent of each square inch of surface area shall be free of all visible residues, and the remainder shall be limited to the light discoloration mentioned above.

   c. The over-all blast cleaning effort expended (nozzle time) shall be not less than two-thirds (2/3) of that which would be required to produce a white metal surface finish on the same surface; nor should more than 95 percent of such effort be required. This limitation shall not be construed as a waiver of any of the above requirements.

   d. The CONTRACTOR shall note that the definition of Near White Metal Blast Cleaning, SSPC-SP10, is from the 1963 version of the SSPC standard, and requires that 95 percent of "each element" of surface area be free of all visible residues. The other surface preparation standards shall be the most recent versions published by the SSPC.

6. WHITE METAL BLAST CLEANING (SSPC-SP5): Removal of all visible rust, mill scale, paint, and foreign matter by blast cleaning by wheel or nozzle (dry or wet) using sand, grit, or shot.

7. Used or spent blast abrasive shall not be reused on this project.

8. The compressed air used for blast cleaning shall be filtered and shall contain no condensed water and no oil. Moisture traps shall be cleaned at least once every four hours or more frequently as required to prevent moisture from entering the supply air to the abrasive blasting equipment.

9. Oil separators shall be installed just downstream of compressor discharge valves and at the discharge of the blast pot discharges. These shall be checked on the same frequency as the moisture traps as defined in item 2 above.

10. Regulators, gauges, filters, and separators shall be in use on compressor air lines to blasting nozzles times during this work.

11. An air dryer or desiccant filter drying unit shall be installed which dries the compressed air prior to blast pot connections. This dryer shall be used and maintained for the duration of surface preparation work.

12. The abrasive blast nozzles used shall be of the venturi or other high velocity type supplied with a minimum of 100 psig air pressure and sufficient volume to obtain the blast cleaning production rates and cleanliness/specified.

13. The Contractor shall provide ventilation for airborne particulate evacuation (meeting pertinent safety standards) to optimize visibility for both blast cleaning and inspection of the substrate during surface preparation work.

14. If, between final surface preparation work and coating system application, contamination of prepared and cleaned metallic substrates occurs, or if the prepared substrates' appearance darkens or changes color, recleaning by water blasting, reblasting and abrasive blast cleaning shall be required until the specified degree of cleanliness is reclaimed.

15. The Contractor is responsible for dust control and for protection of mechanical, electrical, and other equipment adjacent to and surrounding the work area.

C. SOLVENT CLEANING:

1. Any solvent wash, solvent wipe, or cleaner used, including but not limited to those used for surface preparation in accordance with SSPC SP-1 Solvent Cleaning and shall be of the emulsifying type which emits no more than 340 g/l VOCs for AIM regions, 250 g/l for CARB regions and 100 g/l for SCAQMD regions, contains no phosphates, is biodegradable, removes no zinc, and is compatible with the specified primer.

2. Clean white cloths and clean fluids shall be used in solvent cleaning.

D. METALLIC SURFACES:

1. Metallic surfaces shall be prepared in accordance with applicable portions of surface preparation specifications of the Society for Protective Coatings (SSPC) specified for each coating system. See Coat Spec for each coating system in this Section 09900. The profile depth of the surface to be coated shall be in accordance with the COATSPEC requirements in this Section measured by Method C of ASTM D4417. Blast particle size shall be selected by the Contractor to produce the specified surface profile. The solvent in solvent cleaning operations shall be as recommended by the CSM.

2. Preparation of metallic surfaces shall be based upon comparison with SSPC-VIS1-89 (ASTM D2200), and as described in the Coat Spec for each coating system. If dry abrasive blast cleaning is selected and to facilitate inspection, the Contractor shall, on the first day of cleaning operations, abrasive blast metal panels to the standards specified. Plates shall measure a minimum of 8-1/2 inches by 11 inches. Panels meeting the requirements of the specifications shall be initialed by the Contractor and the Construction Manager and coated with a clear non-yellowing finish. One of these panels shall be prepared for each type of abrasive blasting and shall be used as the comparison standard throughout the project.

3. Blast cleaning requirements for steel, ductile iron and stainless steel substrates are as follows:

   a. Steel piping shall be prepared in accordance with SSPC SP-6 (Commercial Blast Cleaning) and primed before installation. Ductile iron piping surfaces including fittings shall be prepared in accordance with NAPF 500-03, NAPF 500-03-04, and NAPF 500-03-05.

   b. Grease and oil shall be removed by wiping with mineral spirits or naphtha per Specification SP-1. Rust, scale, welding slag, and spatter shall be removed and the surface prepared by hand tool cleaning, power tool cleaning, or blast cleaning in accordance with the appropriate Specification SP-2 through SP-10. Shop-primed surfaces shall be field primed and painted prior to the formation of rust. Shop-primed surfaces showing mill scale or signs of rust shall be tool or blast cleaned prior to field priming and painting.

   c. Metal surfaces to be coated with coal-tar epoxy shall be cleaned per Specification SP-10.

   d. Metal surfaces to be coated with the aliphatic polyester polyurethane system shall be cleaned per Specification SP-6.

   e. The minimum abrasive blasting surface preparation shall be as specified in the coating system schedules included at the end of this Section. Where there is a conflict between these specifications and the coating manufacturer's printed recommendations for the intended service, the higher degree of cleaning shall apply.

f. Workmanship for metal surface preparation shall be in conformance with the current SSPC Standards and this Section. Blast cleaned surfaces shall match the standard samples available from the National Association of Corrosion Engineers, NACE Standard TM-01-70.

g. All oil, grease, welding fluxes and other surface contaminants shall be removed by solvent cleaning per SSPC-SP1 prior to blast cleaning.

h. All sharp edges shall be rounded or chamfered and all burrs, and surface defects and weld splatter shall be ground smooth prior to blast cleaning.

i. The type and size of abrasive shall be selected to produce a surface profile that meets the coating manufacturer's recommendation for the particular coating and service conditions.

j. The abrasive shall not be reused unless otherwise approved by the ENGINEER. For automated shop blasting systems, clean oil-free abrasives shall be maintained.

k. The CONTRACTOR shall comply with the applicable federal, state, and local air pollution control regulations for blast cleaning.

l. Compressed air for air blast cleaning shall be supplied at adequate pressure from well maintained compressors equipped with oil/moisture separators which remove at least 95 percent of the contaminants.

m. Surfaces shall be cleaned of all dust and residual particles of the cleaning operation by dry air blast cleaning, vacuuming or another approved method prior to painting.

n. Enclosed areas and other areas where dust settling is a problem shall be vacuum cleaned and wiped with a tack cloth.

o. Damaged or defective coating shall be removed by the specified blast cleaning to meet the clean surface requirements before recoating.

p. If the specified abrasive blast cleaning will damage adjacent work, the area to be cleaned is less than 100 square feet, and the coated surface will not be submerged in service, then SSPC-SP2, hand tool cleaning or SSPC-SP3, power tool cleaning, may be used.

q. Shop applied coatings of unknown composition shall be completely removed before the specified coatings are applied. Valves, castings, ductile or cast iron pipe, and fabricated pipe or equipment shall be examined for the presence of shop-applied temporary coatings. Temporary coatings shall be completely removed by solvent

cleaning per SSPC-SP1 before the abrasive blast cleaning work has been started.

r. Shop primed equipment shall be solvent cleaned in the field before finish coats are applied.

s. Field Priming of Metals for Enamel Coating: All metal surfaces that are to be painted with enamel shall be primed in the field, whether or not they have been shop primed.

t. Stainless steel surfaces shall be abrasive blast cleaned to leave a clean uniform appearance with a minimum surface profile of 1.5 to 2.5 mils that is uniform.

u. Remove traces of grit, dust, dirt, rust scale, friable material, loose corrosion products or embedded abrasive from substrate by vacuum cleaning prior to coating application.

v. Care must be taken to prevent contamination of the surface after blasting from worker's fingerprints, deleterious substances on workers' clothing, or from atmospheric conditions.

w. Ambient environmental conditions in the enclosure must be constantly monitored and maintained to ensure the degree of cleanliness is held and no "rust back" occurs prior to coating material application.

E. CONCRETE SURFACES:

1. Inspection of concrete surfaces prior to surface preparation and surface preparation of concrete surfaces shall be performed in accordance with SSPC-SP13 (also called NACE 6).

2. Prepare substrate cracks, areas requiring resurfacing and perform detail treatment including but not limited to, terminating edges, per CSM recommendations. This shall precede surface preparation for degree of cleanliness and profile.

3. The surface profile for prepared concrete surfaces to be coated shall be evaluated by comparing the profile of the prepared concrete with the profile of graded abrasive paper, as described in ANSI B74.18 or by comparing the profile with the ICRI 03732 (surface profile replicas). Surface profile requirements shall be in accordance with the Coat Spec requirements and the CSM's recommendations.

4. Surface cleanliness of prepared concrete substrates shall be inspected after cleaning, preparation, and/or drying, but prior to making repairs or applying a coat in the coating system. If concrete surfaces are repaired, they shall be reinspected for surface cleanliness prior to application of the coating system.

5. Surface preparation of concrete substrates shall be accomplished using methods such as dry abrasive blast cleaning, high, or ultra high-pressure water blast cleaning in accordance with SSPC-SP-13. The selected cleaning method shall produce the requirements set forth below.

   a. A clean substrate that is free of calcium sulfate, loose coarse or fine aggregate, laitance, loose hydrated cement paste, and otherwise deleterious substances shall be achieved. Blast cleaning and other means necessary shall be used to open up air voids or bugholes to expose their complete perimeter. Leaving shelled over, hidden air voids beneath the exposed concrete surface is not acceptable. Concrete substrate must be dry prior to the application of filler/surface or coating system materials.

      (1) Acceptable surface preparation must produce a concrete surface with a minimum pH of 8.0 to be confirmed by surface pH testing. If after surface preparation, the surface pH remains below 8.0, perform additional water blasting, cleaning, or abrasive blast cleaning until additional pH testing indicates an acceptable pH level.

   b. Following inspection by the Contractor of the concrete surface preparation, thoroughly vacuum clean concrete surfaces to be coated to remove loose dirt, and spent abrasive (if dry blast cleaning is used) leaving a dust free, sound concrete substrate. Debris produced by blast cleaning shall be removed from the structures to be coated and disposed of legally off site by the Contractor.

   c. Should abrasive blast cleaning or high or ultrahigh pressure water blasting not remove degraded concrete, chipping or other abrading tools shall be used to remove the deteriorated concrete until a sound, clean substrate is achieved which is free of calcium sulfate, loose coarse or fine aggregate, laitance, loose hydrated cement paste, and otherwise deleterious substances. Concrete substrates must be dry prior to the application of filler/surfacers or coating system materials.

   d. Surface cleanliness of prepared concrete substrates shall be inspected after cleaning, preparation, and/or drying, but prior to application of coating materials. If concrete surfaces are repaired, they shall be reinspected for surface cleanliness and required surface profile prior to application of the coating system.

   e. Moisture content of concrete to be coated shall be tested in accordance with ASTM D4263, Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method and ASTM F 1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride. The ASTM D4263 plastic sheet test shall be conducted at least once for every 500 sq. ft. of surface area to be coated. The presence of any moisture on plastic sheet following test period constitutes a non-acceptable test. For concrete surfaces to be coated

which are on the negative or back side of concrete walls or structures exposed to soils (back filled) or immersed and waterproofed in accordance with Section 07100, perform calcium chloride tests in accordance with ASTM F-1869 once for each 500 sq. ft. of surface area to be coated. Comply with CSM's written recommendations regarding acceptance/non-acceptance of moisture vapor emissions.

F. MASONRY SURFACES:

1. Prepare masonry surfaces such as Concrete Masonry Units (CMU) to remove chalk, loose dirt, dried mortar splatter, dust, peeling, or loose existing coatings, or otherwise deleterious substances to leave a clean, sound substrate.

2. Be certain masonry surfaces are dry prior to coating application. If pressure washing or low-pressure water blast cleaning is used for preparation, allow the masonry to dry for at least 5 days under dry weather conditions or when the minimum ambient temperature is 70 degrees F prior to coating application work.

G. PLASTIC, NONFERROUS METAL, AND FIBERGLASS REINFORCED PLASTIC (FRP) SURFACES:

1. Prepare FRP surfaces by sanding to establish uniform surface roughness and to remove gloss from the resin in the FRP. Next, vacuum clean to remove loose FRP dust, dirt, and other materials. Next, solvent clean using clean white rags and allow solvent to evaporate completely before application of coating materials.

2. Non-ferrous metal surfaces shall be solvent-cleaned SSPC-SP1 followed by sanding or brush-off blast cleaning SSPC-SP7.

3. All surfaces shall be clean and dry prior to coating application.

H. SURFACE PREPARATION OF FERROUS XSURFACES WITH EXISTING COATINGS:

1. GENERAL: All grease, oil, heavy chalk, dirt, or other contaminants shall be removed by solvent or detergent cleaning prior to abrasive blast cleaning. The generic type of the existing coatings shall be determined by laboratory testing.

2. ABRASIVE BLAST CLEANING: The CONTRACTOR shall provide the degree of cleaning specified in the coating system schedule for the entire surface to be coated. If the degree of cleaning is not specified in the schedule, deteriorated coatings shall be removed by abrasive blast cleaning to SSPC-SP6, Commercial Blast Cleaning. Areas of tightly adhering coatings shall be cleaned to SSPC-SP7, Brush-off Blast Cleaning, with the remaining thickness of existing coating not to exceed 3 mils.

3. INCOMPATIBLE COATINGS: If coatings to be applied are not compatible with existing coatings the CONTRACTOR shall apply intermediate coatings per the paint manufacturer's recommendation for the specified coating system or shall completely remove the existing coating prior to abrasive blast cleaning. A small trial application shall be conducted for compatibility prior to painting large areas.

4. UNKNOWN COATINGS: Coatings of unknown composition shall be completely removed prior to application of new coatings.

5. WATER ABRASIVE OR WET ABRASIVE BLAST CLEANING: Where specified or where job site conditions do not permit dry abrasive blasting for industrial coating systems due to dust or air pollution considerations, water abrasive blasting or wet abrasive blasting may be used. In both methods, paint-compatible corrosion inhibitors shall be used, and coating application shall begin as soon as the surfaces are dry. Water abrasive blasting shall be done using high-pressure water with sand injection. In both methods, the equipment used shall be commercially produced equipment with a successful service record. Wet blasting methods shall not be used for submerged and severe service coating systems unless specified.

3.3 APPLICATION

A. WORKMANSHIP:

1. Coated surfaces shall be free from runs, drips, holidays, ridges, waves, laps, and brush marks. Coats shall be applied to produce an even film of uniform thickness completely coating corners and crevices.

2. The Contractor's equipment shall be designed for application of the materials specified. Compressors shall have suitable traps and filters to remove water and oils from the air. A paper blotter test shall be performed by the Contractor when requested by the Construction Manager to determine if the air is sufficiently free of oil and moisture so as not to produce deteriorating effects on the coating system. The amount of oil and moisture in spray air shall be less than the amount recommended by the CSM. Spray equipment shall be equipped with mechanical agitators, pressure gages, and pressure regulators, and spray nozzles of the proper sizes.

3. Each coat of coating material shall be applied evenly and sharply cut to line. Care shall be exercised to avoid overspraying or spattering paint on surfaces not to be coated. Glass, hardware, floors, roofs, and other adjacent areas and installations shall be protected by taping, drop cloths, or other suitable measures.

4. Coating applications method shall be conventional or airless spray, brush or roller, or trowel as recommended by CSM.

5. Allow each coat to cure or dry thoroughly, according to CSM's printed instructions, prior to recoating.

6. Vary color for each successive coat for coating systems when possible.

7. When coating complex steel shapes, prior to overall coating system application, stripe coat welds, edges of structural steel shapes, metal cut-outs, pits in steel surfaces, or rough surfaces with the primer coat. This involves applying a separate coat using brushes or rollers to ensure proper coverage. Stripe coat via spray application is not permitted.

8. Skilled craftsmen and experienced supervision shall be used on all work.

9. Clean droop cloths shall be used. All damage to surfaces resulting from the work hereunder shall be cleaned, repaired, and refinished to their original condition.

10. Factory-finished items shall be protected against damage during transit, storage and erection. Damaged areas must be refinished as the original.

B. STORAGE, COATING PROPERTIES, MIXING AND THINNING: Coatings, when applied, shall provide a satisfactory film and smooth even surface. Glossy undercoats shall be lightly sanded to provide a surface suitable for the proper application and adhesion of subsequent coats. Coating materials shall be thoroughly stirred, strained, and kept at a uniform consistency during application. Coatings consisting of two or more components shall be mixed in accordance with the CSM's instructions. Where necessary to suit the conditions of the surface, temperature, weather and method of application, the coating may be thinned as recommended by the CSM immediately prior to use. The volatile organic content (VOC) of the coating as applied shall comply with prevailing air pollution control regulations. Unless otherwise specified, coatings shall not be reduced more than necessary to obtain the proper application characteristics. Thinner shall be as recommended by the CSM.

1. MANUFACTURER'S RECOMMENDATIONS: Unless otherwise specified herein, the coating manufacturer's printed recommendations and instructions for thinning, mixing, handling, applying, and protecting its coating materials, for preparation of surfaces for coating, and for all other procedures relative to coating shall be strictly observed. The CONTRACTOR shall supply the ENGINEER with copies of each manufacturer's instructions in accordance with the General Requirements.

2. Thinning of paint shall be in accordance with the manufacturer's published instructions, especially as to the amount and kind of thinner used. Thinning must be approved by the ENGINEER.

3. All protective coating materials shall be used within the manufacturer's recommended shelf life.

4. STORAGE AND MIXING: Coating materials shall be protected from exposure to excessive heat and cold weather, and shall be thoroughly stirred, strained, and kept at a uniform consistency during application. Coatings of different manufacturers shall not be mixed together. Flammable materials shall be stored in accordance with state and local codes.

C. ATMOSPHERIC CONDITIONS: Coatings shall be applied only to surfaces that are dry, and only under conditions of evaporation rather than condensation. Coatings systems shall not be applied during rainy, misty weather, or to surfaces upon which there is frost or moisture condensation. During damp weather, when the temperature of the surface to be coated is within 10 degrees F of the dew point, forced dehumidification equipment may be used to maintain a temperature of minimum 40 degrees F and 10 degrees F above the dew point for the surfaces to be coated, the coated surface, and the atmosphere in contact with the surface. These conditions shall be maintained for a period of at least 8 hours or as recommended by the CSM. Where conditions causing condensation are severe, dehumidification equipment, fans, and/or heaters shall be used inside enclosed areas to maintain the required atmospheric and surface temperature requirements for proper coating application and cure.

D. CONCRETE SUBSTRATE TEMPERATURES AND DETAIL TREATMENT:

1. When the surface temperatures of the concrete substrates to be coated are rising or when these substrates are in direct sunlight, outgassing of air from the concrete may result in bubbling, pinhole formations, and/or blistering in the coating system. The application of the filler/surface and the coating system will only be allowed during periods of falling temperature. This will require that application of the filler/surface and coating system shall only occur during the cooler evening hours. Contractor shall include any cost for working outside of normal hours in the bid.

a. Should bubbles, pinholes, or discontinuities form in the applied coating system material, they shall be repaired as recommended by the CSM. Should pinholes develop in the filler/surfacer material or in the first coat of the coating material, the pinholes shall be repaired in accordance with the CSM's recommendations prior to application of the next coat of material. Whenever pinholes occur, the air void behind or beneath the pinhole shall be opened up completely and then completely filled with the specified filler/surfacer material. Next, the coated area around the pinhole repair shall be abraded and the coating reapplied over that area.

2. Perform application detail work per CSM's current written recommendations and/or drawings.

E. PROTECTION OF COATED SURFACES: Items that have been coated shall not be handled, worked on, or otherwise disturbed, until the coating is completely dry and hard. After delivery at the site, and upon permanent erection or installation, shop-coated metalwork shall be recoated or retouched with specified coating when it is necessary to maintain the integrity of the film.

F. METHOD OF COATING APPLICATION:

1. GENERAL: No exterior or interior painting shall be done under conditions which, in the opinion of the ENGINEER, could jeopardize the appearance or quality of the finish in any way. It may be necessary for the CONTRACTOR to provide a working area which is protected, heated, and has a controlled atmosphere.

2. Cleaned surfaces and all coats shall be inspected prior to each succeeding coat. The CONTRACTOR shall schedule such inspection with the ENGINEER in advance.

3. Coatings shall be applied in accordance with the manufacturer's instructions and recommendations, and this Section, whichever has the most stringent requirements.

4. Where two or more coats are required, alternate coats shall contain sufficient compatible color additive to act as indicator of coverage, or the alternate coats shall be of contrasting colors. Color additives shall not contain lead, or lead compounds, which may be destroyed or affected by hydrogen sulfide or other corrosive gas, and/or chromium.

5. Mechanical equipment, on which the equipment manufacturer's coating is acceptable, shall be touch-up primed and coated with two coats of the specified coating system to match the color scheduled. Electrical and instrumentation equipment specified in Divisions 16 and 17 shall be coated as specified in paragraph 09900-3.03 I.

6. Special attention shall be given to edges, angles, weld seams, flanges, nuts and bolts, and other places where insufficient film thicknesses are likely to be present. Use stripe painting for these areas.

7. Special attention shall be given to materials which will be joined so closely that proper surface preparation and application are not possible. Such contact surfaces shall be coated prior to assembly or installation.

8. Finish coats, including touch-up and damage repair coats shall be applied in a manner which will present a uniform texture and color matched appearance.

9. Blast cleaned ferrous metal surfaces shall be painted before any rusting or other deterioration of the surface occurs. Blast cleaning shall be limited to only those surfaces that can be coated in the same working day.

10. Coatings shall not be applied to a surface until it has been prepared as specified. The primer or first coat shall be applied by brush to ferrous surfaces that are not blast-cleaned. Coats for blast-cleaned ferrous surfaces and subsequent coats for nonblast-cleaned ferrous surfaces may be either brush or spray applied. After the prime coat is dry, pinholes and holidays shall be marked, repaired in accordance with CSM's recommendations and retested before succeeding coats are applied. Unless otherwise specified, coats for concrete and masonry shall be brushed, rolled, or troweled.

11. Coatings shall not be applied under the following conditions:

    a. Temperature exceeding the manufacturer's recommended maximum and minimum allowable.

    b. Dust or smoke laden atmosphere.

c. Damp or humid weather.

12. Dewpoint shall be determined by use of a sling psychrometer in conjunction with U.S. Dept. of Commerce, Weather Bureau psychrometric tables.

13. Steel piping shall be abrasive blast cleaned and primed before installation.

14. The finish coat on all work shall be applied after all concrete, masonry, and equipment installation is complete and the work areas are clean and dust free.

G. CURING OF COATINGS:

1. The CONTRACTOR shall provide curing conditions in accordance with the conditions recommended by the coating material manufacturer or by this Section, whichever is the highest requirement, prior to placing the completed coating system into service.

2. In the case of enclosed areas, forced air ventilation, using heated air if necessary, may be required until the coatings have fully cured.

3. FORCED AIR VENTILATION OF STEEL RESERVOIRS AND ENCLOSED HYDRAULIC STRUCTURES: Forced air ventilation is required for the application and curing of coatings on the interior surfaces of steel reservoirs and enclosed hydraulic structures. During curing periods continuously exhaust air from a maintenance hole in the lowest shell ring, or in the case of an enclosed hydraulic structure, from the lowest level of the structure using portable ducting. After all interior coating operations have been completed provide a final curing period for a minimum of 10 days, during which the forced ventilation system shall operate continuously.

H. FILM THICKNESS AND CONTINUITY:

1. WFT of the first coat of the coating system and subsequent coats shall be verified by the Contractor, following application of each coat.

2. The surface area covered per gallon of coating for various types of surfaces shall not exceed those recommended by the CSM. The first coat, referred to as the prime coat, on metal surfaces refers to the first full paint coat and not to solvent wash, grease emulsifiers or other pretreatment applications. Coatings shall be applied to the thickness specified, and in accordance with these specifications. Unless otherwise specified, the average total thickness (dry) of a completed protective coating system on exposed metal surfaces shall be not less than 1.25 mils per coat. The minimum thickness at any point shall not deviate more than 25 percent from the required average. Unless otherwise specified, no less than two coats shall be applied.

3. In testing for continuity of coating about welds, projections (such as bolts and nuts), and crevices, the Construction Manager shall determine the minimum conductivity for smooth areas of like coating where the dry-mil thickness has been accepted. This conductivity shall be the minimum

required for these rough or irregular areas. Pinholes and holidays shall be recoated to the required coverage.

4. The ability to obtain specified film thickness is generally compromised when brush or roller application methods are used and, therefore, more coats may need to be applied to achieve the specified dry film thickness.

5. For concrete substrates, the Contractor shall apply a complete skim coat of the specified filler/surfacer material over the entire substrate prior to application of the coating system. This material shall be applied such that all open air voids and bugholes in the concrete substrate are completely filled prior to coating application.

I. SPECIAL REQUIREMENTS: Before erection, the Contractor shall apply all but the final finish coat to interior surfaces of roof plates, roof rafters and supports, pipe hangers, piping in contact with hangers, and contact surfaces that are inaccessible after assembly. The final coat shall be applied after erection. Structural friction connections and high tensile bolts and nuts shall be coated after erection. Areas damaged during erection shall be hand-cleaned or power-tool cleaned and recoated with primer coat prior to the application of subsequent coats. Touch-up of surfaces shall be performed after installation. Surfaces to be coated shall be clean and dry at the time of application. Except for those to be filled with grout, the underside of equipment bases and supports that have not been galvanized shall be coated with at least two coats of primer specified for system E-2 prior to setting the equipment in place. Provide coating system terminations at leading edges and transitions to other substrates in accordance with the CSM's recommendations or detail drawings.

J. ELECTRICAL AND INSTRUMENTATION EQUIPMENT AND MATERIALS: Electrical and instrumentation equipment and materials shall be coated by the equipment manufacturer as specified below.

1. FINISH:

a. Electrical equipment shall be treated with zinc phosphate, bonderized or otherwise given a rust-preventive treatment. Equipment shall be primed, coated with enamel, and baked. Minimum dry film thickness shall be 3 mils.

b. Unless otherwise specified, instrumentation panels shall be coated with system E-1 for indoor mounting and system EU-1 for outdoor mounting.

c. Before final acceptance, the Contractor shall touch up scratches on equipment with identical color coating. Finish shall be smooth, free of runs, and match existing finish. Prior to touching up scratches, Contractor shall fill them with an appropriate filler material approved by the CSM.

2. COLOR:

a. Exterior color of electrical equipment shall be FS 26463 (ANSI/NSF 61) light gray. Interior shall be painted FS 27880 white. Nonmetallic electrical enclosures and equipment shall be the equipment manufacturer's standard grey color.

b. Exterior color of instrumentation panels and cabinets mounted indoors shall be FS 26463 light gray; unless otherwise specified, exterior color for cabinets mounted outdoors shall be FS 27722, white. Cabinet interiors shall be FS 27880, white.

K. SOLUBLE SALT CONTAMINATION OF METALLIC SUBSTRATES: Contractor shall test in accordance with SSPC-TU-4 metallic substrates to be coated that have been exposed to seawater or coastal air or to industrial fallout of particulate or other sources of soluble chlorides (such as wastewater exposure). If testing indicates detrimental levels of soluble salts, those in excess of 25 ppm, the Contractor shall clean and prepare these surfaces to remove the soluble salts.

3.4 CLEANUP

A. Upon completion of coating, the Contractor shall remove surplus materials, protective coverings, and accumulated rubbish, and thoroughly clean surfaces and repair overspray or other coating-related damage.

3.5 COATING SYSTEM SPECIFICATION SHEETS (COATSPEC)

A. Coating systems for different types of surfaces and general service conditions for which these systems are normally applied are specified on the following COATSPEC sheets. Surfaces shall be coated in accordance with the COATSPEC to the system thickness specified. Coating systems shall be as specified in paragraph 09900-3.06, Coating System Schedule. In case of conflict between the schedule and the COATSPECS, the requirements of the schedule shall prevail.

B. Coating Specification Sheets included in Table 09900A are included this paragraph 09900-3.05.

Table 09900A Coating Specification Sheets

Coating System ID	Coating Material	Surface	Service Condition
E-1	Epoxy	Metal	Interior; exterior, covered, not exposed to direct sunlight, non-corrosive exposure.
E-1-G	Epoxy	Galvanized Steel	Interior; exterior, covered non-corrosive exposure. Do not use in immersion service.
E-2	Epoxy	Metal	Immersed, nonpotable; non-immersed, moderately corrosive environment, color required.

Coating System ID	Coating Material	Surface	Service Condition
E-3	Epoxy	Concrete or Masonry	Immersed, nonpotable; non-immersed, corrosive environment, color required.
E-4	Epoxy	Concrete, masonry, plaster, gypsum board	Interior
E-5 (NSF 61 certified)	Epoxy	Metal	Interior potable water tanks and reservoirs and other metal components in contact with water being treated and stored for potable use.
E-6 (NSF 61 certified)	Epoxy	Concrete	Interior potable water tanks and reservoirs and other metal components in contact with water being treated or stored.
E-7	Epoxy	Plastic	Interior; exterior covered, not exposed to direct sunlight.
E-8	Clear epoxy	Wood	Interior
E-9	Epoxy	Metal	Immersed, nonpotable; non-immersed, corrosive environment, color required. (Not for Biogenic Sulfide Corrosion areas.)
E-9-C	Epoxy	Concrete or masonry	Immersed, nonpotable; non-immersed, moderately corrosive environment, color required. (Not for Biogenic Sulfide Corrosion areas.)
E-10	Polyamidoamine epoxy	Metal or concrete	Below grade (buried).
EF-1	Amine Epoxy Broadcast Floor Coating	Concrete Floors	Light duty, wheeled traffic, frequent foot traffic, mildly corrosive.
EF-2	Amine Epoxy Troweled Floor Coating	Concrete Floors	Heavy-duty, wheeled traffic, frequent foot traffic, wet and moderately corrosive.
EA-1	Blended Amine Cured Epoxy	Metal	Immersed, nonpotable; non-immersed, corrosive environment, color not required especially for headspace environments that are corrosive due to biogenic sulfide corrosion.
EA-2	Blended Amine Cured Epoxy	Concrete or masonry	Immersed, nonpotable; non-immersed, corrosive environment, color not required, new construction especially for headspace environments that are corrosive due to biogenic sulfide corrosion.
EA-3	Blended Amine Cured Epoxy	Concrete or Masonry	Immersed, nonpotable; non-immersed, corrosive environment, color not required, new or existing construction, especially for headspace environments that are corrosive due to biogenic sulfide corrosion.

Coating System ID	Coating Material	Surface	Service Condition
EA-4	Blended Amine Cured Epoxy – For Very Corrosive Conditions	Concrete or Masonry Potable	Non-immersed or immersed, very corrosive environment. Very high H_2S conditions.
EA-5	Novolac Epoxy Lining	Concrete	Secondary containment for spills of HFS acid or ferric chloride.
G	Grease	Metal	Ferrous Metal: Ferrous metal surfaces shall be prepared in accordance with SSPC SP-1 (Solvent Cleaning.)
HH-1	Proprietary Primer Plus Silicone Topcoat	Metal	Temperature to 750 degrees F.
HH-2	Proprietary Primer Plus Silicone Topcoat (black or aluminum only)	Metal	Temperature to 1200 degrees F.
L-1	Latex	Concrete, masonry, plaster, gypsum board	Interior and Exterior including existing exterior coated concrete.
L-2	Latex	PVC and CPVC pipe	Exterior, direct sunlight exposure.
L-3	Latex-Direct to Metal	Ferrous Metal	Interior or Exterior
L-4	Latex	Wood	Interior
M-1	Petrolatum based mastic or wax based wrapping tapes	Metal	Below grade (buried) or where little to no surface preparation can be performed on piping or structural steel.
M-2	Epoxy mastic or equal	Ferrous Metal	Interior, corrosive environment, confined enclosures, where minimal surface preparation is possible.
EU-1	Zinc-epoxy-polyurethane system	Ferrous Metal	Exterior, exposed to direct sunlight, moderately corrosive non-immersed.
EU-1-FRP	Specialty Primer plus Polyurethane Finish Coat	Exterior of FRP pipe and tanks, etc.	Exterior, exposed to direct sunlight, non-immersed.
EC-1	Hybrid Polyurethane	Concrete or dense masonry where existing crack or joint movement is suspected of propagating through rigid cured epoxy coatings	Service Condition: Interior or exterior, exposed to direct sunlight or not, corrosive (immersion pH 4.0 or lower and/or headspace pH 4.0 or lower and/or gaseous H_2S concentrations between 10 and 150 ppm typically.)

Coating System ID	Coating Material	Surface	Service Condition
EC-2 (NSF-61)	Modified Polyurethane	Concrete or dense masonry where existing crack or joint movement is suspected due to thermal conditions and would propagate through rigid epoxy coating systems and/or where NSF-61 certification is required	Interior or exterior, submerged or non-submerged indirect sunlight – moderately corrosive.
S-1	Penetrating acrylic stain, color required	Concrete	Non-immersed, exposure to moisture and sunlight.
S-2	Silane/Siloxane or Blended Sealer	Concrete Floors	Wet, non-immersed, non-corrosive. Interior or exterior for waterproofing.
S-3	RTV Silicone Rubber Based Sealer	Concrete or Masonry Walls	Exterior or Interior – Weathering Exposure, Non-Corrosive.
S-4	Acrylic Co-polymer Blend	Concrete Floors	Wet, non-immersed, non-corrosive, interior for oil and water repellent.

1. Coating System Identification: E-1

   Coating Material: Epoxy

   Surface: Metal

   Service Condition: Interior; exterior, covered, not exposed to direct sunlight, non-corrosive exposure.

   Surface Preparation:

   General: Shop primed surfaces which are to be incorporated in the work shall be prepared in the field by cleaning surfaces in accordance with SSPC SP-2 (Hand Tool Cleaning). Damaged shop coated areas shall be cleaned in accordance with SSPC SP-5 (White Metal Blast Cleaning) to achieve a uniform surface profile of 2.0 to 2.5 mils and spot primed with the primer specified. Shop epoxy primed surfaces shall require light abrasive and vacuum cleaning blasting prior to receiving finish coats.

   Ferrous Metal: Bare ferrous metal surfaces shall be prepared in accordance with SSPC SP-6 (Commercial Blast Cleaning) to achieve a uniform, surface profile of 2.0 to 2.5 mils.

		Ferrous metal with rust bleeding shall be cleaned in accordance with SSPC SP-1 (Solvent Cleaning). Areas of rust penetration shall be spot blasted to SSPC SP-10 (Near White Blast) (to achieve the 2.0- to 2.5-mil surface profile) and spot primed with the specified primer. For ductile iron surfaces, refer to the requirements in paragraph 09900-3.02 D.
	Nonferrous and Galvanized Metal:	Nonferrous and galvanized metal shall be prepared in accordance with SSPC SP-7 (Brush-off Blast Cleaning) to achieve uniform, minimum surface profile 1.0 to 1.5 mils.
	Application:	Field
	General:	Prime coat may be thinned and applied as recommended by the CSM, provided the coating as applied complies with prevailing air pollution control regulations.
	Ferrous Metal:	Prime coats shall be an epoxy primer compatible with the specified finish coats and applied in accordance with the written instructions of the CSM.
	Nonferrous and Galvanized Metal:	Nonferrous and galvanized metal shall be cleaned prior to the application of the prime coat in accordance with SSPC SP-1 (Solvent Cleaning).
	System Thickness:	10 mils dry film.
	Coatings:	
	Primer:	One coat at CSM's recommended dry film thickness.
	Finish:	One or more coats at CSM's recommended dry film thickness per coat to achieve the specified system thickness.
2.	Coating System Identification:	E-2
	Coating Material:	Epoxy
	Surface:	Metal

Service Condition:	Immersed, nonpotable; non-immersed, moderately corrosive environment, color required.
Surface Preparation:	
Ferrous Metal:	Ferrous metal surfaces shall be prepared in accordance with SSPC SP-5 (White Metal Blast Cleaning) to achieve a uniform surface profile of 2.0 to 2.5 mils. Damaged shop coating shall be cleaned in accordance with SSPC SP-5 (White Metal Blast Cleaning) and vacuum cleaning and spot primed with the primer specified. Shop epoxy primed surfaces shall require light abrasive blasting or abrading prior to receiving finish coats if the maximum recoat time for the primer has been exceeded. This cleaning must produce a uniform 1.0- to 1.5-mil profile in the intact shop primer. For ductile iron surfaces, refer to the requirements in paragraph 09900-3.02 D.
Nonferrous and Galvanized Metal:	Nonferrous and galvanized metal shall be prepared in accordance with SSPC SP-7 (Brush-off Blast Cleaning) to achieve a uniform surface profile of 1.0 to 1.5 mils. Galvanized steel with this E-2 coating system shall not be used in immersion service in wastewater.
Application:	Field
General:	Prime coat may be thinned and applied as recommended by the CSM, provided the coating as applied complies with prevailing air pollution control regulations.
Ferrous Metal:	Prime coat shall be an epoxy primer compatible with the specified finish coats.
Nonferrous and Galvanized Metal:	Nonferrous and galvanized metal, non-immersed, shall be coated prior to the application of the prime coat with a grease emulsifying agent in accordance with the CSM's written instructions. Nonferrous metal to be immersed shall not be painted. Galvanized metal shall not be immersed even if it is painted.

System Thickness: 16 mils dry film.

Coatings:

Primer: One coat at CSM's recommended dry film thickness.

Finish: Two or more coats at CSM's recommended dry film thickness per coat to the specified system thickness.

3. Coating System Identification: E-4

Coating Material: Epoxy

Surfaces: Concrete, masonry, plaster, gypsum board.

Service Condition: Interior

Surface Preparation:

Concrete: Concrete surfaces shall be allowed to age for at least 28 days and allowed to dry to the moisture content recommended by the CSM. Moisture content may be tested by the Construction Manager with a Delmhorst Instrument Company moisture detector, or equal. Loose concrete, form oils, surface hardeners, curing compounds and laitance shall be removed from surfaces, and voids and cracks shall be repaired as specified in Section 03300. Surface preparation shall produce a concrete surface profile of CSP-2 in accordance with ICRI 03732. After cleaning, air voids or bugholes in the concrete shall be filled with a surfacer or block filler compatible with the specified primer and finish coats.

Masonry: Masonry surfaces shall be allowed to age for at least 28 days. Holes or other joint defects shall be filled with mortar and repointed. Loose or splattered mortar shall be removed by scrapping and chipping. Masonry surfaces shall be cleaned with clear water by washing and scrubbing to remove foreign and deleterious substances. Muriatic acid shall not be used. After cleaning, exterior masonry surfaces shall be sealed or filled with a sealer or block filler compatible with the specified primer.

	Plaster:	Plaster surfaces shall be dry, clean, and free from grit, loose plaster, and surface irregularities. Cracks and holes shall be repaired with acceptable patching materials, keyed to existing surfaces, and sandpapered smooth. Surfaces shall be cleaned with clean water by washing and scrubbing to remove foreign and deleterious substances.
	Application:	Field Block Filler shall be multiple component epoxy block filler or an acrylic based or waterborne epoxy based block filler and shall dry a minimum of 48 hours prior to primer application or as required by the CSM. Prime coat shall be thinned and applied as recommended by CSM, provided the coating as applied complies with prevailing air pollution control regulations. Drying time between coats shall be as recommended by CSM.
	System Thickness:	10 mils dry film, excluding block filler and sealer.
	Coatings:	
	Primer:	One coat at CSM's recommended dry film thickness.
	Finish:	One or more coats at CSM's recommended dry film thickness per coat to the specified system thickness.
4.	Coating System Identification:	E-7
	Coating Material:	Epoxy
	Surface:	Plastic
	Service Condition:	Interior; exterior covered, not exposed to direct sunlight.
	Surface Preparation:	Plastic shall be prepared in accordance with SSPC SP-1 (Solvent Cleaning) and light sanding to produce a uniform surface

roughness(uniform surface profile of 1.0 to 1.5 mils) on the plastic.

Application: Field

System Thickness: 5 mils dry film.

Coatings: One or more coats at CSM's recommended dry film thickness per coat to the specified system thickness.

5. Coating System Identification: E-9-C

Coating Material: Epoxy

Surface: Concrete or masonry

Service Condition: Immersed, nonpotable; non-immersed, moderately corrosive environment, color required. (Not for Biogenic Sulfide Corrosion areas.)

Surface Preparation:

Concrete: Concrete surfaces shall be allowed to cure for at least 28 days following initial concrete placement and allowed to dry to the moisture content recommended by the CSM before coating work proceeds. Moisture content may be tested by the Construction Manager with a Delmhorst Instrument Company moisture detector, or equal. Except as otherwise specified, loose concrete, form oils, surface hardeners, curing compounds, and laitance shall be removed from surfaces by abrasive blasting and chipping, and voids and cracks shall be repaired as specified in Section 03300. Cleaning can be performed using abrasive blast cleaning or water blast cleaning methods to produce a minimum concrete surface profile of CSP-3 in accordance with ICRI 03732. After cleaning, all air voids or bugholes in the concrete shall be filled with a surfacer or block filler compatible with the specified primer and finish coats.

Masonry: Masonry surfaces shall be allowed to cure for at least 28 days after being constructed and be allowed to dry to the moisture content recommended by the CSM. Holes

or other joint defects shall be filled with a material compatible with the primers and finish coats or shall be filled with masonry mortar that shall cure for at least 28 days. Loose or splattered mortar shall be removed by scraping and chipping.

Masonry surfaces shall be cleaned with clear water by washing and scrubbing to remove foreign and deleterious substances.

Muriatic acid shall not be used. After cleaning, masonry surfaces shall be sealed or filled with a sealer or block filler compatible with the specified primer.

Application: Field

Apply filler/surfacer as recommended by CSM to fill bugholes and air voids or block texture, etc. leaving a uniformly filled surface that does not produce blowholes or outgassing causing pinholing of the coating system.

Filler/Surfacers shall dry a minimum of 48 hours prior to application of prime coat or as required by the CSM.

Prime coat shall be thinned and applied as recommended by the CSM, provided the coating as applied complies with prevailing air pollution control regulations.

Drying time between coats shall be as recommended by CSM.

System Thickness: 16 to 20 mils dry film.

Coatings:

Primer: One coat at CSM's recommended dry film thickness.

Finish: Two or more coats at CSM's recommended dry film thickness per coat to the specified system thickness.

6. Coating System Identification: EA-1

Coating Material:	Blended Amine Cured Epoxy
Surface:	Metal
Service Condition:	Immersed, nonpotable; non-immersed, corrosive environment, color not required especially for headspace environments that are corrosive due to biogenic sulfide corrosion.
Surface Preparation:	
Ferrous Metal:	Ferrous metal surfaces shall be prepared in accordance with SSPC SP-5 (White Metal Blast Cleaning) to achieve a uniform surface profile of 3.0 to 3.5 mils. Blast Cleaning shall produce a minimum surface profile of 3.0 mils. Shop primed surfaces which are to be incorporated in the work shall be prepared in the field by cleaning surfaces in accordance with SSPC SP-11 (Power Tool Cleaning to Bare Metal). Damaged shop coated areas shall be cleaned in accordance with SSPC SP-5 (White Metal Blast Cleaning) and spot primed with the primer specified. Shop epoxy primed surfaces shall require light abrasive blasting and blow down cleaning prior to receiving finish coats. Cast or ductile iron surfaces to be coated shall be abrasive blast cleaned to a clean, gray uniform metal appearance free of variations in color and loose materials. Ductile iron surfaces shall be prepared in accordance with paragraph 09900-3.02 D.
Nonferrous andGalvanized Metal:	Nonferrous and galvanized metal shall be prepared in accordance with SSPC SP-7 (Brush-off Blast Cleaning) to achieve a uniform surface profile of 2.0 to 2.5 mils. Galvanized metal should generally not be used in these environments.
Application:	Field
General:	Prime coat may be thinned and applied as recommended by the CSM, provided the coating as applied complies with prevailing air pollution control regulations.

Drying time between coats shall be as specified by the CSM for the site conditions. If the maximum recoat time is exceeded, surface preparation shall require solvent washing, light abrasive blasting, or other procedures per CSM's instructions.

Ferrous Metal: If shop priming is required or field priming is necessary, the prime coat shall be an epoxy primer compatible with the specified coating system. Generally, the EA-1 coating system is self-priming and does not require a primer unless there is a special reason to prime the steel to hold the blast cleaning from rusting back.

System Thickness: 30 to 40 mils dry film.

Coatings:

Primer: One coat at CSM's recommended dry film thickness only if required by special circumstances.

Finish: One or more coats at CSM's recommended dry film thickness per coat to the specified system thickness.

Testing: Holiday detection shall be performed over 100% of the coated surface area to identify any holidays or pinholes that must be repaired.

Pinhole and Holiday Repair Procedure: Pinholes and holidays identified by Holiday Detection shall be repaired as follows:

- Using a pencil grinder, remove a ½-inch diameter area of the coating system material back to the ferrous metal substrate. The metal must be shiny.
- Aggressively sand or abrade the intact coating system surface 2 inches around the complete periphery of the ½-inch diameter removal area to produce a uniform 6 to 8 mils profile.
- Vacuum clean the prepared area to remove all dust and dirt to achieve a clean, sound surface. Tape the peripheral area to prevent coating application onto unprepared surfaces.

- Brush apply one coat of the finish coating material. Following proper recoat cure time, apply additional coats of the finish coating system to achieve 60 mils DFT at the coating removal area and feather the coating onto the roughened coated surfaces to form a neat repair outline.

7. Coating System Identification: EU-1

   Coating Material: Zinc-Epoxy-Polyurethane System

   Surface: Ferrous Metal

   Service Condition: Exterior, exposed to direct sunlight, moderately corrosive, non-immersed.

   Surface Preparation:

   General: Shop primed surfaces which are to be incorporated in the work shall be prepared in the field by cleaning surfaces in accordance with SSPC SP-2 (Hand Tool Cleaning). Damaged shop coated areas shall be cleaned in accordance with SSPC SP-3 (Power Tool Cleaning) and recoated with the primer specified.

   Ferrous Metal: Bare ferrous metal surfaces shall be prepared in accordance with SSPC SP-6 (Commercial Blast Cleaning) 2.5 – 3.0. Ductile iron surfaces to be coated shall be abrasive blast cleaned in accordance with paragraph 09900-3.02 D.

   Ferrous metal with rust bleeding shall be cleaned in accordance with SSPC-SP-11 (Power Tool Cleaning to Bare Metal). Areas of rust penetration shall be spot blasted to SSPC SP-10 (Near White Blast) and spot primed with the specified primer.

   Galvanized Metal: Damaged galvanized steel areas with exposed ferrous metal and/or rusted shall be cleaned in accordance with SSPC SP 5 (White Metal Blast Cleaning) or Power Tool Cleaned to Bare Metal in accordance with SSPC-SP-11 to achieve a uniform 1.0- to 1.5-mil profile and spot primed with the primer specified.

		Nonferrous and galvanized metal shall be prepared in accordance with SSPC SP-7 (Brush-off Blast Cleaning) to impart a 1.0- to 2.0-mil profile to the galvanized steel surfaces. Where this cannot be performed, prepare by abrading in accordance with SSPC-SP-3, Power Tool Cleaning to impart a 1.0- to 1.5-mil profile uniformly to the galvanized steel surfaces. For EU-1 over galvanized steel, delete the zinc rich primer.
	Application:	Field
	General:	Prime coat may be thinned and applied as recommended by the CSM, provided the coating as applied complies with prevailing air pollution control regulations.
	Ferrous Metal:	Prime coats shall be a zinc rich epoxy or polyurethane primer compatible for use with urethane finish coats and applied in accordance with written instructions of the CSM or in the case of CARB or SCAQMD applications, prime with specified primer that is not zinc rich. In these cases, only a two-coat system is applied.
	System Thickness:	3 to 4 mils of zinc rich primer, one intermediate or primer epoxy coat at 5 to 6 mils and one finish coat of polyurethane at 2 to 3 mils DFT.
	Coatings:	
	Primer:	One coat at CSM's recommended dry film thickness.
	Intermediate:	One coat at CSM's recommended dry film thickness.
	Finish:	One coat at CSM's recommended dry film thickness per coat to meet the specified system thickness.
8.	Coating System Identification:	EU-1-FRP
	Coating Material:	Specialty Primer plus Polyurethane Finish Coat

	Surface:	Exterior of FRP Pipe and Tanks, etc.
	Service Condition:	Exterior, exposed to direct sunlight, non-immersed.
	Surface Preparation:	
	General:	Clean to remove loose dirt, dust, or other contaminants. Prepare surfaces by sanding to produce roughness to achieve a uniform, minimum surface profile of 1.5 to 2.0 mils. Solvent clean thoroughly using solvent as recommended by the CSM. Thoroughly clean to remove loose debris by vacuum cleaning.
	Application:	Field
	General:	Apply primer coat and thin as recommended by the CSM provided the coating applied complies with prevailing air pollution control regulations. Apply finish coat as recommended by the CSM.
	System Thickness:	Primer to 2 to 4 mils and finish coat is 2 to 3 mils DFT.
	Coatings:	
	Primer:	One coat at CSM's recommended dry film thickness.
	Finish:	One coat at CSM's recommended dry film thickness per coat to meet the specified system thickness.
9.	Coating System Identification:	L-2
	Coating Material:	Latex
	Surface:	PVC and CPVC pipe.
	Service Condition:	Exterior, direct sunlight exposure.

Surface Preparation:	Plastic pipe shall be cleaned with solvent compatible with the specified primer and sanded to roughen surfaces to achieve a uniform surface profile of 1.0 to 1.5 mils. Vacuum clean after sanding to remove all loose dust, plastic particles, and dirt.
Application:	Field
System Thickness:	3 mils dry film.
Coatings:	
Primer:	One coat at CSM's recommended dry film thickness.
Finish:	One or more coats at CSM's recommended dry film thickness per coat to the specified system thickness.

3.6 COATING SYSTEMS SCHEDULE (FINISH SCHEDULE)

A. Specific coating systems, colors, and finishes for rooms, galleries, piping, equipment, and other items that are coated or have other architectural finishes are specified in the following coating system schedule. Unless otherwise specified in the coating system schedule, the word "interior" shall mean the inside of a building or structure, and the word "exterior" shall mean outside exposure to weather elements.

Location Description	Surface	Coating System Identification	Standard Color
A. General for all areas (Areas 60, 76, 86, and 94)	1. Structural Steel	E-2	Match existing color
	2. Equipment and Metal Appurtenances		
	a. Equipment, non immersed, unless otherwise specified		
	1) Indoors	E-1	Match existing color
	2) Outdoors	EU-1	Match existing color
	b. Existing equipment		
	1) Not damaged nor modified by work in this contract	Uncoated	--
	2) Damaged, exposed, or modified by work in this contract		
	a) Indoors	E-1 (see paragraph 09900-3.02)	Match existing color

Location Description	Surface	Coating System Identification	Standard Color
	b) Outdoors	EU-1 without primer (see paragraph 09900-3.02)	Match existing color
	c. Electrical switchgear panels, unit substations, motor control centers, power transformers, distribution centers, and relay panels; indoors and outdoors	See paragraph 09900-3.03 I	ANSI 61 Grey (outside) FS 27880 White (inside)
	d. Instrumentation panels, graphic indicating panels, indicating and transmitting field panels, unless otherwise specified		
	1) Indoors	See paragraph 09900-3.03 I	FS 26306 Grey (outside) FS 27880 White (inside)
	2) Outdoors	See paragraph 09900-3.03 I	FS 27722 White (outside) FS 27880 White (inside)
	e. Existing electrical and instrumentation panels		
	1) Not damaged by work in this contract	Uncoated	--
	2) Damaged or exposed to outside surfaces by work in this contract		
	a) Indoors	E-1 (see paragraph 09900-3.02 F)	FS 26306 Grey
	b) Outdoors	EU-1 without primer (see paragraph 09900-3.02 F)	FS 26306 Grey (Electrical) FS 27722 White (Instrumentation)
	3. Conduit, Piping and Exposed Ductwork		
	a. Ferrous, non-ferrous and galvanized piping, and appurtenant hangers and supports, non-immersed, unless otherwise specified.		
	1) Indoors – noncorrosive	E-1	Match existing color
	2) Outdoors – noncorrosive	EU-1	Match existing color
	3) Indoors – in corrosive environment	EA-1	Match existing color

Location Description	Surface	Coating System Identification	Standard Color
	c. Conduit, outlet and junction boxes, lighting transformers, lighting, communication and small power panels, control stations, piping, lagged ductwork, appurtenant hangers, clamps, and supports on coated surfaces, unless otherwise specified.		
	1) Indoors	E-1	Match background color
	2) Outdoors	EU-1	Match background color
	d. Conduit, outlets and junction boxes, lighting transformers, lighting, communication and small power panels, control stations, piping, lagged ductwork, appurtenant hangers, clamps and supports on uncoated surfaces, unless otherwise specified		
	1) Indoors	E-1	Match existing color
	2) Outdoors	EU-1	Match existing color
	e. Existing conduit, outlet and junction boxes, lighting transformers, lighting communication and small power panels, control stations, piping, lagged ductwork, appurtenant hangers, clamps, and supports		
	1) Not damaged nor modified by work in this contract	Uncoated	--
	2) Damaged, exposed, or modified by work in this contract		
	a) Indoors	E-1 (see paragraph 09900-3.02 F)	Match existing color
	b) Outdoors	EU-1 without primer (see paragraph 09900-3.02 F)	Match existing color
	f. Racked conduits and cable trays	Uncoated	--
	g. Insulated pipe jacketing	Uncoated	--
	h. Plastic, fiberglass and flexible conduit and piping		
	1) Unless otherwise specified	Uncoated	--
	2) PVC and CPVC Piping	L-2	To be determined

Location Description	Surface	Coating System Identification	Standard Color
	a) Exposed to direct sunlight	L-2	To be determined
	b) Not exposed to direct sunlight	E-7	To be determined
	j. Exposed ductwork, unless otherwise specified	Uncoated	--
	4. Concrete, Grout, Masonry and Plaster		
	a. Walls and ceilings		
	1) Precast concrete or colored masonry	Uncoated	--
	2) Outdoors, unless otherwise specified	E-9-C	Match existing color
	3) Indoors, unless otherwise specified	E-4	Match existing color
	b. Concrete equipment bases unless otherwise specified	E-4	Match equipment color
	5. Handrails, Gratings, Floor Plates, Manhole Covers, and Hatches		
	a. Unless otherwise specified	Uncoated	
	b. Existing		
	1) Not damaged by work in this contract	Uncoated	--
	2) Damaged, exposed, or modified by work in this contract		
	a) Indoors	E-1 (see paragraph 09900-3.02 F)	Match existing color
	b) Outdoors	EU-1 without primer (see paragraph 09900-3.02 F)	Match existing color
	6. Aluminum Flashing, Light Standards, Supports, and Louvers		
	Indoors and outdoors, unless otherwise specified	Uncoated	--
	7. Precast Concrete Metalwork		
	Fasteners, anchors, supports, etc.	EU-1	Match wall
	8. Other		
	a. Foul air ductwork and appurtenances made from fiberglass, in areas not exposed to view (indoors) (metal hangers and supports are coated with E-1)	EU-1-FRP	Match existing color

3.7 INSPECTION AND TESTING BY OWNER:

A. Inspection by the Owner or others does not limit the Contractor's or CSA's responsibilities for quality workmanship or quality control as specified or as required by the CSM's instructions. Inspection by the Owner is in addition to any inspection required to be performed by the Contractor.

B. The Owner may perform, or contract with an inspection agency to perform, quality control inspection and testing of the coating work covered by this Section 09900. These inspections may include the following:

1. Inspect materials upon receipt to ensure that are supplied by the CSM.

2. Inspect to verify that specified storage conditions for the coating system materials, solvents and abrasives are provided.

3. Inspect and record findings for the degree of cleanliness of substrates.

4. Inspect and record the pH of concrete and metal substrates.

5. Inspect and record substrate profile (anchor pattern).

6. Measure and record ambient air and substrate temperature.

7. Measure and record relative humidity.

8. Check for the presence of substrate moisture in the concrete.

9. Inspect to verify that correct mixing of coating system materials is performed in accordance with CSM's instructions.

10. Inspect, confirm, and record that the "pot life" of coating system materials is not exceeded during installation. Inspect to verify that recoat limitations for coating materials are not exceeded.

11. Perform adhesion testing.

12. Measure and record the thickness of the coating system.

13. Inspect to verify proper curing of the coating system in accordance with the CSM's instructions.

14. Perform holiday or continuity testing for coatings that will be immersed or coatings that will be exposed to aggressively corrosive conditions.

3.8 FINAL INSPECTION

A. Contractor shall conduct a final inspection to determine whether coating system work meets the requirements of the specifications.

B. The Construction Manager will subsequently conduct a final inspection with the Contractor to determine the work is in conformance with requirements of the contract documents.

C. Any rework required shall be marked. Such areas shall be recleaned and repaired as specified at no additional cost to the Owner.

3.9 IDENTIFICATION OF PIPING

A. Identification of piping shall be in accordance with Section 15050 Piping Systems.

B. Every valve or connection, where it may be possible for a worker to be exposed to a hazardous substance, shall be labeled per General Industry Safety Orders, Article 112 OSHA Occupational Safety and Health Standards 29CFR1910.

3.10 COLORS

A. Colors shall be as specified or as selected by the ENGINEER. Colors will not necessarily be standard colors with all suppliers and shall be mixed by the manufacturer to secure desired color when not standard. The CONTRACTOR shall prepare and submit color chip samples for all items that require color selection by the ENGINEER. If requested for special architectural finishes, the CONTRACTOR shall also submit 6 x 6 inch samples similar to the intended coated surfaces and coated with the selected color. No color selection shall be made until after samples of all paints have been submitted to the ENGINEER who will prepare a color scheme using the submitted colors.

B. Factory-finished items shall be of the color specified under the particular equipment items.

09900-A Coating System Inspection Checklist			
Project Name:			
Owner		Coating System Manufacturer(CSM)	
General Contractor (GC)		Coating System Applicator(CSA)	
Area or Structure		Location within Structure	
Coating System (e.g. E-1)		Coating Type (e.g. Epoxy, etc.)	

Step	Description		Name	Signature	Date
1	Completion of cleaning and substrate decontamination prior to abrasive blast cleaning.	GC QC			
		CSM QC			
		CSA QC			
2	Installation of protective enclosure of structure or area and protection of adjacent surfaces or structures that are not to be coated.	GC QC			
		CSM QC			
		CSA QC			
3	Completion of ambient condition control in structure or building area and acceptance of ventilation methods in structure or Area.	GC QC			
		CSM QC			
		CSA QC			
4	Completion of Surface Preparation for Substrates to Be Coated.	GC QC			
		CSM QC			
		CSA QC			
5	Completion of Primer Application.	GC QC			
		CSM QC			
		CSA QC			

6	Completion of Concrete Repairs If Required and Related Surface Preparation Rework Prior to Coating System Application.	GC QC			
		CSM QC			
		CSA QC			
7	Completion of Concrete Filler/ Surface Application to Concrete.	GC QC			
		CSM QC			
		CSA QC			
8	Completion of First Finish Coat Application and of Detail Treatment at Transitions or Terminations.	GC QC			
		CSM QC			
		CSA QC			
9	Completion of Second Finish Coat Application and of Detail Treatment at Transitions and Terminations.	GC QC			
		CSM QC			
		CSA QC			
10	Completion of Full and Proper Cure of Coating System.	GC QC			
		CSM QC			
		CSA QC			
11	Completion of Testing of Cured Coating System including Adhesion, Holiday (Continuity) Testing and Dry Film Thickness.	GC QC			
		CSM QC			
		CSA QC			
12	Completion of Localized Repairs to Coating System Following Testing.	GC QC			
		CSM QC			
		CSA QC			

13	Final Acceptance of Coating System Installation Including Final Clean-Up Complying with Specification Requirements and the CSM's Quality Requirements.	GC QC			
		CSM QC			
		CSA QC			

****END OF SECTION****

SECTION 09920

ARCHITECTURAL PAINT FINISHES

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

A. The WORK of this Section includes preparation of surfaces and painting of surfaces not intended to receive other protective coatings.

B. Following are some of the types of surfaces which are not included in the WORK of this Section:

1. Factory-finished surfaces.

2. Surfaces whose coatings are for the specific purpose of protection from abrasion, wear and tear, or from corrosion, oxidation, decomposition, or other effects of exposure.

3. Stainless steel, aluminum brass, bronze, and plated finished metals (not zinc or cadmium).

4. Finish hardware except prime-coated items, and fusible links, UL labels, nameplates, numbers, and identifying data.

1.2 RELATED SECTIONS

A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 09900 Coating Systems

1.3 STANDARD SPECIFICATIONS

A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the most current edition of the Greenbook and the Whitebook.

1.4 CODES

A. The WORK of this Section shall comply with the current editions, with revisions, of the following codes and City of San Diego Supplements:

1. Uniform Building Code

1.5 SHOP DRAWINGS AND SAMPLES

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. Manufacturer's product data describing paint materials as to composition and manufacturer's recommended usage, preparation and application.

2. List of proposed paint materials with each material identified, manufacturer's name, product name, and number. The list shall include primers, thinners, and coloring agents. The list shall be submitted within 60 days after Notice to Proceed.

3. Color samples and stain samples. Stain samples shall be provided on the same material as the stain will be applied in the final installation.

4. Identification, including finish and color, of surfaces to receive paint materials.

1.6 FIELD TESTING

A. Thickness of the paint film shall be tested by the CONSTRUCTION MANAGER in compliance with Section 09800. CONTRACTOR shall furnish the required gages for performing these tests.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. The paint materials shall be delivered to the job site in the manufacturer's unopened containers.

B. Paint materials shall be covered, and precautions shall be taken for the prevention of fire. Paint thinner shall not be stored in a room scheduled to receive resilient flooring.

1.8 QUALIFICATIONS

A. Paint materials shall be the products of reputable manufacturers, specializing in such products, who have demonstrated successful experience with the indicated coating systems in the recent past.

1.9 WARRANTY INSPECTION

A. A warranty inspection shall be conducted during the eleventh month following completion of painting WORK. The CONTRACTOR and Installer shall attend this inspection. The OWNER may, at its sole option, by written notice to the CONTRACTOR, reschedule the warranty inspection within the contract guarantee period, or may cancel the warranty inspection altogether.

PART 2 - PRODUCTS

2.1 GENERAL

A. GENERAL: Only paint materials certified as complying with the indicated requirements shall be provided.

B. PRODUCTS: Paint materials shall be new and of current manufacture.

2.2 ALTERNATIVE MATERIALS

A. Where alternative painting systems are indicated, selection from among the alternatives is the CONTRACTOR's option.

B. Coatings applied under a single paint system shall be the products of a single manufacturer.

2.3 FACTORY MIXING

A. Paint shall be factory-mixed to the specified color, gloss, and consistency indicated.

2.4 PRIMERS AND FINISH PAINTS

A. PRIMERS: Primers, represented by the symbol below for the associated generic group, shall be the product, known by the tradename, of one of the listed manufacturers (or equal):

Symbol		Generic Group		Manufacturer/Trade Name
P1		Masonry Prime Coat (waterproofing)		Chemstop Heavy Duty Masonry Waterproofing Rainguard Heavy Duty Waterproofing Thompson Heavy Duty Water Seal
P2		Pigmented Wall Primer and Sealer		Pittsburgh Speedhide Primer Sealer SW Wall Primer and Sealer B49W1 Sinclair Pigmented Sealer
P3		Pigmented Vinyl Primer		Pittsburgh Speedhide Vinyl Primer, Pigmented SW Promar Latex Pigmented Wall Primer B28W1 Sinclair Pigmented PVA Sealer
P5		Enamel Undercoater		Pittsburgh Speedhide Enamel Undercoater SW Enamel Undercoater B49W2

B. FINISH PAINTS: Finish paints, represented by the symbol below for the associated generic group, shall be the product, known by the tradename, of one of the listed manufacturers (or equal):

Symbol	Generic Group	Manufacturer/Trade Name
F1	Latex Flat Wall Paint	Pittsburgh Speedhide Latex Flat Wall SW Promar Latex Flat Wall B30 Series Sinclair Sinwall Vinyl Latex
F2	Semi-Gloss Alkyd Enamel	Pittsburgh Speedhide Semi-Gloss Enamel SW Promar Alkyd Semi-Gross Enamel B34 Series Sinclair Sinco Satin Enamel
F3	Exterior Latex Finish	Pittsburgh Speedhide Semi-Gloss Enamel SW Promar Exterior Latex B36 Series Sinclair Plast-O-Life
F4	Gloss Alkyd Enamel	Pittsburgh Speedhide Exterior Wood Finish SW Promar Gloss Alkyd Enamel Sinclair Avalon Gloss

2.5 SCHEDULE OF PRIMERS AND FINISHES

A. PRIMERS AND FINISHES: Primers and finishes shall be applied, as indicated, for exterior and interior WORK in compliance with SSPWC Sub-section 310-5 and this Section.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. ATMOSPHERIC CONDITIONS: Painting shall comply with SSPWC Sub-section 310-1.1 except that painting shall not be applied under the following conditions: (1) when the surrounding air temperature or the temperature of the surface to be coated is below 40 degrees F; (2) to wet or damp surfaces or in rain, fog or mist; (3) when the temperature is less than 5 degrees F above the dewpoint temperatures; (4) when it is expected the air temperature will drop below 40 degrees F, or less than 5 degrees F above the dewpoint within 8 hours after application of coating; or (5) in extreme heat or in dust- or smoke-laden air. Dewpoint shall be determined by use of a sling

psychrometer in conjunction with U.S. Department of Commerce Weather Bureau psychrometric tables.

B. WORKMANSHIP: Except as otherwise indicated, paint materials shall be applied by brush or roller and in accordance with the manufacturer's instructions. Each coat shall be applied at proper consistency, and shall be free of brush or roller marks, sags, runs or other evidence of poor workmanship. The splattering of paint on glass, hardware, tile, trim, and other surfaces is not permitted. Masking tape shall be applied. Surfaces shall be sanded between enamel coats.

C. COVERAGE RATES: In no case shall paint application exceed the paint manufacturer's published coverage rate based upon unthinned material. In the event that paint has been extended beyond the recommended coverage, or the "hide" produced is inadequate, additional coats shall be applied. The manufacturer's recommended amount of thinner shall not be exceeded. Finish paint material shall be applied directly from manufacturer's container.

D. PROTECTION: Floors, fixtures, equipment, and similar surfaces shall be protected with impervious protective covers and drop cloths.

E. REMOVAL OF FINISH HARDWARE: Finish hardware shall be removed prior to painting and re-installed in compliance with Section 06200.

F. CONTRASTING COLORS: Where painting is to be executed in contrasting colors, edges shall be cut to meet true lines. Holidays and restrikes in painted surfaces shall be sufficient cause for recoating the entire surface involved.

G. BARRICADES: Barricades and wet paint signs shall be maintained for duration of painting.

H. SCAFFOLDS: Scaffolds, staging, and planking shall be used wherever required for proper painting.

3.2 SURFACE PREPARATION

A. WOODWORK: The preparation of woodwork surfaces for which painting is indicated shall comply with SSPWC Sub-section 310-4 and the following:

1. Painted Surfaces shall be sanded smooth and dusted clean. Nail holes, cracks, or other defects shall be carefully filled after prime coat using fill material which matches the color of the paint. Knots and sappy areas shall be covered with shellac or accepted knot sealer.

2. Fill WORK shall be knifed (thumb filling is not allowed). On painted and enameled WORK, exposed end grain shall be putty-glazed smooth and flush, and shall be allowed to dry before the next coat.

B. FERROUS AND GALVANIZED METAL: Ferrous metal surfaces shall be prepared in compliance with SSPWC Sub-sections 310-2 and 310-3. Surfaces shall be cleaned of rust, scale, grease, oil, and other deleterious matter by wire brushing, scraping, washing with solvent, sandblasting, and other means necessary to prepare surfaces

properly for painting. Shop painted ferrous metal surfaces that show rusting when initially installed shall be touched up with a rust inhibitor complying with the requirements of MIL-M-10578B for Phosphoric Acid Rust Inhibitor. Rust inhibitor shall be applied only after wire brushing to a sound surface, and the surface shall be prime coated. Galvanized metals shall be cleaned with suitable organic solvent. Empty containers and paint-soiled or oily rags shall be removed from the site at the end of each day's work.

C. MASONRY AND CONCRETE: Masonry and concrete shall be dry and free of dust, dirt, grease, oil, and other foreign matter such as loose or granular material. Holes, cracks, joints and other surface defects shall be repaired and filled out flush and smooth with appropriate products, except where a priming coat is recommended by the manufacturer of the paint. Glaze and loose particles shall be removed by wire brushing. No evidence of curing compounds, release agents and the like will be acceptable.

3.3 APPLICATION

A. Paint shall be applied in accordance with manufacturer's printed instructions.

B. Spray painting, where allowed, shall be conducted under controlled conditions, and the CONTRACTOR shall be responsible for damage to adjacent work or adjoining property resulting from spray painting.

C. Drying times shall not be less than those in manufacturer's printed instructions.

D. Surfaces found to contain runs, overspray, roughness, or other signs of improper application shall be recoated.

E. Exposed surfaces behind permanent cabinets, cases, counters, and similar WORK shall be painted prior to installation.

F. Woodwork shall be sanded smooth and knots and pitch streaks shall be painted with a thick coat of orange shellac or a resin sealer, except for stained wood. Nail holes and minor imperfections shall be filled between first and second coat; color of fill material shall match stain in the case of stained work.

G. Back surfaces of wood trim and finish that will be concealed after installation, including exposed grounds, and paneling shall be painted prior to installation; the primer indicated for exposed surfaces shall be applied. WORK to receive a natural finish shall be backpainted with one coat of spar varnish. Backpainting shall be omitted on factory finished casework and cabinets.

H. The number of coats indicated to be applied are minimums. Paint finishes shall be even, of uniform color, and shall be free from cloudy or mottled appearance in surfaces and evident thinness of coatings. Each coat shall be tinted a sufficiently different shade of finish color to permit identification, in accordance with accepted samples.

3.4 REQUIREMENTS OF PAINTING AND FINISHING WORK

A. EXTERIOR: Exposed exterior surfaces of the building shall be painted and finished in accordance with the indicated requirements. Exposed surfaces of metal, sheet metal, mechanical equipment, and other, as required, shall be painted with the indicated primers and finish of paint.

B. INTERIOR: Exposed interior surfaces of the buildingshall be painted and finished in accordance with the indicated requirements and as follows:

1. Exposed surfaces of gypsum wallboard, plaster, and doors and frames, shall be primed and painted as indicated.

2. Metal surfaces in partitions and ceilings such as registers, grilles, and similar items shall be painted to match finish of room or area except as otherwise indicated.

3. Painted doors opening into rooms or spaces with different finishes or colors shall be edge-finished as directed. Closet and storage room doors shall be finished on both sides to match the room into which they open.

3.5 INSPECTION AND CLEANING

A. GENERAL:

1. The WORK of this Section includes inspection of finishes after painting WORK has been completed. Splatterings of paint materials on adjoining WORK including plumbing fixtures, trim, tile, and finish metal surfaces is not allowed. Abraded, stained, or otherwise disfigured painting WORK shall be touched-up.

2. Upon completion of the work, staging, scaffolding and containers shall be removed from the site. Coating spots and oil or stain upon adjacent surfaces shall be removed and the job site cleaned. Damage to adjacent surfaces or facilities resulting from the WORK performed under this Section shall be cleaned, repaired or refinished. Final acceptance of the WORK by the OWNER will be withheld until the CONTRACTOR has satisfactorily complied with the foregoing requirements for final cleanup of the project site.

****END OF SECTION****

SECTION 11000

GENERAL REQUIREMENTS FOR EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. SCOPE: This section specifies general requirements which are applicable to all mechanical equipment. The Contractor is responsible for ensuring that all mechanical equipment meets the requirements of this section in addition to the specific requirements of each individual equipment specification section.

B. EQUIPMENT LISTS: Equipment lists, presented in these specifications and as specified on the drawings, are included for the convenience of the Construction Manager and Contractor and are not complete listings of all equipment, devices and material required to be provided under this contract. The Contractor shall prepare its own material and equipment takeoff lists as necessary to meet the requirements of this project manual.

Equipment No.	Location	Description
60MD-1648	Area 60 Odor Control Facility	Fan inlet damper at Train 1
60MD-1698	Area 60 Odor Control Facility	Fan inlet damper at Train 2
60MD-1748	Area 60 Odor Control Facility	Fan inlet damper at Train 3
76-EF-11	Area 76, Second Floor	Window-mounted propeller exhaust fan
86-OCF-3	Area 76 Roof	In-line foul air fan for truck loading lanes

1.2 QUALITY ASSURANCE

A. ARRANGEMENT: The arrangement of equipment shown on the drawings is based upon information available to the Owner at the time of design and is not intended to show exact dimensions conforming to a specific manufacturer. The drawings are, in part, diagrammatic, and some features of the illustrated equipment installation may require revision to meet actual submitted equipment installation requirements; these may vary significantly from manufacturer to manufacturer. The contractor shall, in determining the cost of installation, include these differences as part of its bid proposal. Structural supports, foundations, connected piping, valves, and electrical conduit specified may have to be altered to accommodate the equipment actually provided. No additional payment shall be made for such revisions and alterations.

B. REFERENCES:

1. This section contains references to the documents listed below. They are a part of this section as specified and modified. Where a referenced document

cites other standards, such standards are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of commencement of the Work. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, has been discontinued or has been replaced.

Reference	Title
ABMA Std 9	Load Ratings and Fatigue Life for Ball Bearings
ABMA Std 11	Load Ratings and Fatigue Life for Roller Bearings
ANSI B1.1	Unified Inch Screw Threads (UN and UNR Thread Form)
ANSI B1.20.1	Pipe Threads, General Purpose (Inch)
ANSI B16.1	Gray Iron Pipe Flanges and Flanged Fittings, (Classes 25, 125, and 250)
ANSI B18.2.1	Square and Hex Bolts and Screws (Inch Series)
ANSI B18.2.2	Square and Hex Nuts (Inch Series)
ANSI S2.19	Mechanical Vibration – Balance Quality Requirements of Rigid Rotors, Part 1: Determination of Permissible Unbalance, Including Marine Applications

C. UNIT RESPONSIBILITY:

1. The Contractor shall cause equipment assemblies made up of two or more components to be provided as a working unit by the unit responsibility manufacturer, where specified. The unit responsibility manufacturer shall coordinate selection, coordinate design, and shall provide all mechanical equipment assembly components such that all equipment components furnished under the specification for the equipment assembly, and all equipment components specified elsewhere but referenced in the equipment assembly specification, is compatible and operates reliably and properly to achieve the specified performance requirements. Unless otherwise specified, the unit responsibility manufacturer shall be the manufacturer of the driven component equipment in the equipment assembly. The unit responsibility manufacturer is designated in the individual equipment specifications found elsewhere in this project manual. Agents, representatives or other entities that are not a direct division of the driven equipment manufacturing corporation shall not be accepted as a substitute for the driven equipment

manufacturer in meeting this requirement. The requirement for unit responsibility shall in no way relieve the Contractor of its responsibility to the Owner for performance of all systems.

2. The Contractor shall ensure that all equipment assemblies provided for the project are products for which unit responsibility has been accepted by the unit responsibility manufacturer(s), where specified. Unit responsibility for related components in a mechanical equipment assembly does not require or obligate the unit responsibility manufacturer to warranty the workmanship or quality of component products not manufactured by them. Where an individual specification requires the Contractor to furnish a certificate from a unit responsibility manufacturer, such certificate shall conform to the content, form and style of Form 11000-C specified in Section 01999, shall be signed by an officer of the unit responsibility manufacturer's corporation and shall be notarized. No other submittal material will be processed until a Certificate of Unit Responsibility has been received and has been found to be satisfactory. Failure to provide acceptable proof that the unit responsibility requirement has been satisfied will result in withholding approval of progress payments for the subject equipment even though the equipment may have been installed in the work.

D. BALANCE:

1. Unless specified otherwise, for all machines 10 HP and greater, all rotating elements in motors, pumps, blowers and centrifugal compressors shall be fully assembled, including coupling hubs, before being statically and dynamically balanced. All rotating elements shall be balanced to the following criteria:

$$U_{per} = 6.015\frac{GW}{N}$$

Where:

U_{per} = permissible imbalance, ounce-inches, maximum

G = Balance quality grade, millimeters per second

W = Weight of the balanced assembly, pounds mass

N = Maximum operational speed, rpm

2. Where specified, balancing reports, demonstrating compliance with this requirement, shall be submitted as product data. Equipment balance quality grade shall be G 2.5 (G = 2.5 mm/sec) or better in accordance with ANSI S2.19.

PART 2 - PRODUCTS

2.1 FLANGES AND PIPE THREADS

A. Flanges on equipment and appurtenances provided under this section shall conform in dimensions and drilling to ANSI B16.1, Class 125. Pipe threads shall conform in dimension and limits of size to ANSI B1.1, coarse thread series, Class 2 fit.

B. Threaded flanges shall have a standard taper pipe thread conforming to ANSI B1.20.1. Unless otherwise specified, flanges shall be flat faced.

C. Flange assembly bolts shall be heavy pattern, hexagonal head, carbon steel machine bolts with heavy pattern, hot pressed, hexagonal nuts conforming to ANSI B18.2.1 and B18.2.2. Threads shall be Unified Screw Threads, Standard Coarse Thread Series, Class 2A and 2B, ANSI B1.1.

2.2 BEARINGS

A. Unless otherwise specified, equipment bearings shall be oil or grease lubricated, ball or roller type, designed to withstand the stresses of the service specified. Each bearing shall be rated in accordance with the latest revisions of ABMA Methods of Evaluating Load Ratings of Ball and Roller Bearings. Unless otherwise specified, equipment bearings shall have a minimum L 10 rating life of 50,000 hours. The rating life shall be determined using the maximum equipment operating speed.

B. Grease lubricated bearings, except those specified to be factory sealed and lubricated, shall be fitted with easily accessible grease supply, flush, drain and relief fittings. Extension tubes shall be used when necessary. Grease supply fittings shall be standard hydraulic alemite type.

C. Oil lubricated bearings shall be equipped with either a pressure lubricating system or a separate oil reservoir type system. Each oil lubrication system shall be of sufficient size to safely absorb the heat energy normally generated in the bearing under a maximum ambient temperature of 60 degrees C and shall be equipped with a filler pipe and an external level indicator gage.

D. All bearings accessible to touch, and located within 7 feet measured vertically from floor or working level or within 15 inches measured horizontally from stairways, ramps, fixed ladders or other access structures, shall either incorporate bearing housings with sufficient cooling to maintain surface temperature at 65 degrees C or less for continuous operation at bearing rated load and a 50 degrees C ambient temperature or shall be provided with appropriate shielding shall be provided that will prevent inadvertent human contact.

2.3 V BELT ASSEMBLIES

A. Unless otherwise specified, V belt assemblies shall be Dodge Dyna V belts with matching Dyna V sheaves and Dodge Taper lock bushings, Wood's Ultra V belts with matching Ultra V sheaves and Wood's Sure Grip bushings, or equal.

B. Sheaves and bushings shall be statically balanced. Additionally, sheaves and bushings which operate at a peripheral speed of more than 5500 feet per minute shall be dynamically balanced. Sheaves shall be separately mounted on their bushings by means of three pull up grub or cap tightening screws. Bushings shall be key seated to the drive shaft.

C. Belts shall be selected for not less than 150 percent of rated driver horsepower and, where two sheaves sizes are specified, shall be capable of operating with either set of sheaves. Belts shall be of the antistatic type where explosion proof equipment is specified.

2.4 PUMP SHAFT SEALS (NOT USED)

2.5 COUPLINGS

A. Unless otherwise specified in the particular equipment sections, equipment with a driver greater than 1/2 HP, and where the input shaft of a driven unit is directly connected to the output shaft of the driver, shall have its two shafts connected by a flexible coupling which can accommodate angular misalignment, parallel misalignment and end float, and which cushions shock loads and dampens torsional vibrations. The flexible member shall consist of a tire with synthetic tension members bonded together in rubber. The flexible member shall be attached to flanges by means of clamping rings and cap screws, and the flanges shall be attached to the stub shaft by means of taper lock bushings which shall give the equivalent of a shrunk on fit. There shall be no metal to-metal contact between the driver and the driven unit. Each coupling shall be sized and provided as recommended by the coupling manufacturer for the specific application, considering horsepower, speed of rotation, and type of service.

B. Where torque or horsepower capacities of couplings of the foregoing type is exceeded, Thomas Rex, Falk Steel Flex, or equal, couplings will be acceptable provided they are sized in accordance with the equipment manufacturer's recommendations and sizing data are submitted. They shall be installed in conformance to the coupling manufacturer's instructions.

2.6 GUARDS

A. Exposed moving parts shall be provided with guards which meet all applicable OSHA requirements. Guards shall be fabricated of 14 gage steel, 1/2 13 15 expanded metal screen to provide visual inspection of moving parts without removal of the guard. Guards shall be galvanized after fabrication and shall be designed to be readily removable to facilitate maintenance of moving parts. Reinforced holes shall be provided. Lube fittings shall be extended through guards.

2.7 CAUTION SIGNS

A. Equipment with guarded moving parts which operates automatically or by remote control shall be identified by signs reading "CAUTION AUTOMATIC EQUIPMENT MAY START AT ANY TIME". Signs shall be constructed of fiberglass material, minimum 1/8 inch thick, rigid, suitable for post mounting.

Letters shall be white on a red background. The sign size and pattern shall be as shown on the drawings. Signs shall be installed near guarded moving parts.

2.8 GAGE TAPS, TEST PLUGS AND GAGES

A. Gage taps shall be provided on the suction and discharge sides of pumps, blowers and compressors. Pressure and vacuum gages shall be provided where specified. Gage taps, test plugs, and gages shall be as specified in Divisions 15 and 17, respectively.

2.9 NAMEPLATES

A. Nameplates shall be provided on each item of equipment and shall contain the specified equipment name or abbreviation and equipment number. Equipment nameplates shall be engraved or stamped stainless steel and fastened to the equipment in an accessible and visible location with stainless steel screws or drive pins.

2.10 LUBRICANTS (NOT USED)

2.11 ANCHOR BOLTS

A. Anchor bolts shall be designed for lateral forces for both pullout and shear in accordance with the provisions of Section 05501. Unless otherwise stated in the individual equipment specifications, anchor bolt materials shall conform to the provisions of Section 05500.

2.12 SPARE PARTS

A. Spare parts, wherever required by detailed specification sections, shall be stored in accordance with the provisions of this paragraph. Spare parts shall be tagged by project equipment number and identified by part number, equipment manufacturer, and subassembly component (if appropriate). Spare parts subject to deterioration, such as fan V-belts and electrical components, shall be properly protected by lubricants or desiccants and encapsulated in hermetically sealed plastic wrapping. Spare parts with individual weights less than 50 pounds and dimensions less than 2 feet wide, or 18 inches high, or 3 feet in length shall be stored in a wooden box with a hinged wooden cover and locking hasp. Hinges shall be strap type. The box shall be painted and identified with stenciled lettering stating the name of the equipment, equipment numbers, and the words "spare parts." A neatly typed inventory of spare parts shall be taped to the underside of the cover.

PART 3 - EXECUTION

3.1 GENERAL

A. Installation of equipment accessories included in this section shall be as recommended by the equipment manufacturer unless otherwise specified in the individual equipment specification section.

****END OF SECTION****

SECTION 11021

VIBRATION ISOLATION SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. SCOPE: This section specifies vibration isolation system requirements for mechanical equipment. Additional vibration isolation system requirements are provided in individual mechanical equipment specification sections.

B. MOUNTING REQUIREMENTS: Unless the equipment incorporates unit construction using an integral rigid frame or is specified otherwise, each item of mechanical equipment, along with its drive unit, shall be mounted on a rigid steel or steel and concrete base. Cast iron bases are not permitted when equipment is furnished with a vibration isolation system. Where specified, the equipment, including the base, shall be mounted on or suspended from vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to the supporting structure. Vibration isolation available internally in the equipment will not be considered equivalent and shall not be provided when vibration isolation as specified herein is required. Normally provided internal vibration isolators shall be replaced with rigid supports in such cases. Vibration isolators shall be selected in accordance with unit weight distribution to produce reasonably uniform deflections at each support. Unless otherwise specified, bases, isolators, and deflections shall be as specified in Table 27, ASHRAE CH-52.

C. DESIGN REQUIREMENTS: The Contractor shall cause all vibration isolation systems, including the isolators, seismic restraints and flexible connectors between the isolated equipment and associated piping, ducting and/or electrical work, to be designed by a professional engineer qualified in this type of work. This provision, however, shall not be construed as relieving the Contractor of its overall responsibility for the work. The Contractor shall submit a copy of the engineer's calculations for design of the vibration isolation systems, stamped with the engineer's seal. Flexible connectors shall be provided by the manufacturer of the mechanical equipment item in accordance with the recommendations of the vibration isolation system engineer.

D. SEISMIC RESTRAINTS:

1. GENERAL: Restraint devices shall resist the forces specified and shall be designed in accordance with the UBC for seismic zone 4. Design lateral forces shall be distributed in proportion to the mass distribution of the equipment.

2. FLOOR MOUNTED EQUIPMENT:

a. Equipment and appurtenances resiliently floor mounted on spring or pad type vibration isolators, except for curb mounted equipment, shall be provided with seismic snubbers. Equipment shall receive four all-directional restraint/snubbers. The capacity of snubbers, at

3/8 inch deflection, shall be 3 to 4 times the load at the adjacent equipment mount.

b. Restraint assembly for floor mounted equipment shall consist of welded steel interlocking assemblies welded or bolted securely to the equipment or the equipment bases and the supporting structure. Restraint assembly surfaces which engage under seismic motion shall be lined with a resilient elastomer, 3/4 inches thick. Restraints shall be field adjustable and be positioned for 1/4-inch clearance both vertically and horizontally or clearance as required to prevent interference during normal operation, stopping, or starting. Restraint assembly shall have a minimum rating of 1 g based on independent test data.

3. CURB MOUNTED EQUIPMENT: Seismic restraints for equipment mounted on vibration isolation curbs shall consist of slack stainless steel cables designed to provide 1g restraint in the four primary horizontal directions based on independent test data.

4. SUSPENDED EQUIPMENT: Restraint assembly for suspended equipment, piping, or ductwork shall consist of plow steel cable attached to steel thimbles with neoprene sleeve all specifically designed for cable service and securely fastened to the equipment, or the equipment base and the building structure. Cables shall be sized for a force of 1g with a minimum safety factor of 2 based upon independent test data. Cables shall be installed to prevent excessive seismic motion and so arranged that they do not engage during normal operation, starting, or stopping.

5. TESTING: Seismic restraint tests shall be conducted in an independent laboratory or under the supervision of an independent registered engineer. The snubber assemblies shall be bolted to the test machine as the snubber is normally installed. Test reports shall certify that neither the elastomeric nor the snubber body sustained any obvious deformation after release of load.

1.2 REFERENCES:

A. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of commencement of the Work. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ASHRAE CH 52	Handbook, HVAC Systems and Applications, Sound and Vibration Control
UBC	Uniform Building Code

1.3 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Construction Manager shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

2. Scale drawing of Type D mounting hanger showing the 30 degree arc capability.

3. Manufacturer and manufacturer's type designation.

4. Manufacturer's catalog data.

PART 2 - PRODUCTS

2.1 ACCEPTABLE PRODUCTS

A. Vibration isolation mountings and seismic restraints shall be as manufactured by Mason Industries, Inc., Korfund Dynamics Corporation, Consolidated Kinetics Corporation, or equal. Flexible connectors shall be provided by the manufacturer of the mechanical equipment item in accordance with the recommendations of the vibration isolation system engineer.

2.2 BASES

A. CURB MOUNTED BASES: Curb mounted equipment where vibration isolation is

required, principally roof top heating, ventilating and air conditioning equipment, shall be mounted on vibration isolation bases that fit over the curb and under the isolated equipment. The extruded aluminum top and bottom members shall contain cadmium-plated springs having a 1-inch minimum deflection with 50 percent additional travel to solid. Spring diameters shall be no less than 0.8 times the spring height at rated load. Wind resistance shall be provided by means of resilient snubbers in the corners with a minimum clearance of 1/4 inch so as not to interfere with spring action except in high winds. The weather seal shall consist of continuous closed cell sponge materials both above and below the base and a waterproof flexible neoprene connection duct joining the outside perimeter of the aluminum members. Foam or other contact seals are unacceptable at the spring cavity closure. Caulking shall be kept to a minimum.

B. TYPE I BASES: Type I bases shall be structural steel bases. The bases shall be rectangular in shape for all equipment other than centrifugal refrigeration machines and pump bases, which may be "T" or "L" shaped. Pump bases for split case pumps shall include supports for suction and discharge base ells. All perimeter members shall be beams with a minimum depth equal to 1/10 of the longest dimension of the base. Beam depth need not exceed 14 inches provided that the deflection and misalignment is kept within acceptable limits as determined by the manufacturer. Height saving brackets shall be employed in all mounting locations to provide a base clearance of 1 inch.

C. TYPE II BASES: Type II bases shall be steel members used to cradle machines having legs or bases that do not require a complete supplementary base. All members shall be sufficiently rigid to prevent strains in the equipment. Height saving brackets shall be employed in all mounting locations to provide a clearance of 1 inch below the base.

D. TYPE III BASES: Type III bases shall be rectangular foundations consisting of concrete filled structural steel beam or channel forms. Bases for split case pumps shall be of sufficient size to provide support for suction and discharge base ells. The base depth need not exceed 12 inches unless specifically recommended by the base manufacturer or required for mass or rigidity. In general, base depth shall be a minimum of 1/12 of the longest dimension of the base but not less than 6 inches. Forms shall include, as a minimum, concrete reinforcement consisting of 1/2-inch bars or angles welded in place on 6-inch centers each way in a layer 1 1/2 inches above the bottom or additional steel as required by structural conditions. Forms shall be provided with drilled steel members with sleeves welded below the holes to receive equipment anchor bolts where the anchor bolts fall in concrete locations. Height saving brackets shall be employed in all mounting locations to maintain a 1-inch clearance below the base.

E. TYPE IV BASES (NOT USED)

2.3 VIBRATION ISOLATION MOUNTINGS

A. TYPE A MOUNTINGS: Type A mountings shall be double deflection neoprene mountings having a minimum static deflection of 0.35 inches. All metal surfaces shall be neoprene covered to avoid corrosion and shall have friction pads both top and bottom so that they need not be bolted to the floor. Bolt holes and anchor bolts

shall be provided where required to resist lateral migration. Resilient washers and bushings shall be provided to prevent contact between the bolts and the equipment support bases. On equipment such as small vent sets, steel rails shall be used above the mountings to compensate for the overhang.

B. TYPE B MOUNTINGS: Type B mountings shall be free-standing spring type isolators laterally stable without any housing and complete with 1/4-inch neoprene acoustical friction pads between the base and the support. Mountings shall have leveling bolts that must be rigidly bolted to the equipment. Spring diameters shall be no less than 0.8 times the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50 percent of the rated deflection. Mountings shall be hot-dip galvanized steel.

C. TYPE C MOUNTINGS: Type C mountings shall be Type B mountings with a housing having vertical limit stops to prevent spring extension when weight is removed. Type C mountings shall be provided for equipment with operating weight different from the installed weight, such as chillers, boilers, etc., and equipment exposed to the wind, such as cooling towers. The housing shall serve as blocking during erection and shall be located between the supporting steel and roof or the grillage and dunnage as shown on the drawings. The installed and operating heights shall be the same. a minimum clearance of 1/2 inch shall be maintained around restraining bolts and between the housing and the spring to prevent interference with the spring action. Limit stops shall be out of contact during normal operations. Mountings shall be hot-dip galvanized steel.

D. TYPE D MOUNTINGS: Type D mountings shall be steel hangers which contain a steel spring and a 0.3-inch deflection neoprene element in series. The neoprene element shall be molded with a rod isolation bushing which passes through the hanger box. Spring diameters and hanger box lower hole sizes shall be of sufficient size to permit the hanger rod to swing through a 30-degree arc before contacting the hole. Springs shall have a minimum additional travel to solid equal to 50 percent of the rated deflection.

E. TYPE E MOUNTINGS: Type E mountings shall be double deflection, cork and rubber sandwich pads consisting of a high-density cork layer permanently bonded to top and bottom layers of corrugated oil-resistant synthetic rubber. The corrugated design shall allow deflection to increase with load and shall form a nonskid surface to resist lateral migration of the equipment. Bolt holes and anchor bolts shall be provided where required to resist migration. Resilient washers and bushings shall be provided to prevent contact between the bolts and the equipment support bases.

2.4 PRODUCT DATA

A. The following information shall be provided as product data in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook:

1. Seismic system design calculations as specified in paragraph 11021-1.01 C.

2. Seismic restraint test reports specified in paragraph 11021-1.01 D.5.

3. Installation report specified in paragraph 11021-3.02.

4. Static and dynamic deflections, weights, isolator locations, and flexible connector designs.

5. Spring deflections and diameters, compressed spring heights and solid spring heights.

6. Curb mounted base seal and wind resistance details.

7. Seismic restraint load deflection curves up to 1/2-inch deflection along the three principal orthogonal axes.

PART 3 - EXECUTION

3.1 GENERAL

A. Seismic restraints shall be securely anchored or fastened to the equipment and supporting structure in accordance with approved submittal data. Operating clearances shall be adjusted so that restraints do not interfere during normal operation of the equipment.

3.2 FIELD INSPECTION

A. The vibration isolation manufacturer, or its qualified representative, shall provide such supervision as is necessary to assure correct installation and adjustment of the isolators and seismic restraints. Upon completion of the installation and after the system is put into operation, the manufacturer, or its representative, shall make a final inspection and submit its report in writing certifying the correctness of installation and compliance with approved submittal data.

****END OF SECTION****

SECTION 11069

ADJUSTABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.1 DESCRIPTION

A. SCOPE:

1. This section specifies 480 Vac rated adjustable frequency drive motor controller systems using insulated gate bipolar transistors (IGBT) for pulse width modulation technology (PWM) for motors larger than 5 HP.

2. The AFDs specified in this section shall be the product of a single vendor and mounted in the specified cabinet enclosure. AFDs installed in existing MCCs shall be of the same manufacturer as the MCC.

3. The terms AFD (adjustable frequency drive), ASD (adjustable speed drive), VFD (variable frequency drive), and VSD (variable speed drive) are interchangeable for the purposes of this specification.

4. Refer to the drawings for control and monitoring requirements including special interlocking requirements.

B. SYSTEM REQUIREMENTS:

1. The AFD system shall convert 460 volt, 60-Hertz nominal input to a suitable voltage and frequency to cause a premium efficient, inverter duty, squirrel-cage induction motor to run at a speed proportional to an external input analog 4 to 20 ma dc or digital input command as specified for the required AFD speed range.

2. The AFD system shall include rectifier units, inverter units, control circuitry, protective equipment, input line reactors and output load reactors and other filters and accessories as necessary to provide the specified functions to meet voltage and current harmonics at the specified point of common connection and to mitigate the motor reflected voltage wave. Unless otherwise specified, the point of common connection for AFDs shall be the 480 distribution bus (motor control center, distribution panel, etc.) immediately upstream of the AFD.

3. The AFD system torque requirement shall match the fan torque requirement. Verify the fan type and select variable torque (VT) or constant torque (CT) as specified in the AFD Schedule. Select 6-Pulse units for small fan motors and 18-Pulse units for large fan motors.

C. AFD SCHEDULE:

Equipment Name & Tag Number	Drive Number	Drive Horse Power	Drive Speed Range	Driven Equipment Specification	AFD Type	AFD Enclosure & Mounting	Distance (ft) from AFD to Driven Equipment Motor
Odor Control Fan No. 1 60-OCF-1	60-OCF-01-VFD	125	900-1800	15859	VT 18P	NEMA-1 Gasketed, Floor Mount	200
Odor Control Fan No. 2 60-OCF-2	60-OCF-02-VFD	125	900-1800	15859	VT 18P	NEMA-1 Gasketed, Floor Mount	200
Odor Control Fan No. 3 60-OCF-3	60-OCF-03-VFD	125	900-1800	15859	VT 18P	NEMA-1 Gasketed, Floor Mount	200
Odor Control Fan No. 1 76-OCF-1	76-OCF-01-VFD	1 ½	900-1800	15859	VT 6P	Open Type, MCC Mount	200
Odor Control Fan No. 2 76-OCF-2	76-OCF-02-VFD	10	900-1800	15859	VT 6P	NEMA-1 Gasketed, Wall Mount	200
Odor Control Fan No. 3 76-OCF-3	76-OCF-03-VFD	5	900-1800	15859	VT 6P	NEMA-1 Gasketed, Wall Mount	200
Odor Control Fan 86-OCF-3	86-OCF-03-VFD	20	900-1800	15856	VT 6P	NEMA-1 Gasketed, Wall Mount	200
Odor Control Fan 94-OCF-1	94-OCF-01-VFD	40	900-1800	15859	VT 6P	Open Type, MCC Mount	200
Odor Control Fan 94-OCF-2	94-OCF-02-VFD	40	900-1800	15859	VT 6P	Open Type, MCC Mount	200

D. ENVIRONMENTAL CONDITIONS: Ambient temperature ranges from 40 degrees through 122 degrees F. Relative humidity ranges from 20 to 95% (non-condensing).

E. SEISMIC: Freestanding AFDs shall be braced per Section 01900.

1.2 QUALITY ASSURANCE

A. REFERENCES:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of commencement of the Work. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
IEEE 519	IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power System
NEMA 250	Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA ICS 2	Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated 600 Volts
NEMA ICS 6	Industrial Control and Systems: Enclosures
NEMA ICS 7	Industrial Control and Systems: Adjustable-Speed Drives
NEMA ICS 7.1	Safety Standards for Construction and Guide for Selection, Installation, and Operation of Adjustable-Speed Drive Systems
NFPA 70	National Electrical Code (NEC)
UL Standard 508	Industrial Control Equipment

B. INDUSTRY STANDARDS: The AFD shall be UL 508 listed and shall conform to the requirements specified in NEMA ICS 2, 6, 7 and 7.1.

C. UNIT RESPONSIBILITY: The Contractor shall assign unit responsibility for the adjustable frequency drives in this section as specified in paragraph 11000-1.02 C. The Contractor shall submit letters of certification with the shop drawings from the AFD manufacturer, the motor manufacturer, and the driven equipment manufacturer stating that they have reviewed each application and that the combination will satisfy

the application duties required, for the actual motor sizes required, regardless of deviations from the scheduled "nominal horsepower."

1.3 PRODUCT HANDLING

A. AFD units shall be shipped in air-cushion vans to ensure against shipping damage and packed in suitable protective containers. The units shall be inspected upon receipt for damage.

1.4 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements.

a. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation.

b. The Construction Manager shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications.

c. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

2. A copy of the contract document control diagrams and process and instrumentation diagrams relating to the submitted equipment, with addendum updates that apply to the equipment in this section, marked to show specific changes necessary for the equipment proposed in the submittal.

a. If no changes are required, the drawing or drawings shall be marked "no changes required". Failure to include copies of the relevant drawings with the submittal shall be cause for rejection of the entire submittal with no further review.

3. Certificate of Unit Responsibility attesting that the Contractor has assigned, and that the manufacturer accepts, unit responsibility in accordance with the requirements of this Section and paragraph 11000 1.02 C. No other

submittal material will be reviewed until the certificate has been received and found to be in conformance with these requirements.

4. Catalog and technical data including outline dimensions, shipping section dimensions, weight, and foundation requirements for all assemblies.

5. Schematic diagrams and wiring connection diagram showing functions and identification of terminals.

6. Voltage and current Total Harmonic Distortion (THD) calculations with line reactors or filter design to mitigate harmonics to meet IEEE-519, if applicable.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The Engineer believes the following candidate manufacturers are capable of producing equipment and/or products that will satisfy the requirements of this Section. This statement, however, shall not be construed as an endorsement of a particular manufacturer's products, nor shall it be construed that named manufacturers' standard equipment or products will comply with the requirements of this Section. AFDs shall be installed in the custom enclosures as specified and Candidate manufacturers include:

1. ABB ACS-600

2. Toshiba Series:

   a. W7 18-Pulse for centrifugal fan motors

   b. G7 18-Pulse for slow speed and high-torque motors

3. Cutler-Hammer SV9000

4. General Electric AF-300

5. Siemens Model 6SE32

6. Square D Altivar Series

7. Allen Bradley

8. Or equal

2.2 ENCLOSURES

A. Provide AFD in NEMA enclosures with fan cooling and conformal coating protection on circuit boards for corrosive atmosphere protection.

B. GENERAL:

1. Provide enclosures with AFDs and custom control as required for the project and as indicated on the drawings. Each drive shall be designed for stand-alone operation and multiple drives shall not utilize shared components. Review the project site location, elevation, temperature, humidity, plant atmosphere, and load current-torque requirements to size the AFD and its associated enclosure with requirements specified herein and the control and monitoring devices and interlocks as indicated.

2. Enclosures shall be designed for indoor service. Each AFD system shall be mounted in a NEMA 250 internally force ventilated enclosure with UL approved Class 1 filters on ventilation openings. Enclosures shall be fabricated from 12-gage minimum thickness sheet steel with an interior frame or formed to provide a rigid structure.

3. Provide enclosure size to allow entry of power source and motor load cables as indicated on the drawings. Submit drawing of the source and load power cable location within the enclosure and indicated barriers from control and instrument wiring.

4. Door width shall not exceed 30 inches and shall be hung on removable-pin hinges, with three-point latch hardware, and handle latch for 3/8-inch-shackle padlock.

C. FINISH AND COATINGS: AFD systems enclosures shall be finished with corrosion protection coatings inside and outside for hydrogen sulfide atmospheres. The electrical and electronic assemblies shall have conformal coatings.

2.3 AFD ASSEMBLIES

A. GENERAL: AFDs shall include the following assemblies:

1. Power disconnect using a thermal magnetic circuit breaker or fused disconnect sized for the specific application by the manufacturer.

2. A load reactor for dV/dT mitigation or motor terminator units for addressing dv/dt effects at the motor

3. Rectifier, direct current bus filter, and inverter.

4. Control circuitry interface with Operator Interface Unit

5. Output protection including phase overload

B. AFD FEATURES: Provided with the following features:

1. Fused control circuit transformer and microprocessor for system logic sequencing functions. Provide fuses with blown fuse indicator lamps.

2. Accept 4 to 20 mAdc speed reference signal.

3. A 4 to 20 mAdc output signal proportional to inverter output frequency for the speed range specified.

4. Adjustable minimum/maximum frequency limits:

   a. Minimum frequency shall be adjustable from 6 to 40 Hertz.

   b. Maximum frequency shall be adjustable from 48 to 90 Hertz.

5. Adjustable and independent timed linear acceleration and deceleration functions, adjustable from 6 to 20 seconds.

6. Current limiting.

7. Automatic restart.

8. CONTROL WIRING:

   a. 600 volt stranded copper

   b. 90 degrees C color-coded insulation

   c. No. 16 AWG

9. WIRING IDENTIFICATION AND TERMINATION: Crimp type wire lugs with sleeve type markers at each termination point and numbered terminal blocks for external connections.

10. Electrically isolated discrete output contacts for ready, running, remote mode status and trouble alarm.

11. Conformal coated terminal blocks for control and signal wires entering and leaving the controller.

12. CONTROL POWER: Provide a 120 Vac, triple fused, control power transformer for cooling fans and external control circuits when required. Control circuits shall be isolated from power circuits by distance and by insulated barriers.

13. Provide 120 Vac or 24 Vdc as required for Operator Interface Unit.

C. FUNCTIONAL REQUIREMENTS:

1. SUPPLY POWER: Operate continuously with supply power of 480 volts plus or minus 10 percent, 60 Hertz plus or minus 3 percent and remain on line and operate without damage to the AFD or connected load during a supply power under-voltage variation to the drive up to 85% of its nominal value for 30 milliseconds at full load.

2. ENVIRONMENTAL CONDITIONS:

   a. Ambient temperature: 0 to + 40 degrees C / 104 degrees F

   b. Atmosphere: Hydrogen Sulfide

3. LOAD: Capable of driving the specified maximum motor load continuously and under the following conditions:

   a. Deliver 110 percent of the specified load for up to 60 seconds in variable torque applications.

   b. Deliver 150 percent of the specified load for up to 60 seconds in constant torque applications.

4. EFFICIENCY: Not less than 95 percent at 60 Hertz output driving the specified maximum load at rated torque and speed at 40 degrees C ambient based on measured input power versus output power with all specified components in the system.

5. FREQUENCY AND VOLTAGE REGULATION: Output frequency regulated to within 0.6 Hertz of the signal/output frequency relationship. Output voltage regulated to within 1.0 percent to produce minimum motor heating at any operating frequency within the specified range.

6. FREQUENCY RANGE: AFD shall be capable of continuous operation with the specified load at any frequency between 6 and 60 Hertz unless noted otherwise.

7. SPACE AND AFD ACCESS:

   a. AFD Enclosure size shall not exceed the size allotments specified on the drawings nor shall any portion of the AFD system exceed a height of 90 inches. Open type AFDs shall fit in the existing MCC buckets specified on the drawings.

   b. Front accessible only and shall not require rear access.

   c. Mount against the wall without any clearance for ventilation or other purposes.

   d. Submit AFD in the enclosure drawing with the detail of front door and the internal arrangement, including the feeder and motor cables, and the control cables, and the instrument cable location and terminations.

8. AMBIENT NOISE: Free field noise generated shall not exceed 85 dBA at 3 feet out from any point on the AFD enclosure under any normal operating condition.

9. MOTOR COORDINATION:

a. AFDs shall be configured as required to maintain output voltage peaks at the connected motor windings from reaching levels damaging to the motor insulation. Provide protection integral to the AFD or as protective hardware to be installed at the motors.

b. Where motor terminator units are provided, they shall be rated for the environment in which they are located. Motor terminator units shall be:

(1) Allen Bradley 1204 Motor Terminator for AFD with the maximum carrier frequency of 6 kilohertz,

(2) Cutler Hammer Reflected Wave Trap (RWT) with the maximum carrier frequency of 12 kilohertz,

(3) Or Equal product

D. PROTECTION AND ANNUNCIATION:

1. OVERCURRENT PROTECTION: Electronic current limit at 150 percent of motor nameplate current and provide motor running overcurrent protection in compliance with NFPA 70.

2. SHORT CIRCUIT PROTECTION: Protected against load faults: bolted faults, phase to phase or phase to ground shall not damage the unit. Fault protection based on a power source short circuit capacity of 65,000 amperes RMS symmetrical at the AFD power input terminals with impedance or current limiting device provided.

3. LINE VOLTAGE: Protected against high and low line voltage on one or more phases.

4. INTERNAL FAULTS: Internal fault monitoring system to detect malfunctions to protect from transient and sustained faults and to limit damage that may be caused.

5. AFD TROUBLE: Provide a 2-ampere output contact to status and alarm if there is a motor overtemperature condition.

6. FAULT ALARM: Indicates the cause of any shutdown visible on the AFD keypad/display without opening the AFD enclosure. As a minimum, the following faults shall be alarmed:

a. Motor over-temperature

b. Motor overcurrent

c. Incoming power line over/under/unbalanced-voltage

d. AFD over-temperature

e. AFD over-voltage

f. AFD control failure

7. AFD FAIL: Provide a 2-ampere output contact for common alarm if the AFD fails due to an alarm condition as outlined in paragraph 11069-2.03.D.6.

8. SAFETY FEATURES: The AFD shall include:

a. Padlock main disconnect handle in the "OFF" position.

b. Mechanical interlock to prevent opening enclosure door with disconnect in the "ON" position while the unit door is open.

c. Auxiliary contact on main disconnect to isolate 120Vac control power when fed from external source.

d. Barriers and warning signs on terminals that are energized with the power disconnect "OFF".

e. Separation and insulated barriers between the power and control and instrument products.

f. External emergency stop input

9. REVERSE DIRECTION PROTECTION: Provide protection from inadvertent operation in reverse where reverse rotation can damage the driven equipment.

10. CRITICAL SPEED BYPASS: Provide capability to program speed bypass for minimum two critical speed points.

11. TRANSIENT VOLTAGE PROTECTION: Provide solid state transient voltage protection to meet or exceed ANSI C37.90.

2.4 CONTROL AND MONITORING DEVICES

A. Front door mounted on the AFD enclosure between 36 inches and 72 inches above the floor for each unit:

1. Digital Operator keypad/display.

2. Local-Off-Remote door mounted selector switch.

3. Manual speed control: Potentiometer function

4. All other control and monitoring functions as shown on the drawings.

B. Ethernet Module Cisco WS-C2960-24TC-L for Communications of other miscellaneous data to Plant Control System. Ethernet Modules for open type AFDs being installed inside MCC lineups could be located in adjacent spare MCC buckets if necessary due to space constraints, and wired to the appropriate AFD units. Ethernet Modules for standalone AFDs shall be located in the AFD enclosure.

C. OPERATOR INTERFACE UNIT:

1. Digital keypad/display for monitoring and controlling the drive and to input drive parameter settings with a backlit LCD or equally visible display with a minimum of 16 characters per line.

2. Digital keypad for numerical settings in English engineering units and a guide to parameter settings. Setup operations and adjustments stored in non-volatile EEPROM memory transferable to new and spare boards. Settings shall be protected from unauthorized tampering, revision, or adjustment by a personal lockout code.

3. The digital keypad to provide programming of the drive and include:

   a. Up and Down arrow keys: Increase or decrease output frequency or data values.

   b. Monitor key: Selection of control mode.

   c. Run and Stop keys: Starting and stopping in the manual mode.

   d. Fault clear / Enter keys: Reset fault conditions and enter change.

   e. Program key: Enter the program mode and adjust parameters.

   f. Remote / Local Location keys: Operation location and local speed control.

   g. Auto / Manual Mode keys: Program mode.

   h. Number keys: 0 through 9 keys to access specific parameters.

   i. Keypad digital illustrations: English and display the last 5 faults.

   j. Frequency / Motor Speed Indication: Calibrated in Hertz and RPM.

   k. Run Status Indication.

   l. Ready Status Indication.

   m. Fault Alarm Indication.

D. CONTROL AND MONITORING COMMUNICATION

1. Additional analog I/O as required for the project

2. Additional discrete I/O as required for the project

3. RS-485 serial ports

4. Ethernet Communication Card to communicate with Ethernet module specified in paragraph 2.4.B.

2.5 KEYPAD FUNCTIONS AND OPERATION

A. Adjustment of the following parameters through the OIU digital keypad:

1. Current limit and torque boost.

2. Maximum voltage level.

3. Minimum/Maximum speed, Volts/Hertz, Upper and Lower limit.

4. Adjustable acceleration rate and deceleration rate.

5. Electronic thermal overload setting.

6. Coast, controlled ramp or DC injection selectable modes of stopping.

7. PID setpoint and time-function selection.

8. Critical frequency avoidance: Three set points selectable from 0 to maximum frequency with set points adjustable from 0-30 Hertz.

2.6 SPARE PARTS

A. The following spare parts shall be supplied with each type or frame size AFD:

1. Three sets of all replaceable fuses.

2.7 PRODUCT DATA

A. The following information shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook:

1. Operation and maintenance information including:

a. Final reviewed submittal.

b. As-built drive configuration settings.

2. Installation certification Form 11000-A as specified in paragraph 11069 3.01.

3. Training certification Form 11000-B as specified in paragraph 11069-3.03.

PART 3 - EXECUTION

3.1 FIELD INSTALLATION

A. Each adjustable speed controller shall be installed and tested by the Contractor with the assistance of factory-trained fan manufacturer engineer/technician and AFD engineer/technician in accordance with the manufacturer's specifications and Section 11069, and witnessed by the Construction Manager.

B. Manufacturers' factory representatives shall provide field testing for devices including the setup of the Operator Interface Unit and the setup of the data communication devices, where used. Upon satisfactory completion of the testing, the Contractor shall submit two certified copies of the test report to the Construction Manager.

C. Component failure during testing will require repeating any test associated with the failure or modified components to demonstrate proper operation.

D. The installation shall be certified on Form 11000-A specified in Section 01999.

1. Adjust drive and perform "start-up" tests as recommended by manufacturer. Set parameters and carrier frequency for existing motors to avoid insulation damage.

2. Establish proper direction of rotation for the motor controlled by the drive. Verify that the AFD is precluded from operating in a direction that can damage the driven equipment. Change motor or AFD power lead connection and not the AFD direction, where rotation is incorrect.

3. Verify that the drive will operate properly both in the "manual speed control mode" and in the "remote or automatic mode" from a remote speed signal input.

4. Set the maximum "locked rotor" current drawn during start-up recommended by the manufacturer and approved by the Construction Manager.

5. Set the minimum and maximum speeds and the acceleration and deceleration "ramps" recommended by the Construction Manager.

6. Verify the motor high temperature switch contacts are wired into the AFD 120 Vac control circuit and will trip on high winding temperature. Test or simulated the alarm and trip feature at the motor for high temperature and for high vibration, where used.

7. Operate the drive at 100 percent speed for one hour and monitor output current. The output current shall remain below the full load current listed on the motor nameplate.

8. Check for excessive heating of the drive and motor. Report any discrepancies to the Construction Manager.

3.2 HARMONIC TESTING

A. The Testing Firm specified in Section 16030 shall perform a harmonics acceptant test with all AFD motor controllers operating to verify compliance with IEEE-519 of less than 5 percent voltage THD and 12 percent current THD at the point of connection to the MCC.

B. Submit the test performance to the Construction Manager per latest version NETA ATS Acceptance Testing Specifications. Refer to the electrical testing specification Section 16030.

3.3 TRAINING

A. Two hours of onsite AFD operation and maintenance training shall be provided for the Owner's Operation and Maintenance Staff.

B. Manufacturers' factory representative shall conduct the training, upon acceptance of a resume submitted by the trainer.

C. Training shall be certified on Form 11000-B specified in Section 01999.

****END OF SECTION****

SECTION 13230

FIBERGLASS REINFORCED PLASTIC (FRP) FABRICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies general requirements for fiberglass reinforced plastic (FRP) fabrications. Equipment-specific requirements are detailed in other sections of the contract documents pertaining to specific equipment. This section is intended to be used in conjunction with the other related equipment specification sections and design drawings. It is intended to specify materials, describe methods of work, and provide for documentation of quality and acceptance.

1.2 QUALITY ASSURANCE

A. Quality, as represented by raw materials used, manufacturing practices employed, and condition of the finished product, is of prime importance. Knowledge of new technology in the interest of improved quality and/or lower cost is welcomed. However, any change of raw materials, alteration of construction, or other deviations from the requirements of the Specification sections or design drawings must be submitted in detail and approved in writing by the Construction Manager.

1.3 REFERENCES AND RELATED SECTIONS

A. REFERENCES:

1. This section contains references to the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

2. Unless otherwise specified, references to the documents in this section shall mean the documents in effect at the time of the commencement of the Work. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
AISC and Research Council for Riveted and Bolted Structural Joints (RCRBSJ)	Specification for Structural Joints Using ASTM A325 or A490 Bolts

Reference	Title
American Institute of Steel Construction (AISC)	Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings
AMCA 500 D	Laboratory Methods of Testing Dampers for Rating
API 12P, American Petroleum Institute (API)	Specification for Fiber Reinforced Plastic Tanks
ASME/ANSI RTP-1	Reinforced Thermoset Plastic Corrosion Resistant Equipment
ASTM C582	Standard Specification for Contact Molded Reinforced Thermosetting Plastic (RTP) Laminates for Corrosion-Resistant Equipment
ASTM D883	Definitions of Terms Relating to Plastics
ASTM D2471	Gel Time and Peak Exothermic Temperature of Reacting Thermoset Resins
ASTM D2563	Recommended Practice for Classifying Visual Defects in Glass-Reinforced Plastic Laminate Parts
ASTM D2583	Test for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
ASTM D2584	Ignition Loss of Cured Reinforced Resins
ASTM D3299	Filament-Wound Glass Fiber Reinforced Polyester Chemical-Resistant Tanks
ASTM D3567	Determining Dimensions of Reinforced Thermosetting Resin Pipe and Fittings
ASTM D3982	Standard Specification for Contact Molded "Fiberglass" (Glass Fiber Reinforced Thermosetting Resin) Duct and Hood
ASTM D4097	Contact-Molded Glass Fiber Reinforced Thermoset Resin Chemical-Resistant Tanks
ASTM E84	Standard Method of Test for Surface Burning Characteristics of Building Materials
AWS D1.1, American Welding Society (AWS)	Structural Welding Code
National Bureau of Standards Voluntary Product Standard PS 15-69	Custom Contact-Molded Reinforced-Polyester Chemical Resistant Process Equipment
Iron and Steel Society	Pocketbook of Standard Steels

Reference	Title
IBC	International Building Code
CBC	California Building Code
IMC	International Mechanical Code

B. RELATED SECTIONS: The work of this section applies to the work in Section 13234 Fiberglass Reinforced Plastic Ductwork. Pultruded fabrications including gratings, ladders, and plate are specified elsewhere in the contract documents.

1.4 DEFINITIONS

A. The terminology of this specification is consistent with ASTM D883. Fabricators are responsible for correct interpretation. Further definitions are as follows.

B. EQUIPMENT: The FRP equipment, as listed in the pertinent equipment section, including all ancillary equipment, work, and materials as described in this section and related sections specification.

C. FABRICATOR: The primary party responsible for fabrication of the FRP equipment.

D. FIELD JOINING CONTRACTOR: The party responsible for the field joining of the equipment. This may be the same party as the Fabricator and/or the Contractor.

E. MAT: A fibrous material consisting of randomly oriented chopped or swirled glass filaments loosely held together with a binder.

F. CHOPPED GLASS: A fibrous material consisting of randomly oriented chopped filaments applied directly to a mold surface or laminate under construction by a chopper gun.

G. FIBER PROMINENCE (JACKSTRAW): The distinct visibility of individual glass strands causing a loss of translucency of the laminate.

1.5 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook. Submittal requirements for FRP fabrications are detailed in those specification sections pertaining to specific equipment.

PART 2 - PRODUCTS

2.1 GENERAL

A. All products shall be new, of current design, and produced by approved manufacturers who specialized in the fabrication of such products.

B. Stainless steel hardware and fabricated parts (including anchor bolts, anchor lugs,

lifting lugs, hangers, etc.) shall be AISI Type 316.

C. Gaskets for use with FRP flanges shall be flat, full-faced, and drilled to match the drilling of the mating flange(s). Gasket material shall be as specified in the pertinent equipment section.

2.2 MATERIALS

A. RESIN:

1. The equipment shall be fabricated using the corrosion-resistant resin(s) specified in the pertinent equipment section, or equal as approved by the Construction Manager. The resin shall be used throughout all laminates.

2. Catalysts and promoters shall be of the type and amount recommended by the resin manufacturer for use with their resin in the required service. The Construction Manager will review the Fabricator's choice of resin/catalyst before fabrication begins to verify compliance to the resin manufacturer's recommended procedures. Positive measurement control of catalysts, promoters, and resins shall be maintained at all times.

3. No fillers, additives, or pigments shall be employed in the resin except as specified below, and in the pertinent equipment section. A thixotropic agent for viscosity control may be used in the proportion and type recommended by the resin manufacturer as approved by the Construction Manager. No thixotropic agent is to be used in the corrosion liner or on surfaces to be in contact with the corrosive environment.

4. Resin putty shall be made using the same resin as was used in the original fabrication of the parts to be joined. Resin putty shall contain a minimum 15 percent by weight of milled glass fibers. A fumed-silica additive such as Aerosil 200 or Cab-O-Sil TS-720 shall be added to increase the viscosity of the putty. The use of silica flour, grinding dust, or other fillers is not allowed.

5. When specified in the pertinent equipment section, antimony trioxide or antimony pentoxide shall be added to the resin in the amount necessary to achieve the required fire retardancy rating in the structural wall only. Resin manufacturer's recommendations shall be followed. The corrosion liner shall not contain this additive.

B. REINFORCEMENT:

1. Type and sequence of reinforcement to be used shall be as designated in the pertinent equipment section, the construction details, or on the design drawings.

2. Glass fiber reinforcement used shall be a commercial grade corrosion-resistant borosilicate glass, except as otherwise noted.

3. All glass fiber reinforcing shall have an epoxy compatible silane type surface finish and binder that is specifically recommended by the glass manufacturer for the particular resin system to be used. This surface finish should allow the maximum possible chemical bonding between the resin and glass.

4. Surfacing veils shall be Type C (chemical grade) glass, 10 mil thickness, unless otherwise specified. An apertured polyester surfacing veil, such as Nexus or approved equal, shall be used only when indicated in the pertinent equipment section. The Construction Manager is not aware of an equal product.

5. Mat shall be Type E (electrical grade) glass, 1 1/2 oz. or 3/4 oz. per sq. ft., as specified in the pertinent equipment section, with nominal fiber length of 1.25 +0.75 inches.

6. Continuous glass roving used in chopper guns for spray-up shall be Type E chopper roving.

7. Woven roving shall be 24 oz. per sq. yd. Type E glass and have a 5 x 4 plain weave.

8. Continuous roving used in filament wound construction shall be Type E glass winder roving with a yield of 200 yards or more per pound.

9. Unidirectional reinforcement shall be weft unidirectional fabric, Type E glass, 15.7 oz./sq. yd., such as Hexcel Knytex, Brunswick Technologies, Inc., W-16, or equal.

2.3 FABRICATION

A. MOLDS:

1. Molds constructed of Masonite, wood, or other porous material must be completely covered with mylar or other suitable material to produce a smooth and glossy inner surface on the FRP equipment.

2. Molds and mandrels shall be hard-surfaced such that working the wet laminate will not cause local displacement of the material or air entrapment. Covering of mandrels with cardboard is not acceptable. If submitted, Contractor shall demonstrate that it produces an RTP-1 Level 2 liner quality before being approved by the Construction Manager prior to start of fabrication.

3. Certain construction details shown on the design drawings assume the availability of specific tooling and/or molds. Alternate mold configurations may be considered by the Construction Manager in the interest of cost savings or betterment. Any deviations from the dimensions shown on the design drawings must be approved by the Construction Manager prior to the start of fabrication.

B. VESSEL ASSEMBLY:

1. All cutouts from the equipment are to be marked, indicating their original location, and retained. All cutouts become the property of the Construction Manager.

2. Centerlines marked on the equipment for use in assembly shall not be removed until after inspection by the Construction Manager.

3. Flanged nozzles shall be installed with boltholes straddling principle centerlines of the vessel. For tank tops, nozzle boltholes straddle radial centerlines. Other layouts take precedence when detailed on the design drawings.

4. When requested, Fabricator shall supply to the Contractor, at the earliest possible time, a template which locates anchor bolt holes within +1/8-inch for each vessel.

5. When specified, or indicated on the design drawings or construction details of the pertinent equipment section, a non-skid surface shall be provided on the exterior surface of domed covers. Silica grit may be applied in conjunction with the final resin coat, or other methods employed if approved by the Construction Manager.

6. The Fabricator shall furnish and overlay on the outside of the equipment a plastic nameplate showing the following information:

   a. Name of manufacturer

   b. Date of manufacture

   c. Construction Manager's purchase order number

   d. Equipment name/number

   e. Resin number and manufacturer

   f. Design pressure and temperature

   g. Vessel diameter, height, and weight

7. Butt joints or shell joints are to be in the number and location(s) as shown on the design drawings. Additional joints are not allowed except as approved by the Construction Manager. Slip joints, "mod joints," or other methods not conforming to the design drawings are not allowed. If joint locations are not indicated on the design drawings, Fabricator shall propose number and location for approval by Construction Manager.

8. Allowable tolerances shall be as listed in RTP-1, Fig. 4-1 and NM 7-1, except as modified herein or on the design drawings.

9. When joining components, gaps at mating edges shall be limited to 1/4 inch maximum, and misalignment of inside surfaces shall not exceed 1/3 of the lesser wall thickness.

10. The outside surface of vessel flat bottoms after assembly shall be flat within +1/2-inch. In addition, localized indentations or protrusions shall not exceed +1/4-inch within two feet.

11. Nozzle cutout reinforcement shall be applied as specified on the design drawings.

12. When reinforcing materials are cut to facilitate placement around an installed nozzle or opening, joints in successive reinforcing layers shall be staggered to avoid overlapping and shall not be placed so that the joints are parallel to the axis of the tank. The principal fiber direction of the woven roving reinforcement shall be parallel to the tank axis.

C. DUCTWORK ASSEMBLY:

1. Centerlines marked on the equipment for use in assembly shall not be removed until after inspection by the Construction Manager's representative.

2. Fabricator shall apply and overlay an identification tag on each duct spool, straight duct length or other equipment, showing the following information:

   a. Name of manufacturer

   b. Date of manufacture

   c. Contractor's purchase order number

   d. Resin identification

   e. Duct diameter

   f. Laminate thickness

   g. Unique spool identification number

3. Tolerances on spool assembly shall be as follows, except as otherwise noted on the drawings:

   a. Diametral, including out of roundness, shall be +1/8-inch or +1 percent, whichever is greater.

   b. Tolerance on overall length and location of tees and laterals shall be +1/4-inch.

   c. Plain ends shall be cut square with the duct axis +1/8-inch.

d. Flanges shall be perpendicular to the axis of the duct within 1/2 degree, and shall be flat to +1/32-inch up to and including 16-inch diameter and +1/16-inch for larger diameters.

e. Tolerance on the specified angle for tees, laterals, and miters shall be +1/2 degree.

4. All cutouts from the equipment are to be marked, indicating their original location, and retained. All cutouts become the property of the Construction Manager.

5. CUT LENGTHS: Construction Manager prefers straight duct to be supplied to required lengths with a minimum of shop butt joining of shorter lengths. Recognizing that waste can be minimized by joining shorter sections, or that mandrels may be limited to 20 ft., shop butt joints will be allowed within reason.

6. DUCT MARKING: All lengths of duct shall be identified in accordance with the requirements of paragraph 13230-2.03 C2 above. If required by the Construction Manager, Fabricator shall return a marked-up copy of the layout drawings, with Mark numbers referenced.

D. ALL LAMINATES:

1. Refer to the pertinent equipment section for reinforcement sequences. No deviations in number or sequence of plies will be allowed without approval by the Construction Manager.

2. Positive methods shall be used to assure uniform total thickness of the laminate and uniform glass-to-resin ratio without surplus resin or unsaturated glass.

3. All laminate thicknesses shown on the design drawings are construction minimums. It is the responsibility of the Fabricator to verify that minimum thicknesses are obtained using the laminate sequences specified.

4. The minimum allowable structural laminate thickness shall be the total laminate thickness less the specified sacrificial corrosion liner thickness.

5. Interruptions in laminating sequence should only occur after exotherm plies (E or e), as described in the pertinent equipment section. If an exotherm interruption becomes otherwise necessary, it shall follow the application of a ply of mat and be succeeded by a ply of mat. This may require an additional ply beyond that specified.

6. Laminating sequence interruptions shall not exceed 24 hours, and the in-process surface must retain acetone sensitivity until laminating is resumed. Lack of compliance with these procedures, or any indication that contamination of the surface has occurred, shall require that surface preparation be accomplished before resuming. Before resuming lamination,

any rough areas or projections shall be touch-ground to allow full contact of the succeeding wet laminate.

7. An exotherm interruption is specifically prohibited within the corrosion liner. An exotherm interruption between the corrosion liner and the structural layers is limited to a maximum of twelve hours.

8. Chopped strand glass applied by chopper gun is allowed in lieu of mat layers in the structural laminates only. Application must be mechanically controlled in order to assure uniform thickness and glass-to-resin ratio. The specific methodology must be approved by the Construction Manager prior to fabrication. Chopper gun application of the corrosion liner is not allowed.

9. All non-mold surfaces shall be coated with resin containing wax additive in the amount necessary to allow full cure of the surface. In the case of interior primary corrosion surfaces, such as interior overlays, this wax coat shall be applied within 24 hours of original lamination. In the case of exterior surfaces, this wax coat shall also contain a UV stabilizer in the type and amount recommended by the resin manufacturer.

10. The exterior surface of all equipment shall be resin rich and reinforced with one layer c-glass surfacing veil, except as otherwise specified.

11. When specified in the pertinent equipment section, the exterior coat shall be an opaque pigmented surface coat, applied only after Construction Manager's inspection. Color to be selected by the Construction Manager.

12. Saturation of reinforcement prior to application to equipment shall not be performed on waxed paper or other contaminated material. Saturation of reinforcement on clean paper or cardboard is allowed.

13. All cut edges shall be thoroughly coated with resin so that no glass fibers are exposed. Cut edges exposed to the corrosive service shall be sealed with a corrosion liner laminate. All voids shall be filled with resin putty.

E. CORROSION LINER LAMINATES (inner surface and interior layers):

1. The inner (corrosion service) surface of all laminates shall be resin-rich and reinforced with surfacing veil of the type and number of layers as described in the pertinent equipment section.

2. The interior layer of the corrosion liner shall consist of 1-1/2 oz. per sq. ft. mat in the number of layers specified in the pertinent equipment section. Each ply shall be rolled separately to remove entrapped air.

3. Chopped glass applied by chopper gun is not allowed in the corrosion liner.

4. All plies of the inner surface and interior layer are to gel completely before proceeding with the structural laminates, but in no case shall the interruption exceed twelve hours. The surface must retain acetone sensitivity until the

structural laminate is applied. Lack of compliance to either of these aspects shall be cause for rejection of the corrosion liner.

5. Completed corrosion liner, as described above, shall contain not less than 20 percent nor more than 30 percent glass (by weight). No thixotropic material shall be used in the liner resin nor in the fabrication of any FRP components intended for direct contact with the process stream. Completed liner shall be the minimum thickness specified in the pertinent equipment section. Completed liner shall meet visual defects requirements of RTP-1, Table 6-1, Level 2.

6. All edges of surfacing veils in wet lay-up shall be lapped a minimum of one inch.

7. A separately cured unreinforced gel coat shall not be used.

8. Antimony shall not be used in the corrosion liner.

F. HAND-LAYUP STRUCTURAL LAMINATES:

1. The corrosion liner laminate shall be followed by structural laminates of varying construction types, as specified in the pertinent equipment sections, or on the design drawings.

2. For hand-layup structural laminates, reinforcement shall consist of mat and woven roving in the sequence specified in the pertinent equipment section.

3. All woven roving shall have a ply of mat on each side. Two adjacent plies of woven roving are not permitted.

4. All edges of woven roving material in wet lay-up shall be lapped a minimum of two inches. Lapped edges of adjacent layers shall be staggered to obtain the maximum possible strength.

5. Laminates containing primarily 1-1/2 oz. per sq. ft. mat layers in conjunction with woven roving shall contain not less than 35 percent or more than 45 percent glass (by weight).

6. Laminates containing primarily 3/4 oz. per sq. ft. mat layers in conjunction with woven roving are considered to be high strength laminates and shall contain not less than 45 percent or more than 55 percent glass (by weight).

G. FILAMENT WOUND STRUCTURAL LAMINATES:

1. The corrosion liner laminate shall be followed by structural laminates of varying construction types, as specified in the pertinent equipment section, or on the design drawings.

2. For filament wound structural laminates, reinforcement shall consist of continuous strand fiberglass roving applied with a minimum of interruptions until the specified minimum thickness is attained. This laminate shall

contain the percentage of glass (by weight) specified in the pertinent equipment sections.

3. Each complete cycle of filament winding shall form a closed pattern of winding bands which completely covers the surface with two bi-directional layers. Each layer shall be a maximum of one roving in thickness. Singular cycles shall not exceed a thickness of 0.06 inches, unless otherwise specified in the pertinent equipment sections. In laminates with helix angles greater than 75 degrees, a minimum 10% of the structural wall thickness shall be oriented at 0 degrees (longitudinal direction), plus or minus 5 degrees.

4. Upon request, Fabricator shall submit the following information:

   a. Specific glass strand to be used and yield

   b. Net thickness per cycle

   c. Number of strands per inch in the winding band

   d. Typical glass-to-resin ratio

5. Construction Manager retains the right to modify the laminate based on fabricator's specific filament winding system.

6. Spacing of filaments within the winding band shall be sufficiently close that bridging is avoided and glass content is maintained within the specified limits. Spacing of the filaments shall be uniform across the winding band without bunching or gapping.

7. The helix angle of winding shall be as specified in the pertinent equipment sections, as measured from the centerline of revolution of the equipment shell.

8. Tolerance on helix angle is +2 degrees, -2 degrees, unless otherwise noted in the pertinent equipment sections.

9. If layers of mat or chopped glass are needed to ensure proper bonding between the corrosion liner and filament winding, or within the filament winding to accommodate the fabricator's manufacturing methods, or to provide for laminates of acceptable quality, they may be added at the Fabricator's option. These layers are considered to be extra material and will result in a thickness greater than specified. The amount of filament winding and unidirectional roving specified must still be applied.

10. If for any reason, winding is interrupted to the point where the outer surface is gelled or exotherm temperatures are excessive, production shall stop and the laminate shall be allowed to cure. Any prominent ridges left on the cured surface shall be ground to smooth the projections and prevent bridging. Following the grinding, a bedding layer of 3/4 oz. per sq. ft. mat or chopped glass shall be applied and thoroughly rolled to remove air. Winding with continuous strand may be resumed before this layer gels. The additional mat

layer is extra material and will result in a wall thickness greater than that specified.

H. SURFACE PREPARATION:

1. SURFACE ABRASION:

a. Prior to starting secondary overlays, adequate surface abrasion with no surface contamination is required. Every precaution shall be taken to assure adequate surface preparation and a good bond of the secondary overlays.

b. Prior to making all overlays, the cured or wax coated surfaces of the area to be overlayed must be roughened thoroughly by grinding. The roughened area shall extend 1-inch minimum beyond the proposed overlay edge. The roughened area must be completely coated with wax coat at the completion of the joint.

c. Grinding shall be sufficiently deep that all traces of glossy resin coat are removed and that glass fiber is exposed over the entire abraded surface.

d. The edges of the abraded surface shall be "feathered" out such that no sharp discontinuities exist.

e. For surface abrasion by grinding, grinding disks shall be new and not contaminated, with a grit size of 16 to 24.

f. FRP joint application must begin within four hours of surface abrasion, or else abrasion must be repeated.

2. FINAL SURFACE PREPARATION:

a. Within 15 minutes prior to beginning FRP joint application, dust shall be removed from the abraded area by vacuuming or brushing with clean non-metallic brushes, or wiping with clean dry rags.

b. Solvent wiping the abraded area is not allowed.

c. Air blowing the abraded area is not allowed.

d. If any indication of contamination is present after this final surface preparation, the abraded area shall be scrubbed with solvent and allowed to evaporate to verify removal of the contaminant. Repeat this solvent wash if necessary. Surface abrasion must be repeated after solvent washing.

I. JOINING LAMINATES:

1. FRP joining laminates are subject to all applicable requirements specified in other sections for laminates.

2. FRP joints shall be reinforced with an overlay of glass reinforcement and resin which extends equally within +1/2-inch on each side of the joint. A smooth contour is required. Minimum thickness, ply sequence, and ply widths of FRP joints shall be as specified in the pertinent equipment sections.

3. Tolerance on width of joint reinforcement plies is +1 inch, -0 inch. Woven roving plies shall not exceed the width of the mat ply below them.

4. Parts to be joined shall be restrained to prevent movement until completion and cure of the joint overlay.

5. Parts shall be fitup, and it shall be verified that all tolerances and assembly requirements of sections are satisfied. The void between component parts shall be completely filled with resin putty, taking care not to extrude an excessive amount of putty into the interior.

6. The puttied area shall be ground to a smooth contour and final surface preparation repeated.

7. The abraded area to be overlaid shall be resin coated immediately prior to applying glass reinforcement, using a stiff brush to work resin into the rough surface. The resin coat shall be applied only to an area as wide (+1 inch, -0 inch) as the next exotherm stage of the joint sequence and shall be repeated prior to each exotherm stage. No thixotropic material shall be used in this resin.

J. ENVIRONMENT:

1. It is the Fabricator's responsibility to maintain conditions in the FRP laminate work area during all times when the final surface preparation and FRP laminate application are in process in order to not jeopardize the reliability of the laminate or secondary bond. As a minimum, controls shall include the following.

2. All surfaces to be overlaid and all materials are to be maintained within a range of 60 to 95 degrees F. This temperature must also be at least 5 degrees F greater than the dew point, as measured with a sling psychrometer. During the exotherm stage(s) of each laminate sequence, and during any unplanned exotherms, the temperature of the curing laminate will likely exceed 95 degrees F. No further lamination may proceed until the exotherm has completed and the laminate has cooled to 95 degrees F or less. No attempt shall be made to cool the curing laminate prematurely.

3. Prepared surfaces and materials shall be protected from blowing dust, moisture, and other contaminants.

4. If any of the above conditions are violated while the final surface preparation or FRP laminate application are in-process, work shall stop immediately and the process must begin again with surface abrasion.

5. Materials shall be stored in a dry area and within the temperature and humidity limits recommended by the manufacturers.

K. FLANGES:

1. Except as otherwise specified on the design drawings, flanges shall be made by hand-layup construction with nozzle neck and flange made integrally in one piece and fabricated in accordance with the dimensions shown on the design drawings. All layers of reinforcement in the nozzle neck and hub shall extend uninterrupted into the flange.

2. Unless otherwise noted on the design drawings, additional hub thickness shall be built-up using alternating layers of 1-1/2 oz. per sq. ft. mat and 24 oz. per sq. yd. woven roving.

3. Additional thickness in the flange shall be built-up using "ring" cutouts of mat, evenly distributed throughout the flange thickness.

4. Press molded or filament wound flanges are not allowed.

5. To obtain proper seating, bolt holes shall be spotfaced for SAE size washers. Overall machine facing of the back of flanges is not permitted. Bolt holes and all other cut surfaces shall be resin coated. Spotfacing shall not produce a flange thickness less than that specified in the pertinent equipment section.

6. Bolt holes in flanges are to straddle principal centerlines of the equipment. Tolerance in bolt hole locations and in diameter of bolt circle shall be +1/16-inch.

7. Flange faces shall be flat to +1/32-inch up to and including 16-inch diameter and +1/16-inch for larger diameters.

8. Resin coat all flange bolt holes so that no fibers are exposed.

2.4 FABRICATION QUALITY CONTROL

A. ALLOWABLE VISUAL DEFECTS:

1. Fabricator shall take care to minimize the amount of defects in all laminates. In no case shall visual defects in any area of the equipment exceed the maximum allowable levels of visual defects set forth in RTP-1, Table 6-1, Level 2.

2. Visual defects shall be as defined in ASTM D2563 and ASME/ANSI RTP-1, Table 6-1.

3. Presence of visual defects in excess of the allowable levels shall be grounds for rejection of the equipment.

B. FRP FABRICATION:

1. Fabricator shall be responsible for implementation of a comprehensive quality assurance procedure. The minimum requirements are described below.

2. Fabricator shall designate personnel to inspect equipment while in-process and after completion to assure compliance to all aspects of the specification and design drawings. Inspection shall include, as a minimum, checks for visual defects, laminate thickness and sequence, glass content, Barcol hardness, dimensional tolerances, adherence to construction details, surface preparation, and environmental conditions. Fabricator's inspector shall complete a report of the findings including method of measurement for each separate assembly.

3. Prior to use of any resin, Fabricator shall test resin to establish cure characteristics and verify that it meets the resin manufacturer's acceptance standards.

4. Resin testing shall be performed in accordance with ASTM D2471. Gel time to peak exotherm and peak exotherm temperature shall be recorded.

5. If the Fabricator in any way alters the resin after receipt, such as through the addition of styrene, promoters, or other additives, one test shall be performed for each drum or portion thereof mixed with additives.

6. Fabricator shall provide documentation for each test, including resin type, manufacturer, batch and lot number, drum number, complete listing of all additives with amounts added, and description and manufacturer of each additive.

7. Fabricator shall inspect all glass reinforcement prior to use in fabrication and shall not use any glass that does not meet the manufacturer's acceptance standards. Glass material that is wet or has been wet shall not be used. For each type of glass and lot number used, Fabricator shall record the manufacturer, product description, binder type, product code, production date, and lot number. For mat, woven roving, unidirectional roving, and cloth, records shall also include actual measured weight per square yard of material.

8. Fabricator shall retain all nozzle cutouts and other excess laminate, clearly marking each piece to identify its original location. These laminate samples become the property of the Construction Manager. For areas where valid laminate samples are not available, sample plugs shall be taken at the Construction Manager's request. Repair of subsequent holes will be performed in a manner approved by the Construction Manager.

9. Fabricator shall verify glass content of corrosion liner and structural laminate on available samples in accordance with ASTM D2584. This test shall be completed, and the results reported for each major component where samples are available.

10. Prior to final shipment of the equipment, Fabricator shall provide the Construction Manager with a complete quality control report, consisting of copies of all records maintained for compliance with this section.

C. CONSTRUCTION MANAGER'S INSPECTION:

1. The Construction Manager shall be permitted access to the equipment during fabrication and upon completion for the purpose of verifying compliance to the contract documents. The Construction Manager's inspection is not intended to replace the Fabricator's own quality control procedures.

2. In no respect does inspection of any equipment by the Construction Manager relieve the Fabricator of compliance with the contract documents. A final inspection shall be performed by the Construction Manager when the Fabricator certifies that all the terms and requirements of the contract documents have been satisfied. At least five days notice shall be given the Construction Manager prior to this inspection.

3. The Fabricator is required to notify the Construction Manager at the completion of particular milestones during fabrication. The Fabricator shall give at least 48 hours notice prior to occurrence of these milestones, as follows:

   a. View tooling prior to fabrication

   b. Beginning application of corrosion liner for each part

   c. Extraction of each part prior to beginning assembly

   d. Upon completion of each separate assembly

4. Construction Manager reserves the right to include additional milestones.

5. In the event the equipment is not to the stage of completion designated for a milestone inspection or is not complete as required for a final inspection at the time specified by the Fabricator, the Fabricator agrees to assume the cost of the inspector's time and expenses and further agrees that such charges be deducted from the cost of the equipment.

6. Construction Manager shall be allowed to photograph the equipment while in-process and/or upon completion.

7. Construction Manager retains the right to employ the use of magnification or other special viewing or measurement devices during inspection.

8. At the time of final inspection, the Fabricator shall assure that the equipment is cleaned of all foreign material and workings which might block the view of the Construction Manager. The equipment shall be in a position that allows for easy access and viewing and, at the request of the Construction Manager, shall be moved to allow viewing of all parts of the equipment.

9. Evidence of poor workmanship or lack of compliance with any aspect of the contract documents will be grounds for rejection of the equipment.

10. Subsequent repair of rejected equipment may, at the Construction Manager's option, be undertaken in an attempt to bring the equipment to an acceptable state. Repair procedures must be approved by the Construction Manager prior to implementation.

D. CONSTRUCTION MANAGER'S ACCEPTANCE:

1. The Construction Manager may employ destructive testing, such as ultimate tensile or flexural strength tests or glass content ignition tests, on available samples or use other non-destructive test methods, such as acoustic emission or ultrasonic polygauge thickness measurement, on the completed equipment for verification of compliance to the contract documents.

2. Testing performed by the Construction Manager shall be accomplished through use of applicable ASTM test methods when appropriate.

3. Hardness tests shall be made for acceptance by the Construction Manager on the liner surface using the Barcol impressor, Model GYZJ 934-1, calibrated at two points in accordance with ASTM D2583. Ten readings will be taken in a localized area, deleting the two highest and two lowest, and averaging the remaining six. Minimum acceptable Barcol hardness will be a reading of 30, unless otherwise specified in the pertinent equipment section.

4. An acetone sensitivity test shall also be performed by the Construction Manager as an acceptance criterion. Evidence of a sticky or tacky surface following rubbing with an acetone-saturated cloth shall be grounds for rejection of the equipment.

2.5 SHIPPING

A. VESSELS:

1. The Fabricator shall be responsible for proper packaging, loading, and protection of all materials to prevent transit and handling damage.

2. All equipment which is shipped in a horizontal position shall be mounted on padded cradles contacting at least 120 degrees of the vessel circumference. All end blocking used to prevent shifting of equipment must be padded.

3. Equipment shall be loaded with a minimum clearance of two inches between pieces (including external fittings, nozzles, or other projections) and the bed of the car or truck. When two or more units are shipped together, sufficient clearance shall be provided between units to prevent contact in transit.

4. Flange faces shall be protected by coverings of suitable plywood or hardboard, securely fastened.

5. Loose parts such as fasteners, gaskets, and accessory fittings shall be packaged securely to allow storage under field conditions.

6. All dry FRP field joining materials shall be precut in the shop and layered in order of laminate sequence, then labeled and packaged in sealed, moisture-proof containers for shipment.

7. When a number of loose items or field joining materials are packed in larger shipping crates, each crate will be individually marked or tagged as to its contents, clearly listing number and type of each item contained therein.

B. DUCTWORK:

1. The Fabricator shall be responsible for proper packaging, loading, and protection of all materials to prevent transit and handling damage.

2. All ducts shall be supported for shipment on cradles spaced no greater than 20 feet. Duct lengths shall also be supported by cradles within two feet of the duct end.

3. Cradles used to support duct or other equipment during shall contact at least 120 degrees of the circumference, be padded and match the outside diameter within +1/8 inch, 0 inch.

4. If duct is stacked in layers, cradles shall be used which support each piece of duct independently from the overlying and underlying equipment, such that no duct in a cradle carries more than its own weight.

5. Duct ends and flange faces shall be protected by covering with suitable material which is securely fastened.

6. If duct is gelcoated or painted, it shall be wrapped with foam or bubble wrap to protect finish during shipment.

7. Equipment shall be loaded with a minimum clearance of two inches between pieces (including external fittings, nozzles, or other projections) and the bed of the car or truck.

8. Loose parts such as fasteners, gaskets, and accessory fittings shall be packaged securely to allow storage under field conditions.

9. When a number of loose items are packed in larger shipping containers, each container will be individually marked or tagged as to its contents, clearly listing number and type of each item contained therein.

2.6 HANDLING FRP EQUIPMENT

A. The equipment shall not be rolled, slid, dropped, allowed to swing into other objects, or forced out of shape. Resulting impact and excessive distortions may cause cracking or crazing.

B. When working in or around FRP equipment, care should be exercised to prevent tools, scaffolding, or other objects from striking or being dropped on or inside the equipment. Soft-soled shoes should be worn by workers entering the equipment.

C. Proper rigging and hoisting practices shall be observed at all times.

D. The use of a crane is recommended both in lifting and positioning the equipment. Ideally, the slings or cables attached to the equipment should lift as nearly vertical as possible, and shall under no circumstances shall slings or cables lift more than 45 degrees from vertical. A spreader bar (lifting fixture) may be necessary to keep the lifting angle within this range.

E. Lifting lugs in most cases are not designed to accommodate lifting vessels in or from the horizontal position. Nylon slings encircling the tank should be used for this purpose and for righting the vessel to the vertical position.

F. Unless otherwise specified, use all lifting lugs, loaded uniformly for lifting vessels in the vertical position. The use of spreader bars is recommended to keep loads on lugs as nearly vertical and uniform as possible.

G. When lifting lugs are not provided, and it is necessary to use lifting slings in direct contact with the FRP equipment, the slings shall be woven nylon or canvas at least 3 inches wide. Care must be taken to assure that shackles, eyes, hooks, or other objects do not come into contact with the FRP equipment.

H. Do not attach lifting slings or cables to (nor allow them to come in contact with) any nozzles, flanges, gussets, or fittings other than lifting and/or anchor lugs.

PART 3 - EXECUTION

3.1 GENERAL

A. FRP specialties shall be shipped, installed, joined and erected under the direction of factory-trained specialists. Where jointing is required, workers employed for these efforts shall have been trained in proper jointing techniques by the Fabricator. Fabricated equipment shall have the warning, "Plastic Equipment Handle with Care" stenciled on two sides in letters a minimum of 2 inches high.

3.2 ASSEMBLY AND ERECTION PLANS

A. Prior to assembly and erection of FRP towers, tanks, stacks and similar structures, the Contractor shall provide assembly and erection plans prepared by the Fabricator. The plans shall provide details on handling, field connections and final installation.

****END OF SECTION****

SECTION 13234

FIBERGLASS REINFORCED PLASTIC (FRP) DUCTWORK

PART 1 - GENERAL

1.1 SUMMARY

A. SCOPE: This section specifies fiberglass reinforced plastic (FRP) ductwork. Unless specified otherwise, all ductwork shall be filament wound construction.

B. STANDARDS: The requirements of Section 13230 shall apply to all aspects of this specification section. In cases of conflict, this section shall take precedence over Section 13230.

1.2 SERVICE REQUIREMENTS

A. AIR STREAM CONTENTS: Saturated air streams at 40-120° F containing hydrogen sulfide in concentrations up to 10 ppm and droplets of sulfuric acid.

B. PRESSURE AND VACUUM: Design conditions are 20 inches water column pressure and 12 inches water column vacuum. A minimum structural safety factor of 10:1 shall be used in the design of ductwork for tensile or flexural stress conditions. A minimum safety factor of 5:1 shall be used for conditions of elastic stability, such as buckling under vacuum loads.

1.3 REFERENCES AND RELATED SECTIONS

A. References are described in Section 13230.

B. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 11000 Equipment General Provisions

1.4 ENVIRONMENTAL CONDITIONS

A. Ambient temperature ranges from 40 degrees through 122 degrees F. Relative humidity ranges from 20 to 95% (non-condensing).

1.5 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked (✓) to indicate specification compliance or marked to indicate requested deviations from specification requirements. A

check mark shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Construction Manager shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

2. Complete damper shop drawings illustrating component configuration, dimensions, and materials list.

3. Certified damper leakage test results in accordance with AMCA 500 standards, pressure drop characteristics, and actuator torque requirements.

4. Proposed FRP ductwork plan, including hanger and support types and locations, field joint locations, inspection plates, drains, blast gates, dampers, expansion boots, etc.

5. Certification from the resin manufacturer that the selected resin and catalyst systems are appropriate for the service conditions of the duct systems, as specified in Section 13234.

6. Calculations and complete fabrication details of special system components specified in paragraph 13234-2.01E. Approval of design is required prior to the start of fabrication.

7. Qualifications of the Fabricator and Field Joining Contractor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The Engineer believes the following candidate manufacturers are capable of producing equipment and/or products that will satisfy the requirements of this Section. This statement, however, shall not be construed as an endorsement of a particular manufacturer's products, nor shall it be construed that named manufacturers' standard equipment or products will comply with the requirements of this Section. Candidate manufacturers include, Daniel Mechanical, Spunstrand, ECS, Augusta Fiberglass or equal.

2.2 FRP DUCTWORK

A. DESIGN CRITERIA:

1. EQUIPMENT: FRP Ductwork.

2. RESIN: Resin shall be premium grade vinyl ester resin. Resin shall achieve ASTM E84 Class I fire retardance without the use of antimony.

3. ADDITIVES: No additives that reduce the translucency shall be included in the resin.

4. MINIMUM BARCOL HARDNESS: 30

5. SURFACING VEIL (INNER SURFACE): One (1) layer of 10 mil C-glass surfacing veil.

6. INTERIOR LAYER: Two (2) layers of 1-1/2 oz./sq. ft. mat.

7. CORROSION LINER THICKNESS, MINIMUM: 100 mils.

8. FILAMENT WINDING HELIX ANGLE: 55° to 65°; Tolerance: ±2°

9. FILAMENT WINDING CYCLE THICKNESS, MAXIMUM: 0.06"

10. FILAMENT WOUND STRUCTURAL WALL GLASS CONTENT: 55 percent to 65 percent.

11. STRUCTURAL LAYERS: Natural color, no pigments allowed.

12. Exterior surface coat and 10 mil C-glass surfacing veil required; color to be determined by the Construction Manager.

13. POSTCURE: Equipment to be postcured in accordance with the recommendations of the resin manufacturer for the intended service.

14. MARKING: In addition to the requirements of paragraph 13230-2.03.C, all spool assemblies and pieces shall be identified with piece mark numbers using non-water-soluble paint, easily removable with agents that will not attack the finish of the FRP Ductwork.

15. The exterior of all FRP duct to be located inside of any buildings shall be coated with two (2) coats of PPG Speedhide Flat Latex paint No. 42-7, or equal, in accordance with the manufacturer's recommendations, for smoke rating and additional fire retardancy.

16. Any damage to this paint coat occurring during installation shall be repaired promptly, restoring the paint coat to the original condition.

B. DETAILS: As a minimum, FRP ductwork shall be constructed in accordance with the thicknesses, laminate sequences and detail drawings that follow at the end of this section. If the design requirements dictate that increased thickness or other changes are required, they shall be submitted for approval of the Construction Manager. Details shall be used in conjunction with contract drawings and Section 13230. Details are as follows:

Detail-1, FRP Duct and Fitting Thickness

Detail-2, FRP Flanges

Detail-3, Expansion Boot

Detail-4, 1-1/2" Dia. Drain Nozzle Installation

Detail-5, FRP Butt and Miter Joints

Detail-6, FRP Tee and Lateral Joints

Detail 7, Typical Round Blast Gate, All FRP Construction

Detail 8, FRP Low Leak Damper

C. ELBOWS: Elbows 30 inch diameter and smaller shall be one piece molded, smooth turn, hand lay-up construction. Larger elbows may be fabricated from straight duct sections, using miter joints per the drawing details in this section. Mitered elbows 45 degrees and less shall be two piece, one miter joint. Mitered elbows 46 to 90 degrees shall be three piece with two miter joints. All elbows shall be large radius (1.5 times the diameter) except as otherwise required.

D. LAMINATE SEQUENCE TABLES FOR FRP DUCTWORK:

Key for Tables 1 and 2:

C = 10 mil C-glass surfacing veil

M = 1-1/2 oz./sq. ft. mat

E = Exotherm ply, 1-1/2 oz./sq. ft. mat

R = 24 oz./sq. yd., 5x4 plain weave, woven roving

FW = Filament winding to the thickness specified.

Table 1. Helix Wound Laminate Composition

Thk.	C	M	E	R	Sequence of plies
0.21"	2	1	1	N/A	CME ⇒ 0.11" F.W. ⇒C
0.24"	2	1	1	N/A	CME ⇒ 0.14" F.W. ⇒C
0.27"	2	1	1	N/A	CME ⇒ 0.17" F.W. ⇒C
0.32"	2	1	1	N/A	CME ⇒ 0.22" F.W. ⇒C
0.35"	2	1	1	N/A	CME ⇒ 0.25" F.W. ⇒C
0.38"	2	1	1	N/A	CME ⇒ 0.28" F.W. ⇒C
0.41"	2	1	1	N/A	CME ⇒ 0.31" F.W. ⇒C

Table 2. Hand Lay-Up Laminate Composition

Thk.	C	M	E	R	Sequence of plies
0.24"	2	4	1	1	CME MRMMC
0.33"	2	5	1	2	CME MRMRMMC
0.39"	2	6	1	3	CME MRMRMRMMC
0.46"	2	6	2	4	CME MRMRE MRMRMC
0.50"	2	7	2	4	CME MRMRMRE MRMMC
0.54"	2	7	2	5	CME MRMRMRE MRMRMC
0.57"	2	8	2	5	CME MRMRMRE MRMRMMC
0.64"	2	9	2	6	CME MRMRMRE MRMRMRMMC

E. SPECIAL SYSTEM COMPONENTS: Fabricator shall be responsible for the design of rectangular duct, transitions, or any special system components not specifically detailed in this section. Deflection of flat panels shall be limited to 1 percent of the panel width at the system operating pressure. Rectangular duct and flanges shall be fabricated in one piece with a minimum radius of 1/2" in all corners. Rectangular duct shall not be assembled from multiple flat panels.

F. TURNING VANES: Turning vanes shall be provided where indicated on the drawings and in accordance with ASHRAE recommendations. All vanes shall have sufficient section and stiffness to operate without flutter or vibration under the airflow conditions indicated. Turning vanes shall be airfoil section with internal metal reinforcement and FRP laminate overlay or airfoil section, all Type 316 stainless steel. Duct fabricator shall propose and submit construction, location, and installation details of vanes and splitters.

2.3 FASTENERS

A. Bolts, nuts, and washers shall be stainless steel, AISI Type 316. Type 316 stainless steel backing strips, drilled for the above bolting requirements, shall be employed for all connections at fans, demisting sections, and wherever shear or moment loads may be encountered on duct connections.

2.4 GASKETS

A. Gaskets shall be EPDM, Viton, or Buna-N.

2.5 EXPANSION BOOTS

A. Expansion boots shall be as shown on the detail drawings in this section, flanged one-piece molded reinforced EPDM, a minimum thickness of 1/8-inch with stainless steel split retaining rings. Expansion boots shall be Mercer Rubber Company, Duct

Connector Model MI-9, or equal. Provide a 1/2-inch diameter galvanized U-bolt to function as a guide at the closest pipe support on each side of each expansion boot. Install U-bolt with approximately 1/8-inch clearance between duct and U-bolt to allow axial movement of duct. For expansion/ flexible connections at fans or blowers, refer to those equipment specifications.

B. For exterior ducts, Contractor shall size the expansion boots based on a minimum temperature of -30°F and a maximum temperature of 105°F, using the coefficient of thermal expansion for the particular duct work being provided by the Contractor.

2.6 SUPPORTS AND HANGERS

A. FRP ductwork shall be supported in accordance with Section 15050 and at intervals no greater than those indicated in the table below. Supports and hangers shall transmit all ductwork loads into the building structural frame through a system of intermediate beams and struts as necessary to accommodate requirements of these specifications. The Contractor shall submit construction details for supports and hangers and its proposed plan for location and type of supports, including location of any required expansion boots. Acceptance of the proposed locations and construction details by the Construction Manager is required prior to the start of fabrication. Where supports and hangers are detailed on the Drawings, they shall be provided as shown.

B. FRP DUCTWORK ALLOWABLE SPANS:

Inside Diameter - inches	Maximum span, feet
<20	12
24-36	15
42	17
48-54	20
60	22
72	24

C. Hangers and supports shall be lined with 1/8-inch thick neoprene, bonded to the metal hanger or support, to cushion the duct.

D. Hangers and supports shall fit the exterior of the duct closely and extend completely around the duct. Minimum width shall be the larger of 4 inches or 1/8 of the duct diameter.

2.7 DAMPERS

A. GENERAL: Dampers shall have FRP or Type 316 stainless steel blades, Type 316 stainless steel shafts and hardware, and permanently lubricated bearings of material impervious to attack by acids and caustics. Damper frames shall be fabricated to

match connecting ductwork. Flanges shall be pre-punched and shall match duct flanges and bolt patterns as specified in this section. No shop fabricated or spooled in duct dampers will be allowed.

1. Stuffing boxes shall be provided for gas-tight seals to prevent leakage at all shaft ductwork penetrations. Stuffing boxes shall be adjustable and shall contain a minimum of two sets of packing glands. Bearings shall be flange mounted, located outside the air stream. Bearings may be oil impregnated sintered bronze or relubricable rolling element.

2. Damper linkage shall be capable of transmitting twice the maximum torque required by the damper at 20 inches differential pressure. Linkage lever arms shall be a minimum of 3 inches, and the lever arms shall be welded to the axles. All linkage connections shall be supplied with oil impregnated bronze bearings.

3. Actuators for dampers having torque requirements of 500 inch-pounds or less shall have heavy-duty manual locking quadrants. Actuators for dampers having torque requirements in excess of 500 inch-pounds shall have manual worm gear actuators with hand wheel. Damper actuators not readily accessible shall be provided with chain wheel actuators.

4. Damper supplier shall provide certified leakage, pressure drop, and torque data for each damper type and size. Data shall result from prototype testing conducted in accordance with AMCA 500 test standards, in an AMCA certified test facility.

B. RECTANGULAR DAMPERS:

1. Rectangular dampers shall be opposed blade dampers of the airfoil design. Rectangular damper blades shall have a minimum thickness of 16 gauge and a maximum width of 9 inches. Axles shall have a minimum diameter of 3/4-inch, shall be solid, and shall extend the full length of the blade stuffing boxes and bearings. Blades shall be through-bolted to axles. Blade edge and axle deflection produced by 20 inches differential pressure across the closed damper shall not exceed 1/360th of the span or 1/8-inch, whichever is less.

2. Seals shall be provided on rectangular damper blade edges and jambs. Seal material shall be closed cell elastomer material, and shall be applied with an adhesive which will provide a bond strength greater than the tensile strength of the seal material. Seal material and adhesive shall be impervious to attack by acids and caustics.

3. Leakage through the closed damper at 70□ F and 10 inches water column differential pressure shall not exceed 30 cfm per square foot of conduit cross-sectional area for rectangular dampers.

4. Damper linkage shall be capable of transmitting twice the maximum torque required by the damper at 20 inches differential pressure. Linkage lever arms shall be a minimum of 3 inches, and the lever arms shall be tack-welded to the axles.

C. STANDARD ROUND DAMPERS: Round dampers shall be butterfly dampers suitable for balancing and shut-off. Dampers shall be constructed between two flanges unless shown otherwise. Minimum damper blade thickness shall be equal to flange thickness specified in this section. Share seal shall be Viton O-ring. Leakage through the closed damper at 70□ F and 10 inches water column differential pressure shall not exceed 30 cfm per square foot of conduit cross-sectional area. Standard round dampers shall be Spundstrand, Swartwout Model 914, or approved equal.

D. LOW LEAK ROUND DAMPERS: Low leak dampers shall be suitable for air tight sealing, and leak free at 28 inches w.c. pressure for one hour. Dampers shall be constructed between two flanges. Minimum damper blade thickness shall be equal to flange thickness specified in this section. Share seal shall be Viton O-ring. Low leak dampers shall be provided similar to the detail drawing in this specification section and installed at the locations shown on the contract drawings. Low leak dampers shall be Spundstrand ZL Series, Ershigs Type B, or approved equal. Unless shown otherwise on drawings, all round dampers shall be low leak.

E. ACTUATORS: All actuators for all dampers shall be independently supported.

2.8 INSPECTION PLATES

A. Removable inspection plates, covering 8 inch round or 8 inch square access holes, shall be provided at all fan inlet and discharge connections and upstream and downstream from all operable fittings such as dampers, , screens, filters, and at all primary instrument locations. Inspection plates shall be gasketed and shall make an airtight seal with the parent duct. Inspection plates shall be fabricated of the same material as the parent duct.

B. Fabricator shall propose and submit construction, location, and installation details of inspection plates.

2.9 BLAST GATES

A. Blast gates shall be provided in accordance with this specification section and installed at the locations shown on the contract drawings.

2.10 DRAINS

A. Drains sumps shall be 1 1/2-inch flanged outlets fabricated and installed in accordance with the detail drawings in this section. Each drain shall be fitted with a 316 stainless steel blind flange with a 1 inch NPT PVC half-coupling mounted at its center.

B. In addition to drains shown on the drawings, drain sumps with 1 1/2-inch minimum flanged outlets shall be provided at all low points. All drain sumps shall be fitted with a 1 1/2-inch PVC ball valve. Drains shall be FRP or Schedule 80 PVC.

C. Fabricator shall propose and submit construction, location, and installation details of drain sumps.

2.11 PRODUCT DATA

A. The following information shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook:

1. Installation certification Form 11000-A as specified in paragraph 13234-3.02.

PART 3 - EXECUTION

3.1 GENERAL

A. Refer to Section 13230. Unless otherwise specified, all ductwork shall be filament wound construction.

3.2 INSTALLATION

A. GENERAL: All material and equipment shall be installed as specified and as required by the applicable state and local codes. All ductwork indicated on the drawings is schematic. Therefore, changes in duct size, duct configuration, and location may be necessary to conform to field conditions. All such changes shall be submitted to the Construction Manager for approval prior to fabrication or construction.

B. FIELD JOINING MATERIALS: FRP duct manufacturer shall supply all materials needed for any required FRP duct field joining. Supply of these materials shall be in accordance with the requirements of this Section and Section 13230.

C. FIELD JOINING: Any required field joining shall be accomplished by the Field Joining Contractor in accordance with the requirements of this section and Section 13230. The Field Joining Contractor shall have a minimum five years experience in FRP ductwork.

D. INSTALLATION AND SUPPORT: FRP ductwork shall be installed and supported in accordance with Chapter 11 of the Uniform Mechanical Code. Ductwork shall be supported as described in Paragraph 13234-2.06. Large elbows and terminal ends of ducts shall be supported independently. Flexible connections as described in Paragraph 13234-2.05 shall be provided between fans and ductwork, and elsewhere as indicated on the layout drawings.

E. CERTIFICATION: The installation shall be certified on Form 11000-A, Section 01999.

3.3 FIELD QUALITY CONTROL

A. TESTING: All ductwork shall be leak-tested as described in Section 15050. All audible leaks shall be sealed. All tests shall be scheduled with the Construction Manager by giving 24 hours notice. The Contractor shall provide necessary fittings, blind flanges, etc. to isolate sections of duct and to enable all sections of ductwork to be tested.

B. MANUFACTURER'S SERVICES:

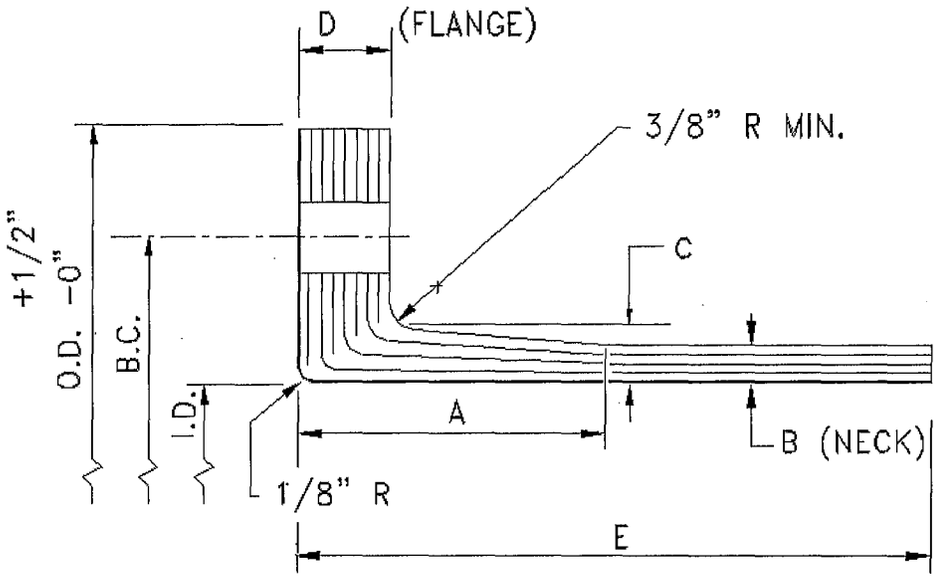
1. The Fabricator shall provide a representative on-site at the start of the installation of the ductwork to supervise installation of the FRP duct system. To ensure the Contractor is employing the proper procedures, the Fabricator shall remain on-site to witness installation of all ductwork. The Fabricator shall be on-site no less than two 8-hour days during the start of installation.

2. The Fabricator shall instruct the Contractor on the proper installation procedures at any time the Fabricator and/or the Construction Manager witnesses improper installation practices.

DUCT I.D.	F.W. WALL THK. (TABLE 1)	H.L.U. WALL THK. (TABLE 2)
Up to 12"	0.21"	0.24"
14"	0.21"	0.24"
16"	0.21"	0.24"
18"	0.24"	0.33"
20"	0.24"	0.33"
24"	0.27"	0.33"
30"	0.32"	0.39"
36"	0.35"	0.46"
42"	0.38"	0.50"
48"	0.41"	0.54"
54"	0.41"	0.64"
60"	0.41"	0.64"

FRP DUCT AND FITTING THICKNESS

DETAIL-1



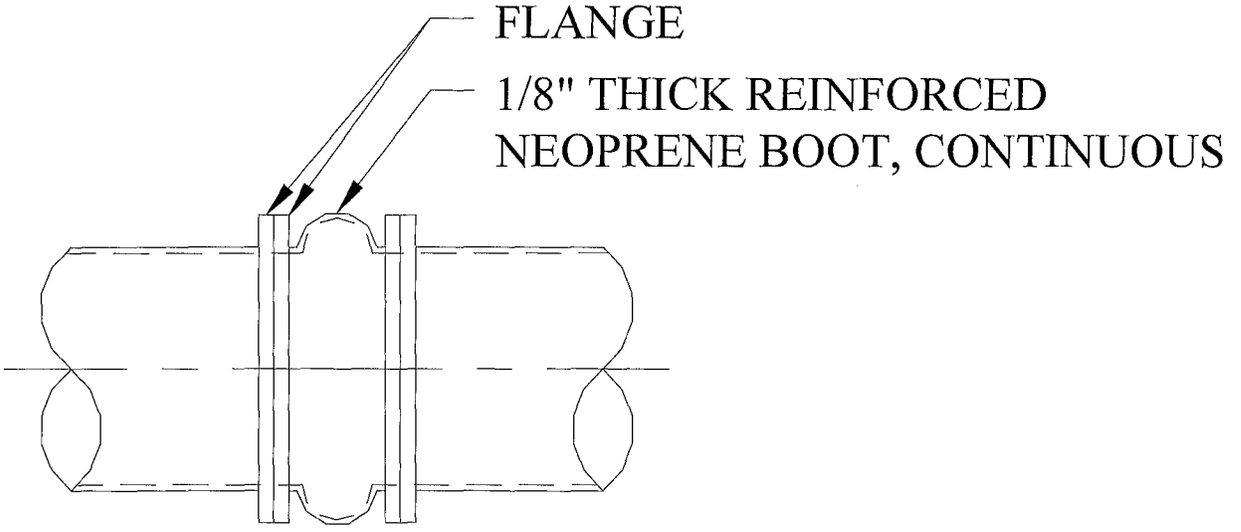
FRP DRILLED FLANGE - DUCT DRILLING

NOZZLE I.D.	NOZZLE O.D	BOLT CIRCLE	NO. OF BOLT HOLES	DIA. OF BOLT HOLES	A	B (Table 2)	C	D
Up to 12"	16 3/8"	15"	12	1/2"	2"	0.24"	0.37"	0.50"
14"	18 3/8"	17"	12	1/2"	2"	0.24"	0.37"	0.50"
16"	20 3/8"	19"	16	1/2"	2 1/2"	0.24"	0.44"	0.63"
18"	22 3/8"	21"	16	1/2"	2 1/2"	0.33"	0.48"	0.63"
20"	24 3/8"	23"	20	1/2"	2 1/2"	0.33"	0.48"	0.63"
24"	28 3/8"	27"	20	1/2"	2 1/2"	0.33"	0.48"	0.63"
30"	34 3/8"	33"	28	1/2"	2 1/2"	0.39"	0.51"	0.63"
36"	40 3/8"	39"	32	1/2"	2 1/2"	0.46"	0.55"	0.63"
42"	46 3/8"	45"	36	1/2"	3"	0.50"	0.63"	0.75"
48"	54 3/8"	52"	44	5/8"	4"	0.54"	0.77"	1.00"
54"	66 3/8"	58"	44	5/8"	4"	0.64"	1.00"	1.00"
60"	66 3/8"	64"	52	5/8"	4"	0.64"	1.00"	1.00"

FRP DRILLED FLANGE – 125/150 PATTERN

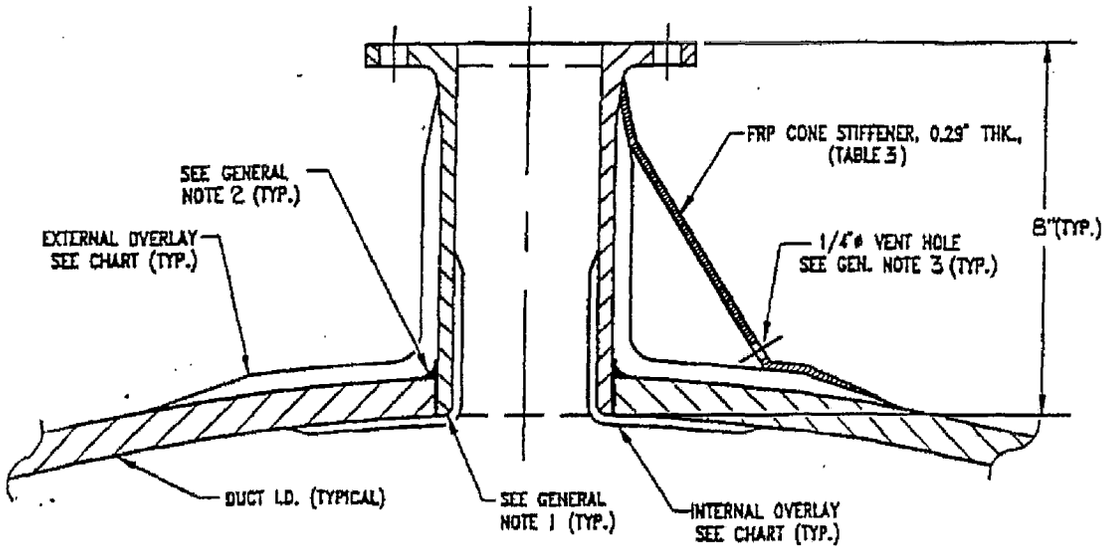
NOZZLE I.D.	NOZZLE O.D	BOLT CIRCLE	NO. OF BOLT HOLES	DIA. OF BOLT HOLES	A	B (Table 2)	C	D	E
1-1/2"	5"	3-7/8"	4	5/8"	2"	0.24"	0.50"	0.50"	8"

FRP FLANGES
DETAIL-2



EXPANSION BOOT

DETAIL-3



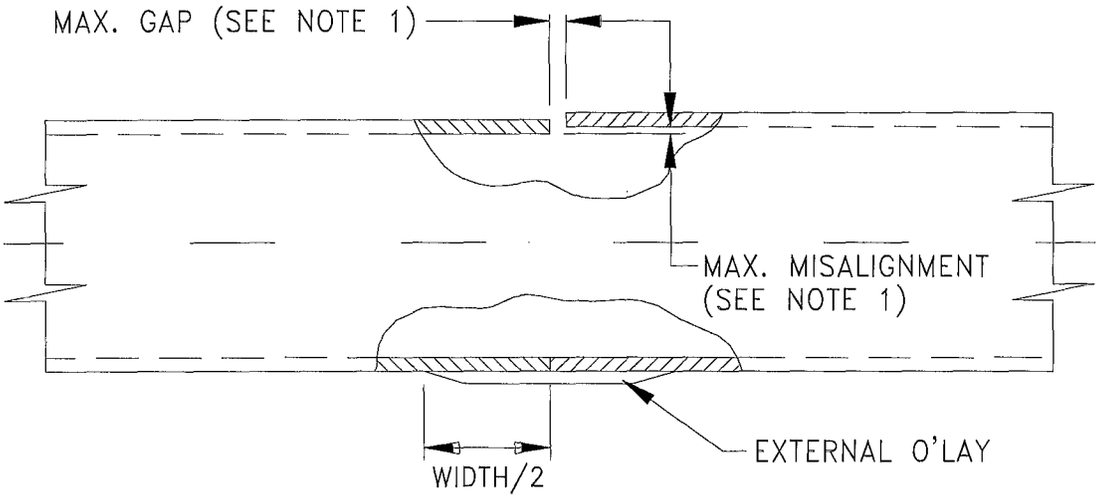
NOZZLE I.D.	EXTERNAL OVERLAY		INTERNAL OVERLAY	
	THK. (TABLE 2)	WIDTH	THK.	WIDTH.
1 1/2"	0.29"	10"	(MMCC)"	4"

GENERAL NOTES:

1. Radius inside edge of nozzle, 1/8" min. to 1/4" max.
2. Fill voids with resin putty. Flare putty into a radius 1/4" min. to 3/8" max.
3. Locate vent hole as low as possible, resin coat edge of hole.

1 ½" DIA. DRAIN AND NOZZLE INSTALLATION

DETAIL-4

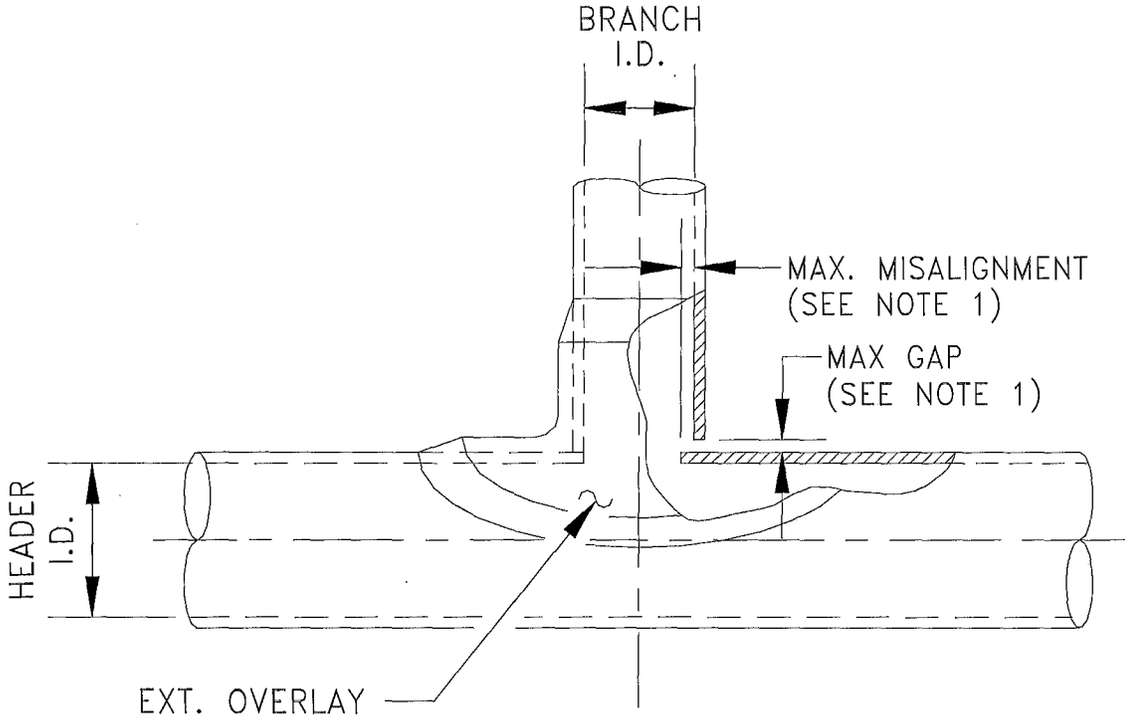


FRP DUCT BUTT AND MITER JOINT OVERLAY		
DUCT I.D.	EXTERNAL OVERLAY (TABLE 2)	
	THICKNESS	WIDTH
Up to 12"	0.24"	8"
14"	0.24"	8"
16"	0.24"	8"
18"	0.33"	10"
20"	0.33"	10"
24"	0.33"	10"
30"	0.42"	12"
36"	0.46"	12"
42"	0.54"	12"
48"	0.54"	12"
54"	0.64"	14"
60"	0.64"	16"

NOTES:
1. See Section 13230 for assembly tolerances.
2. For 24" diameter and larger, and where accessible, apply an internal overlay (MMC) 6"wide.

FRP BUTT AND MITER JOINTS

DETAIL-5

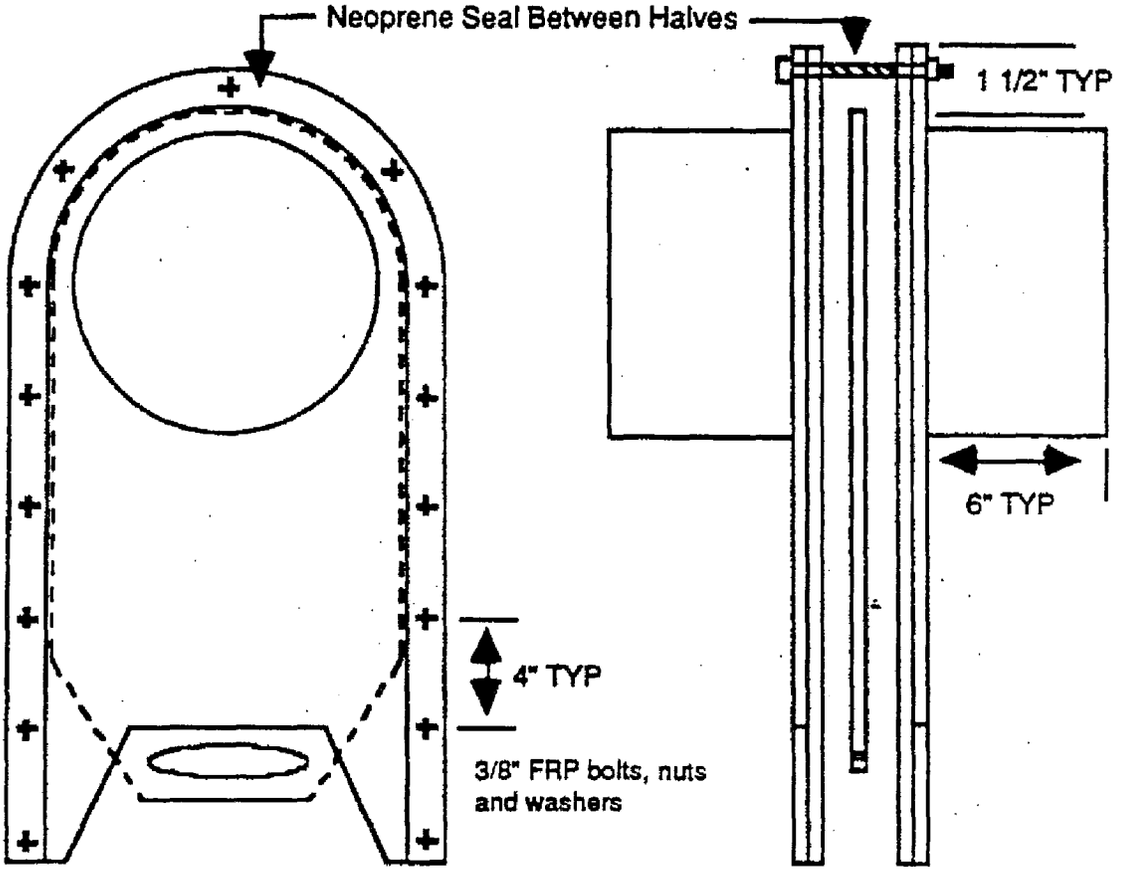


FRP DUCT TEE AND LATERAL JOINT OVERLAY		
DUCT	EXTERNAL OVERLAY (TABLE 2)	
I.D.	THICKNESS	WIDTH
12"	0.33"	10"
14"	0.33"	10"
16"	0.33"	10"
18"	0.39"	12"
20"	0.39"	12"
24"	0.39"	12"
30"	0.46"	14"
36"	0.54"	14"
42"	0.57"	16"
48"	0.64"	16"
54"	0.64"	16"
60"	0.64"	16"

NOTES:
1. See Section 13230 for assembly tolerances.
2. Fill voids with resin putty as shown. Flare putty into a radius 1/4" min. to 3/8" max.
3. For header diameter 24" and larger, and where accessible, apply an internal overlay (MMC) 6"wide.

FRP TEE AND LATERAL JOINTS

DETAIL-6

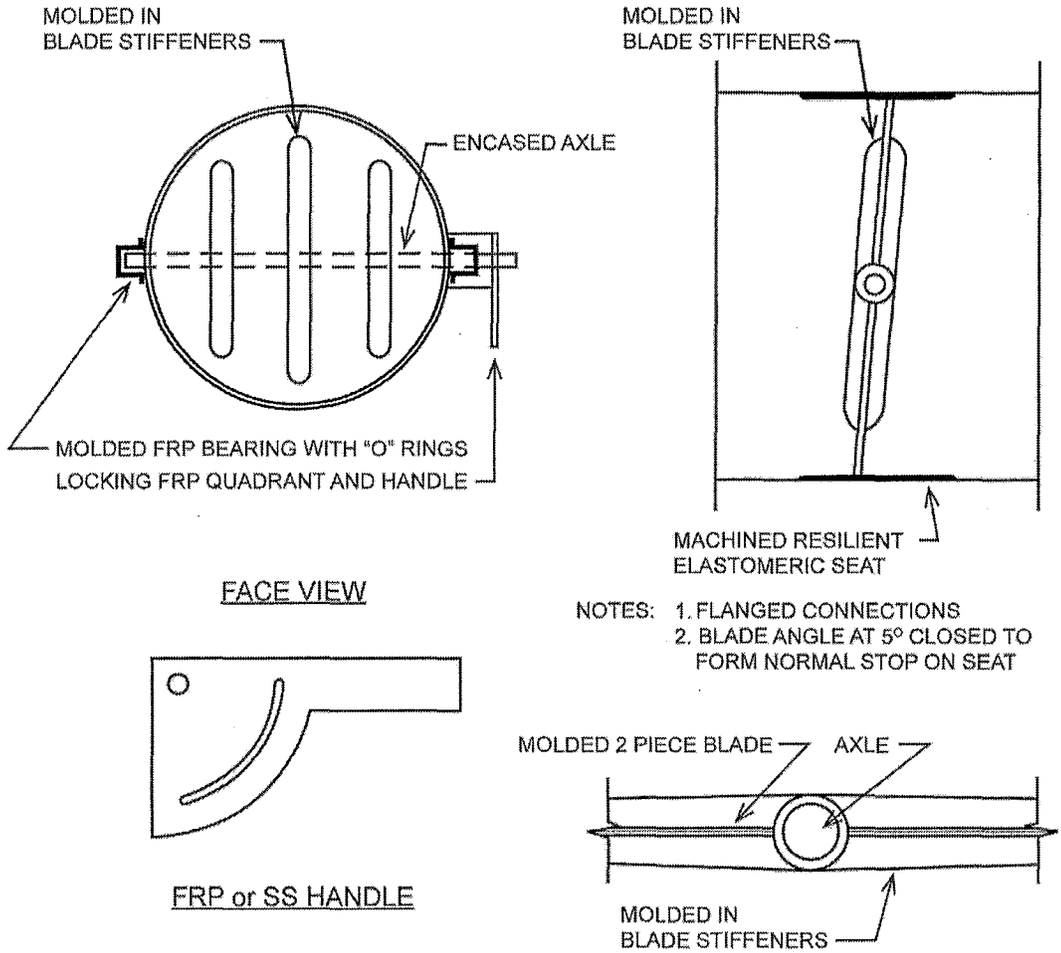


VINYLESTER RESIN
NEOPRENE SEALS

CONSTRUCTION	BLADE THKNESS	HOLE SIZE	BOLT SIZE
4" THRU 16"	.187	7/16"	3/8"
18" THRU 24"	.250	7/16"	3/8"
26" THRU 36"	.320	7/16"	3/8"
42" THRU 72"	.375	9/16"	1/2"

TYPICAL ROUND BLAST GATE
ALL FRP CONSTRUCTION

DETAIL-7



VITON OR EPDM SEAT

CONSTRUCTION	BLADE THKNESS	AXLE DIM	BLADE STIFFENERS
4" THRU 10"	.125	0.75	--
12" THRU 16"	.125	1.0	1
16" THRU 22"	.187	1.0	2
24" THRU 28"	.25	1.5	2
30" THRU 36"	.375	1.5	3

LOW LEAK ROUND DAMPER

DETAIL-8

****END OF SECTION****

SECTION 13300

INSTRUMENTATION AND CONTROL

PART 1 - GENERAL

1.1 WORK OF THIS SECTION

A. 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.

B. The CONTRACTOR shall be responsible for the design, procurement, installation, testing, training, and documentation for instrumentation and control systems provided under this Contract. The CITY shall be responsible for programming of the existing distributed control system (DCS) and control systems integration. The CONTRACTOR shall be responsible for interfacing with the DCS components, including installing and terminating DCS inputs and outputs (I/O), providing power, and for installing and testing all equipment.

C. Per Section 2-5 and applicable subsections of the Greenbook and the Whitebook, 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.

D. These drawings shall be forwarded to the Design Engineer. The Design Engineer will incorporate the CONTRACTOR's data and generate a complete loop drawing for each measuring or control loop. The loop drawing shall include a minimum of 3 sheets as required in paragraph 1.5 B.2.

E. 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).

F. 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.

1.2 RELATED SECTIONS

A. The WORK of the following Sections applies to the WORK of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent

required for proper performance of this WORK.

1. Division 11 Equipment, as applicable

2. Division 15 Mechanical, as applicable

3. Division 16 Electrical, as applicable

1.3 CODES

A. WORK of this Section shall comply with the current editions of the following codes as adopted by the City of San Diego Municipal Code:

1. Uniform Fire Code

2. National Electrical Code

1.4 SPECIFICATIONS AND STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the WORK of this Section:

Reference	Title
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

Reference	Title
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 SUBMITTALS, SHOP DRAWINGS, AND SAMPLES

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information and activities:

1. The CONTRACTOR shall arrange and conduct a Presubmittal Conference within 60 days after award of the Contract. The purpose of the Presubmittal Conference is to review and approve the manner in which the CONTRACTOR intends to carry out its responsibilities for shop drawing submittal on the WORK to be provided under this Section. The CONTRACTOR and the CONSTRUCTION MANAGER shall attend. Both the CONTRACTOR and the CONSTRUCTION MANAGER may invite additional parties at their discretion.

2. The CONTRACTOR shall allot two, 4-hour days for the Conference.

3. The CONTRACTOR shall prepare the following for discussion at the Conference:

   a. List of equipment and materials for the instrumentation systems, including proposed manufacturer names and model numbers.

   b. List of proposed clarifications to the indicated requirements plus a brief written explanation of each exception. Review and acceptance of proposed clarifications will be according to Section 01600.

c. One complete example of each type of submittal proposed.

d. A flow chart showing the steps the CONTRACTOR will take in preparing and coordinating each submittal to the CONSTRUCTION MANAGER.

e. A bar chart type schedule for the WORK provided under this Section, covering the time period beginning with the conference and ending after startup and training. Dates for the beginning and ending of submittal preparation, submittal review, design, fabrication, programming, factory testing, delivery to the site, installation, field testing, and training shall be scheduled. The schedule shall be subdivided into major items or groups of items which are on the same schedule.

4. The CONTRACTOR shall furnish 3 copies of all the items above to the CONSTRUCTION MANAGER.

5. The CONTRACTOR shall take formal minutes of the Conference, including all events, questions, and resolutions. Prior to adjournment, all parties must concur with the accuracy of the minutes and sign accordingly.

B. SHOP DRAWINGS:

1. GENERAL:

a. Preparation of shop drawings shall not commence until adjournment of the Presubmittal Conference.

b. Preliminary Shop Drawings shall be submitted as a single package at one time within 90 days of the commencement data stated in the Notice to Proceed.

c. Both paper (hard copy) and electronic copies are required for both Preliminary and Final Shop Drawing submittals.

d. In the Contract Documents, all systems, meters, instruments, and other elements are represented by symbology derived from the latest version of ANSI/ISA S5.1. The nomenclature and numbers indicated herein shall be used exclusively in all shop drawings. No manufacturer's standard symbology or nomenclature shall replace those indicated in the Contract Documents.

e. During the period of shop drawing preparation, the CONTRACTOR shall maintain a direct, informal liaison with the CONSTRUCTION MANAGER for exchange of technical information. As a result of the exchange, certain minor refinements and revisions to the indicated systems may be authorized informally by the CONSTRUCTION MANAGER but these shall not alter the WORK or cause increase or decrease in the Contract Price. During informal exchanges, no statement by the CONSTRUCTION MANAGER

shall be construed as approval of any component or method or exception to or variation from these Contract Documents.

2. SUBMITTALS:

a. Preliminary Submittal: Four copies of the preliminary submittal shall be provided for the City's review. Documents shall be in PDF format.

b. Final Submittal: All documents, including design and O&M documents, shall be provided on CD-ROM. One set of CD-ROMS shall contain the native file formats (Microstation, MS Word, MS Excel, etc), and the other in PDF format, using the same file name with "PDF" or "TIF" as the file extension. Four copies of the final submittal shall be provided.

c. Each document shall be indexed, and a database table in Excel shall be provided which includes the following data for each document:

(1) Document file name

(2) Document description

(3) Hard Copy Catalog No. (used by facility document coordinator)

(4) Document Type:

(a) Shop drawings

i) P&IDs

ii) Loop Drawings

iii) Instrument Data Sheets

iv) Other

(b) Manufacturer's data

(c) Maintenance instructions

(d) Training

(5) Facility Name

(6) Specification Number

(7) Process Name

(8) Unit Process Number

d. Electronic Document Submittal Requirements:

(1) All documents shall be submitted in electronic format, including shop drawings manufacturer's data and O&M manuals.

(2) Documents shall be in Adobe Acrobat PDF format, version as specified by the Contract Manager. Vendor and Contractor shop drawings developed under the Contract shall be in Bentley Microstation (.DGN) format. Documents in electronic format (WordPerfect, Microsoft Word, Excel, Lotus, etc.) shall be electronically converted to standard PDF format. In order to minimize file size, drawing conversion from Microstation files to Acrobat PDF shall be in monochrome.

(3) Deviation from this standard will be accepted only if advance approval is given by the Owner.

(4) Documents not available in electronic format shall be scanned at 300 dpi, bitonal (black and white) for documents without graphics, or 150 dpi color for documents with graphics where color is required for legibility, and converted into Adobe Acrobat (PDF). Scanned image enhancement software shall be used. PDF sub-format shall be full Image Hidden Text PDF file format.

(5) All PDF documents shall be reviewed, and corrected if necessary, for orientation and legibility.

(6) Individual document files shall not exceed 3 megabytes in size.

e. Paper Document Submittal Requirements:

(1) All shop drawings shall include the letterhead or title block of the CONTRACTOR. The title block shall include, as a minimum, the CONTRACTOR registered business name and address, project name, drawing name, revision level, and personnel responsible for the content of the drawing.

(2) Shop drawing copies shall be submitted as standard size 3-ring, loose-leaf, vinyl plastic binders suitable for bookshelf storage. Maximum binder size shall be 2 inches.

(3) A complete index shall be placed at the front of each binder.

(4) A separate technical brochure or bulletin shall be included for each instrument, meter system, and other element. The brochures shall be indexed by systems or loops. If, within a single system or loop, a single item is employed more than

once, one brochure may cover all identical uses of that item in the system. Each brochure shall include a list of tag numbers to which it applies. System groups shall be separated by labeled tags.

(5) All shop drawings shall be produced in using Microstation CAD formats. Each shop drawing submittal shall include the requisite number of hard copies and one (1) Microstation electronic copy. Upon completion of this project, the Contractor shall submit four (4) electronic copies of all current shop drawings.

3. LOOP DIAGRAMS: loop diagrams shall be provided conforming 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. The following three-sheet format is required:

a. Sheet 1: A device schedule developed from an electronic spreadsheet or database file, which will be submitted with the loop diagrams. The table will show the following:

(1) Device tag number, with Prefix, Unit Process, ISA Tag Prefix, Tag No. (a three or four-digit number based on the loop number) and Tag suffix

(2) Equipment Service

(3) Device Type

(4) Location

(5) Device Manufacturer

(6) Model No.

(7) Spec. No.

(8) Area Contractor (if applicable)

(9) Submittal No.

(10) Calibrated Range/Remarks

(11) Data Sheet No.

(12) I/O Signal type (AI, AO, DI, or DO)

(13) Signal Level

(14) Device Range (full available instrument range)

(15) Engineering Units

(16) Process Set Point

(17) Loop Diagram No., reflecting the field instrument tag number.

(18) Loop Drawing File Name

(19) Interconnect Drawing File Name

b. Sheet 2: Loop drawing meeting the Requirements of ANSI/ISA S5.4, except that intermediate terminal junction boxes may omitted and be shown on Page 3 for clarity. Butt splices and wire nuts shall be shown on as-builts, with the corresponding termination housing (JB, LB, etc. shown on Sheet 3.

c. Sheet 3: (Expansion sheet - required if the number of intermediate devices or terminal junction boxes exceeds what can be legibly shown on Sheet 2). Abbreviated diagram showing instrument, wire and cable numbers, intermediate terminal junction boxes, and PCM terminations. Wire identification numbers will reflect the field instrument tag number, and not the DCS I/O number.

d. 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
QI	In Computer status
ZSO	Device Open
ZSC	Device Closed
MI	Motor Run
HS	Equipment Start/Stop

4. Technical brochures, bulletins and data sheets containing:

a. Fully completed ISA S20 data sheets

b. Component functional descriptions

c. Locations or assembly at which component is to be installed

d. Materials of a component's parts which will be in contact with process fluids or gases

5. SHOP DRAWINGS of differential pressure producing flow tubes and elements, showing the device's proportions and performance. The

CONTRACTOR shall furnish a certified curve from the manufacturer showing flow versus differential pressure for each flow metering device furnished. Where applicable, the following data shall be furnished for each device:

a. Coefficient values and tolerances

b. Effects of upstream configuration

c. Headloss as a function of the velocity head expended

d. Test results from a recognized hydraulic laboratory showing that the discharge coefficient is within 0.75 percent of standard for each meter. Documentation tabulating tests of at least 30 different meters of the same type which show compliance with the two standard deviation tests in ASME "Fluid Meters," Sixth Edition, will be an acceptable alternative.

6. 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 CONSTRUCTION MANAGER, 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.

7. 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.

8. Installation, mounting, and anchoring details for all components and assemblies to be field-mounted, including conduit connection or entry details.

9. Complete control panel layouts, all drawn to a 1-1/2 inch=1 foot scale showing:

a. 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.

b. All cutout locations fully dimensioned. All outside panel dimensions shall be shown.

c. Locations of back-of-panel stiffeners.

d. 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.

e. Nameplate engraving list.

f. 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

A. The Owner's Manual shall be submitted in both paper and electronic format. Electronic format shall conform to the Electronic Document Submittal Requirements for Shop Drawings.

B. Information included in the OWNER'S MANUAL shall comply with the requirements of Section 2-5 and applicable subsections of the Greenbook and the Whitebook, with the following exceptions:

1. 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.

2. Final copies of the OWNER'S MANUAL, after revision, shall be submitted to the CONSTRUCTION MANAGER 15 days prior to startup.

C. The following shall be included in the OWNER'S MANUAL in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook:

1. Installation, connection, operating, troubleshooting, maintenance, and overhaul instructions from the manufacturer.

2. Exploded or details views of all instruments, assemblies, and accessory components.

3. Parts lists and ordering instructions.

4. Wiring diagrams.

5. A list of spare parts for 1 year operation recommended by the manufacturers of all analog equipment.

1.7 AS-BUILT DRAWINGS

A. As-built drawings shall be prepared in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook with the following exceptions and changes:

1. 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 13and 16 of this Contract.

2. One set of original drawings and two copies of each as-built drawing under this Section shall be submitted to the CONSTRUCTION MANAGER after completion of field checkout but before placing the systems in service for the OWNER'S use.

3. Drawings shall also be submitted in electronic format (Microstation)

1.8 SERVICES OF MANUFACTURER

A. 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.

1. Inspection, checking and calibrating the equipment.

2. Startup and field testing for proper operation.

3. Performing field adjustments to ensure that installation and operation comply with the Specifications.

B. INSTRUCTION OF OWNER'S PERSONNEL: The manufacturer's technical service representative shall instruct the OWNER'S personnel as indicated in Paragraph 3.4.

1.9 SPECIAL GUARANTEE

A. The CONTRACTOR shall guarantee the WORK of this section for one year 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.

1.10 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. 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.

B. STORAGE: Products shall be carefully stored in a manner that will prevent damage and in an area that is protected from the elements.

1.11 ENVIRONMENTAL CONDITIONS

A. 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.

B. 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:

1. Temperature Range: 0 through 50 degrees C (32 through 122 degrees F)

2. Thermal Shock: 0.55 degrees C per minute (1.0 degrees F per minute)

3. Relative Humidity: 20 through 95 percent (non-condensing)

C. 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).

D. 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 CONSTRUCTION MANAGER 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.

1.12 CABLE NUMBERING

A. The first two characters denote the facility or area number.

B. The second group of characters identifies the device being served (field device, not

C. 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.

D. 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 ( ).

E. 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

A. 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.

B. 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.

C. 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.

D. 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.

E. Mercury switches and components containing liquid mercury shall not be used.

F. 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 milliamperes 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.

G. 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.

H. 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.

I. Each control loop shall be individually fused.

2.2 CONTROL PANELS

A. GENERAL: Control panels, including those furnished by equipment manufacturers, and shall be provided according to the following requirements.

1. 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 CONSTRUCTION MANAGER'S approval.

2. 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.

3. Panels shall be fabricated, piped and wired by fully qualified workmen who are properly trained, experienced and supervised.

B. MATERIALS:

1. 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.

2. Relay rack high density type panels shall utilize standard relay racks with 14 gage steel frame and supports.

3. Structural Shapes and Strap Steel: ASTM A 283.

4. 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.

C. FABRICATION:

1. 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-feet 6-inches wide or five 2-feet 0-inches wide standard panels. The vertical joints of these panels shall align with the vertical joints of the standard panels.

2. 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.

   a. The flanged edges of all panels shall be straight and smooth. Corners shall be welded and ground smooth.

   b. The face of the panel shall be true and level after flanging.

   c. 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.

   d. Adjacent panels shall be assembled with faces flush. Gaps or cracks shall not be visible from the front of the assembled instrument board.

   e. 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.

   f. Panels shall be self-supporting as defined below.

D. FRAMEWORK AND SUPPORTS:

1. 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.

2. 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.

E. FINISH:

1. 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.

a. All high spots, burrs, and rough spots shall be ground smooth.

b. The surfaces shall be sanded or sandblasted to a smooth, clean bright finish.

c. All traces of oil shall be removed with a solvent.

2. FINISHING:

a. A 3-mils dry coat of Amercoat 185 or equal primer shall be applied over the entire panel surface immediately after solvent cleaning.

b. Wet sand, dry, then quick glaze spot putty on the front of the panel only. Dry, then wet sand again and dry.

c. Apply a second 3-mils dry coat of alkyd enamel primer to the front of the panel.

d. Wet sand to smooth clear finish, then dry.

e. 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 CONSTRUCTION MANAGER.

f. The CONTRACTOR shall furnish two 1-pint containers of the enamel to the CONSTRUCTION MANAGER.

3. 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

F. MOUNTING OF INSTRUMENTS:

1. 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.

2. The CONTRACTOR shall also mount, behind the panels, other instrument accessory items as indicated.

3. Rear of panel mounted equipment shall be installed with due regard to commissioning adjustments, servicing requirements and cover removal.

4. Wiring shall be kept clear of spare space to give maximum space for future additions.

G. PIPING REQUIREMENTS FOR CONTROL PANELS:

1. GENERAL:

a. 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.

b. Each terminal connection shall have an engraved metal or plastic plate with a terminal and instrument tag number affixed nearby.

c. 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.

2. Air Supply Piping:

a. 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.

b. 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.

c. 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.

d. 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.

e. 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.

f. The dead end of the air header opposite the supply end shall be fitted with a plugged ½-inch brass gate valve.

g. 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

H. ELECTRICAL REQUIREMENTS FOR CONTROL PANELS:

1. The CONTRACTOR shall provide all wiring, conduit, wireways, and switches required to make instruments and other panel electrical devices operational.

2. 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.

3. 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.

4. 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.

5. 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.

6. Smaller panels shall be sized to adequately dissipate heat generated by equipment mounted in or on the panel.

7. 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.

8. Smaller panels shall be provided with a hand-switch controlled 100-watt incandescent light and a breaker protected 120-volt, 15-amp duplex receptacle.

9. 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.

10. CONSTRUCTION:

a. 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.

b. Flexible conduit is not acceptable.

c. Conduit fittings shall be cast fittings.

d. Soldered or pressure crimped wire splicing in conduits shall be acceptable.

e. 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.

f. 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.

g. 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.

11. POWER SUPPLY WIRING:

a. Unless otherwise indicated, all instruments, all alarm systems, and all motor controls shall operate on 24 VDC circuits.

b. The CONTRACTOR shall furnish terminal box connections for the main power supply entry as indicated.

c. 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.

d. 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.

e. 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.

f. 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.

12. 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.

13. SIGNAL WIRING:

a. 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:

(1) Positive - Black (+)

(2) Signal Ground Negative - White (-)

(3) Equipment Ground - Green

(4) Ungrounded - Red

(5) Energized by voltage sound external to panel - Yellow

(6) DC circuit - Blue

b. 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.

c. Multi-conductor cables, wireways and conduit shall provide for 10 percent allocation of spare, unused signal wires in addition to the indicated requirements.

14. THERMOCOUPLE WIRING:

a. 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 CONSTRUCTION MANAGER. 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.

b. 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.

c. Conduit for thermocouple lead wire shall be in accordance with the following:

CONDUIT SIZE	½"	3/4"	1"	1½"	2"
NO. OF DUPLEX LEADS	1	4	6	16	26

d. 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.

e. All thermocouple wireways and main conduits shall be sized to allow for 10% spare thermocouple leads.

f. 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.

15. 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.

I. COLOR CONVENTIONS: Lens covers for indicating lights on all panels will be colored as follows:

1. Red-ON when;

- Motor not running (STOPPED)
- Valve CLOSED (not fully opened)
- Device not energized.
- Circuit breaker OPENED

2. Green-ON when;

- Motor running in forward direction (fast speed for multi-speed motors).
- Valve OPEN (not fully closed)
- Device energized.
- Circuit breaker CLOSED

3. White-ON when;

- Power available
- System in AUTOMATIC mode.
- Monitoring taking place.

4. Amber-ON when;

- Malfunction trip.
- Equipment locked out.
- Alarm condition

J. 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.

K. FACTORY INSPECTION:

1. Panels shall be inspected for compliance with requirements at the factory before shipment to the site. The CONTRACTOR shall notify the CONSTRUCTION MANAGER 2 weeks in advance of the testing date. A representative of the CONSTRUCTION MANAGER will visit the factory to make the inspection.

2. CONTRACTOR shall perform the following tests prior to arrival of the CONSTRUCTION MANAGER:

   a. All air lines adequately tested for leaks.

b. All alarm circuits rung out to determine their operability.

c. Electrical circuits checked for continuity and where applicable, operability.

d. Nameplates checked for correct spelling and correct size of letters.

e. Other test required to place the panel in an operating condition.

3. It shall be the responsibility of the CONTRACTOR to furnish all necessary testing devices and sufficient manpower to perform the tests required by the CONSTRUCTION MANAGER to determine conformance to the requirement of the Contract documents.

4. If the above tests have not been performed prior to the arrival of the CONSTRUCTION MANAGER, the CONTRACTOR shall reimburse the OWNER for the cost of the extra time required for the inspector's services and travel expenses

L. 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

A. 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.

B. 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.

C. TIME DELAY RELAYS: Time delay relays shall be electronic on delay or off delay type with contacts rated 10amperes at 120 volts AC. Units shall include adjustable dials with graduated scales covering the indicated time range.

D. 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.

E. 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 PROGRAMMABLE LOGIC CONTROLLER (PLC):

A. Where required, the CONTRACTOR shall furnish, install, program, test, calibrate, fully configure and place into operation Programmable Logic Controllers (PLCs) as specified herein. These requirements also pertain to all PLCs provided under Divisions 11, 15, and 16.

B. GENERAL: The CONTRACTOR shall furnish all necessary interconnecting cables, all accessories, and all appurtenances as indicated herein or as required for proper operation of the system. All major PLC components of the system shall be of the same manufacturer and PLC family product line. All equipment shall be housed in an enclosure or control panel suitable for the intended operation and location. The PLC system shall be capable of tolerating and capable of riding through a power interruption of 8 milliseconds or less without interruption of normal operation. The PLC system shall be Allen Bradley to match existing.

C. CONSTRUCTION: The PLC central processing unit (CPU) shall be of solid-state design. The PLC system shall be provided with a housing or chassis with enough slots to handle all power supplies, CPUs, I/O cards, and communication modules. All CPU operating logic shall be contained on plug-in modules for quick replacement. Chassis wired logic is not acceptable. The controller shall be capable of operating in a hostile industrial environment (i.e., heat, electrical transients, RFI, vibration, etc.) without fans, air conditioning, or electrical filtering (up to 60 degrees C and 95 percent humidity).

D. DESIGN: The PLC shall be furnished with I/O (input/output) modules suitable for interfacing with new and existing field devices. The PLC I/O modules shall be 4-20 mA signals for analog inputs and analog outputs and shall be 24 VDC and/or 120 VAC signals for discrete inputs and discrete outputs. The PLC shall provide internal fault analysis with a fail-safe mode and a dry contact output for remote location alarming, and a local indicator on the PLC frame in the event of a fault in the PLC.

E. CENTRAL PROCESSOR: The central processor shall contain all the relays, timers, counters, number storage registers, shift registers, sequencers, arithmetic capability, and comparators necessary to perform the specified control strategy functions. It shall be capable of interfacing sufficient discrete inputs, analog inputs, discrete outputs, and analog outputs to meet the specified requirements plus an additional 25 percent excess capacity. The power supply shall contain capacitors to provide orderly shutdown in the event incoming power does not meet specifications. If this occurs, the processor shall cease operation, forcing all outputs off. The processor shall have a key type memory protect switch to prevent unauthorized program changes. The central processor shall be 32-bit, minimum.

F. MEMORY:

1. The programmable controller memory shall be Complementary Metal Oxide Semi-conductor (CMOS) based memory with battery backup or Erasable Programmable Read-Only Memory (EPROM) based memory. The CMOS memory shall be a minimum of 21K with sufficient battery backup to retain the program during power interruptions of up to 1 year. An indicator shall show the status of the batteries. A reference shall be available through the

discrete outputs to alarm the operator that the batteries should be changed.

2. The PLC shall be supplied with sufficient memory to implement the specified control strategy functions plus a reserve capacity of 25 percent of the total provided. This reserve capacity shall be totally free from any system use. The memory shall be programmed in a multi-node configuration with multiple series or parallel contacts, counters, timers, and arithmetic functions.

G. CONTROLLER: The controller shall have its control strategies programmed in a "ladder logic" language. It shall be easily reprogrammed with a laptop computer as specified below. The PLC system shall be programmed by the CONTRACTOR to perform the specified control strategies and monitoring functions. Two documented copies, in hardcopy and electronic format, of the operating PLC program(s) shall be furnished to the OWNER which shall allow direct, step-by-step, reloading of the PLC system program(s). The ladder logic shall reflect equipment name designations used in the PLC as well as the Contract Drawing equipment name designations (i.e., timer "Q" in the Contract Drawing may become timer OL in PLC program).

H. POWER SUPPLY: The PLC shall be provided with all requisite power supplies and shall operate at the following:

1. 120V ac RMS plus or minus 15 percent continuously.

2. 120V ac RMS plus or minus 30 percent maximum 30 seconds.

3. 120V ac RMS plus or minus 100 percent maximum milliseconds.

4. Line spikes at 1000V ac (5000 micro-seconds duration; 0.05 percent maximum duty cycle).

I. INPUT/OUTPUT MODULES: All I/O housings and I/O modules shall be of rugged construction with modules in place. Sufficient input and sufficient output modules shall be provided with the PLC to implement the specified control functions plus a reserve capacity of 25 percent of the total provided. All PLC I/O shall be arranged in a distributed I/O configuration such that the failure of any I/O card will not affect multiple items of the same equipment.

1. DISCRETE INPUT MODULES: Defined as contact closure inputs from devices external to the programmable logic controller module. Input modules shall be shielded from short time constant noise and 60-Hz pickup. Individual inputs shall be optically isolated for low energy common mode transients to 1500 volts peak from user's wiring or other I/O Modules. The modules shall have LED lights to indicate a discrete input.

2. DISCRETE OUTPUT MODULES: Defined as contact closure outputs for ON/OFF operation of devices external to the programmable logic controller module. The output modules shall be fused (typically 5-amp at 115V ac) with blown fuse indicator lights. The output modules shall be optically isolated from inductively generated, normal mode and low energy, common mode transients to 1500 volt peak. All output modules shall have LED lights

to indicate output has been cycled ON by the controller.

3. ANALOG INPUT MODULES: Defined as analog inputs for 1 to 5 VDC or 4 to 20 mA dc signals, where an analog to digital conversion is performed and the digital result is entered into the processor. New inputs shall be provided for every scan.

4. ANALOG OUTPUT MODULES: Defined as analog output for 1 to 5 VDC or 4 20 mA dc signals, where a digital to analog conversion is performed and the analog result is produced as an output. New outputs shall be produced on every scan.

J. DATA ACCESS PANEL: Where required, a Data Access Panel with LCD display and keypad shall be provided to allow the operator to monitor and make changes in internal registers for set points, timers, and counters in the PLC. Program logic or sequence changes shall not be made from this panel unless a security code or key lock is used to prevent unauthorized changes. Interconnecting cables between the Data Access Panel and the PLC shall be provided.

K. COMMUNICATIONS: If the PLC is required to interface with the DCS via a datalink, is shall be done so by an RS422 or RS232 serial link. The serial link type used shall be determined by distances. The PLC system shall be provided with all appurtenances to support this requirement. The communications protocol shall be MODBUS with the PLC configured in a slave mode. The DCS will operate in the master mode.

L. PROGRAMMING LAPTOP: All programming shall be accomplished with a laptop computer. The laptop shall be capable of being directly plugged into the PLC system without the requirements of additional hardware. All programming, all monitoring, all searching, and all editing shall be accomplished with the laptop. These functions shall be capable of being done both "on line" while the PLC processor is scanning or "off line" while the PLC processor is not scanning. The laptop shall display multiple series and parallel contacts, coils, timers, counters, and calculation functions. The laptop shall also be able to monitor the status of all inputs, all outputs, all timers, all counters, and all coils. It shall have the capability to disable/force all inputs, all outputs, and all coils to simulate system operation. It shall also indicate "power flow" through all elements and include a search function to locate any element and its program location. The PLC processor status information, such as error indication and amount of memory remaining, shall be shown on the laptop screen. The CONTRACTOR shall provide one new laptop complete with manuals to the OWNER to enable future system support. The laptop shall be turned over to the OWNER at START-UP.

M. PLC CONTROL SYSTEM SOFTWARE: This Section covers the furnishing of standard and customized software, fully installed and fully configured in the control systems specified herein. It is the intent of this specification to have the PLC System Supplier furnish its latest generation, standard, field proven, fully debugged and supported software package for this application with a minimum of additions or changes. Customized or specially written software shall be furnished if required to meet all of the functional requirements specified herein. Any custom applications software required shall be fully integrated into the basic software and shall not

require unique command structures. Software specified herein is described in broad, functional categories. The System Supplier shall furnish a complete software package including the functional requirements specified herein along with whatever additional software is required by the supplier for proper and efficient operation of the PLC Control System. No attempt has been made to list all software or list all characteristics of software required by the System Supplier to meet the functional requirements specified herein.

1. GENERAL:

   a. The software package shall provide a system capable of controlling system level activities and a higher level process control language allowing the operator to monitor and control the process through an interactive human interface. The software environment shall support a multi-programming atmosphere allowing concurrent execution of more than one program in a background/foreground mode or multi-tasking mode.

   b. Throughout the execution of all software modules, the operator shall be presented with all of the command or operation choices available at that point in the program using sufficient verbiage or symbols to make the choices self-explanatory and unambiguous. Question and answer or fill-in-the-blank requests shall only be permitted where file names, tag names, or other unique text or numerical information is required.

   c. System-level software shall include a real time operating system, a calendar/time program, a file management program and a system of diagnostic routines in addition to any compilers, editors, loaders, or assemblers required to support the process control software language.

   d. All programs shall be self-configuring, such that they obtain the size and configuration of the system from parameters contained in the various files created during system generation. No parameters related to the hardware configuration shall be hard coded into any of the software.

2. SYSTEM LEVEL SOFTWARE: System-level software shall include a complete and unmodified operating system furnished by the System Supplier that provides system-level functions as specified herein. Operating system software shall function automatically without operator intervention, except as required to establish file names and similar information.

3. OPERATING SYSTEM SOFTWARE: The real-time operating system software shall be the standard uncorrupted product of the host computer and shall provide the following minimum functions:

   a. Respond to demands from a program request or to demands from an operator.

b. Dynamic allocation of the resources available in the system. These resources shall include main memory usage, computation time, peripheral usage, and I/O channel usage.

c. Allotment of system resources on the basis of task priority levels such that a logical allocation of resources and suitable response times are assured.

d. Queuing of requests in order of priority if one or more requested resources are unavailable.

e. Resolution of contending requests for the same resource in accordance with priority.

f. Service requests for execution of one program by another.

g. Transfer data between programs as requested.

h. Management of all information transfers to and from peripheral devices.

i. Control and recovery from all program fault conditions.

j. Diagnose and report real-time hardware device errors.

4. Program execution shall be scheduled on a priority basis. A multilevel priority interrupt structure is required. A program interrupted by a higher priority program shall be entered into a list of pending programs. Its execution shall be resumed once it becomes the currently highest priority program. Initiation of programs shall, as a minimum, be activated in the following ways:

a. In response to external interrupts.

b. At a scheduled time of the day.

c. On an elapsed time interval basis.

d. On request by another program.

e. On request from the data access panel.

5. The system shall allow periodic programs to be scheduled. The allocation of resources to a time scheduled program shall be based on its relative priority ad the availability of computer system resources.

6. START-UP AND RESTART:

a. Software shall be provided which initializes and brings a computer or any microprocessor based hardware unit from an inactive condition to a state of operational readiness.

b. Initialization shall include determination of computer system status prior to start-up of initializing operating system software and initializing application software. Initialization shall also include the loading of all memory resident software, initialization of timers, counters, and queues, and initialization of all dynamic database values.

7. SHUTDOWN: The software shall provide an orderly shutdown capability for shutdowns resulting from equipment failure, including computer processor failure, primary power failure, or a manually entered shutdown command. When the loss of primary power is sensed, a high-priority hardware interrupt shall initiate software for an immediate, orderly shutdown. When a shutdown occurs in response to a command or malfunction, the software shall control the affected hardware quickly and automatically to a secure state.

8. DIAGNOSTICS:

a. Diagnostic programs shall be furnished with the software package to detect and isolate hardware problems and assist maintenance personnel in discovering the causes for system failures. The system manufacturer's standard diagnostic routines shall be used as much as possible. Diagnostic software and test programs shall be furnished for each significant component in the system.

b. Diagnostic routines shall test for power supply, central processing unit, memory, and I/O bus failures as a minimum.

9. CALENDAR/TIME PROGRAM: The calendar/time program shall update the second, minute, hour, day, month and year in the operating system and transfer accurate time and date information to all system level and application software. Variations in the number of days in each month and in leap years shall be handled automatically by the program. The operator shall be able to set or correct the time and date from the data access panel, only at the highest security level.

N. OPERATOR INTERFACE:

1. System-level software shall provide for creation and modification of alphanumeric displays, compression of display information for storage, and linking of dynamic files to database variables. Each display screen shall be able to be made up of static and dynamic alphanumeric information. The system shall be furnished with standard displays as specified herein. The system shall be capable of storing and utilizing all standard display formats.

2. Additionally, all display screens shall include a dedicated area that shall display the current time and date, and at lease one line for system-level messages.

O. STANDARD DISPLAYS: The operator interface systems shall include at least the following standard, non-configurable displays.

1. CURRENT ALARM SUMMARY: As specified in the alarm processing section of this document.

2. SYSTEM OVERVIEW: Displaying the current status of major systems hardware components including the input/output hardware.

3. MENU DISPLAYS: Indicating the various displays and application level choice available to the operator.

4. POINT DISPLAYS: Detailed displays in a standard format for all types of points in the system. Any point in the system shall be able to be displayed indicating all parameters associated with the point. Each entry in the display shall be labeled in engineering units.

P. ALGORITHMS: System software shall support the implementation of algorithms for the determinations of control actions and special calculations involving analog and discrete inputs. These algorithms shall be capable of outputting positional or incremental control outputs or providing the product of calculations. The algorithms shall include alarm checks where appropriate. As a minimum, the following types of algorithms shall be provided.

1. A calculator algorithm which performs functions such as summing several variables, raising to a power, roots, dividing, multiplying, and subtracting.

2. A switch algorithm which reads the current value from its input address and stored it as the value of its output address. Two types of switches shall be accommodated, 2 outputs with one input and one output with 2 inputs.

3. A 3 mode Proportional-integral-Derivative (PID) controller algorithm, with each of the 3 modes independently adjustable. The algorithm shall support both direct and reverse acting modes.

4. Algorithms for lead, lag, dead time, and ration compensators.

5. Algorithms to perform integration and totalization of analog process variables.

6. Algorithms that drive the set point of a controller shall include provisions for bumpless transfer, which shall be implemented by use of a bias value.

7. Algorithms shall be implemented and modified in the system at any time through the use of interactive software modules in a manner consistent with other interactive modules and shall not required any direct source of code changes.

Q. ALARM PROCESSING:

1. Alarm processing software shall be provided to recognize and report alarm events and conditions to the Local Control Panel in an organized, unambiguous, clear, and convenient manner. Alarms shall be classified into at least 2 priority levels and at least 2 independent classes.

2. Alarm processing software shall generate alarms for the following conditions:

a. Discrete input or output change of state is defined as an alarm in the control software.

b. Analog value exceeding alarm limits defined in the control software.

c. Analog rate of change exceeding limits defined in the control software.

d. Failure of the PLC processor, mass memory device, process input/output hardware, or other major hardware component.

(1) Alarms shall be generated in each case above at the time of occurrence and at the time the condition returns to normal.

R. TESTING: The CONSTRUCTION MANAGER shall witness testing of the PLC system. Solid-state logic systems shall be tested as complete assemblies. Testing of individual components or modules shall not be acceptable.

S. TRAINING: A manufacturer's representative shall supply two 8-hour days of on-site training for the OWNER'S personnel. The training shall include but not be restricted to, operation of programming unit, trouble shooting of system hardware and software, and program development.

T. OPERATIONS AND MAINTENANCE MANUALS:

1. The CONTRACTOR shall furnish to the OWNER 5 complete sets of operation and maintenance manuals. The manuals shall include date, information drawings, etc., for the system, subsystem, and all components, and shall include names, addresses and telephone numbers of equipment suppliers, representatives and repair facilities.

2. This shall include a complete description of the recommended operating procedures, maintenance procedures, and spare/replacement parts list for equipment items with catalog data, diagrams, and drawings or cuts describing the equipment. Each set shall include full size assembly and wiring diagrams; drawings showing "as-build" conditions shall be furnished to the OWNER.

PART 3 - EXECUTION

3.1 INSTALLATION

A. 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.

B. The CONTRACTOR shall install all instruments according to the manufacturer's installation instructions and the following:

1. Perform field engineering as required for mounting and supporting all field mounted components.

2. Prepare any additional schematic and interconnection diagrams required for installation.

3. Assemble and interconnect instrument components disconnected for shipping purposes.

4. Remove all temporary supports, bracing, and padding inserted in instrument control panels and other equipment to prevent damage during shipping, storage, or installation.

5. All piping shall be field measured prior to fabrication and erection. Any significant discrepancies between drawings and field conditions shall be reported to the CONSTRUCTION MANAGER. The OWNER will not be responsible for any costs to the CONTRACTOR for rework because of CONTRACTOR failure to take measurements prior to fabrication.

6. Adequately support and protect capillary tubing. All extra tubing shall be carefully coiled, tied, and protected at the instrument location.

C. The CONTRACTOR shall install pneumatic instrument air systems according to the manufacturer's installation instructions and the following:

1. Install all pneumatic tubing and make all connections at control panels, instruments, and control valves.

2. Perform field engineering as required for instrument air supply headers and individual air supply taps and lines.

3. Check all air supply branch headers by blowing with clean air and checking for tightness.

4. Clean all transmission and control tubing by blowing with dried and filtered air prior to connecting to instrument components.

5. Leak test all pneumatic control circuits in accordance with ISA Recommended Practice RP-7.1.

6. Set all instrument air regulators at manufacturer's recommended supply pressures.

D. 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.

E. 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.

F. 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.

G. Where job conditions require minor changes in approximated locations and arrangements, the CONTRACTOR shall make such changes without additional cost to the OWNER.

H. 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.

I. 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

A. 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.

B. 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.

C. 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.

D. 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.

3.3 INSTRUMENT CABLE TESTS

A. 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 CONSTRUCTION MANAGER. Complete records of all tests shall be made and delivered to the CONSTRUCTION MANAGER. Each form shall be signed by the CONSTRUCTION MANAGER who witnessed the testing.

1. 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.

2. Insulation resistance tests shall be performed by using a 500 volt megometer 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.

3.4 INSTALLATION, CALIBRATION, TESTING, PRECOMMISSIONING, STARTUP AND INSTRUCTION

A. INSTALLATION AND CONNECTION: The CONTRACTOR shall install and connect all field mounted components and assemblies under the following criteria:

1. 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.

2. 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.

3. 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.

4. 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.

5. All power and all signal wires shall be terminated with spade type lugs.

6. All connectors shall be, as a minimum, water tight.

7. 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.

8. 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.

B. 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 CONSTRUCTION MANAGER. These test forms shall verify compliance with all. A report shall be delivered to the CONSTRUCTION MANAGER for each instrument, certifying that the instrument has been calibrated in the presence of the [CONSTRUCTION MANAGER or the CONSTRUCTION MANAGER's designated representative] and meets contract and system requirements.

C. 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 CONSTRUCTION MANAGER at no additional cost to the OWNER.

1. At least 15days before installation testing begins, the CONTRACTOR shall submit to the CONSTRUCTION MANAGER 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.

2. 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.

3. 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.

4. Air systems shall be tested for leaks in compliance with ISA RP7.1.

5. 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 CONSTRUCTION MANAGER 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.

D. 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.

1. The CONTRACTOR shall develop and submit to the CONSTRUCTION MANAGER 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.

2. 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.

3. 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.

4. Individual component accuracy tolerances shall be as indicated in the Contract Documents or as specified by published manufacturer accuracy specifications whenever not indicated.

5. The CONTRACTOR shall submit an instrumentation and control system pre-commissioning 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 CONSTRUCTION MANAGER 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.

E. THIRTY DAY OPERATIONAL ACCEPTANCE TEST:

1. After start up has been completed, the System shall undergo a 30-day operational acceptance test. The System must run continuously for 30 consecutive days. During this period, all System functions shall be exercised. Any System interruption and accompanying component, subsystem, or program failure shall be logged for cause of failure, as well as time of occurrence and duration of each failure. A failure shall cause termination of the 30-day operational acceptance test. When the cause of a failure has been corrected, a new 30-day operational acceptance test shall be started.

2. Each time the CONTRACTOR's technician is required to respond to a System malfunction, he must complete a report which shall include details concerning the nature of the complaint or malfunction and the resulting repair action required and taken.

3. The CONTRACTOR shall furnish its own general personnel, electrical personnel, and any instrument manufacturers' representatives as required during the testing period to produce a fully operational system.

F. INSTRUCTION: The CONTRACTOR shall train the OWNER'S maintenance personnel in the maintenance, calibration and repair of all instruments provided under this contract.

1. The training shall be scheduled a minimum of 3weeks in advance of the first session. The training shall be performed concurrent with the pre commissioning in subparagraph D.

2. 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.

3. 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.

4. Proposed training material, including resumes for the proposed instructors and a detailed outline of each lesson shall be submitted to the CONSTRUCTION MANAGER at least 30 days in advance of when the lesson is to be given. The CONSTRUCTION MANAGER shall review the submitted data for suitability and provide comments which shall be incorporated into the course.

5. Within 10 days after the completion of each lesson the CONTRACTOR shall present to the CONSTRUCTION MANAGER the following:

   a. A list of all OWNER personnel that attended the lesson.

   b. An evaluation of OWNER personnel knowledge through written testing or equivalent.

   c. A copy of text utilized during the lesson with all notes, diagrams, and comments.

3.5 PROCESS CONTROL STRATEGIES

A. The control strategies shown in Appendix A 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.

B. See Appendix A for detailed descriptions of the process control strategies.

C. See Appendix B for the Input/Output (I/O) List.

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

PROJECT OVERALL CONTROL SYSTEM STRATEGY OVERVIEW

Areas 60, 76, 86 and 94:

Modify the DCS control strategy to maintain constant air flow through the scrubbers in lieu of constant pressure drop across the main fans and scrubbers.to ensure that sufficient foul air is being collected from the odor sources and treated.

Area 86 - Dewatered Biosolids Storage Facility:

Modify the DCS foul air collection strategies for foul air exhaust rates at the truck loading area during active loading periods by closing intake dampers at the silos.

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 has 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.

CONTROL STRATEGIES

AREA 60 ODOR CONTROL TRAINS

P&IDs: OC-60-I-218, OC-60-I-238, OC-60-I-258

CONTROLER: 60PCM01, 60PCM02, 60PCM07

A. Area 60 Summary and Control Strategy Overview:

1. General Description:
   a. The Area 60 odor control trains were designed to provide treatment of 52,000 cfm of foul air that is withdrawn from various process areas in the facility. Two trains are operational at all times during normal operation. Each train consists of an ammonia scrubber (bypassed during normal operation) process, a caustic/bleach scrubber process, and a carbon adsorption process. Treated air is discharged via stacks dedicated to each train.
   b. Each train is equipped with one foul air fan designed to operate at a flow rate of 26,000 cfm of foul air. Each train will have a motorized open/close damper upstream of the fan suction. The motor for the foul air fan at each train will be equipped with a VFD for controlling the fan speed.
   c. Each train will be equipped with a sensor to detect the amount of air flow when that train is in operation.
2. Control Strategy:
   a. During normal operation, two trains shall be online and operational and each train shall provide 26,000 cfm of air flow. If the flow rate per train measured by the sensor increases or decreases, the VFD shall regulate the motor to change the fan speed up or down to return the air flow rate to 26,000 cfm per train.
   b. Fans can be operated in either HAND or COMPUTER.
   c. Dampers can be operated in either HAND or COMPUTER.
3. Foul Air Fans
   a. Normal Operation:
      (1) Normal Operation: Operations selects the fan to operate and starts in either HAND or COMPUTER.

(2) Appropriate (Open-closed) positioning of motorized dampers is required when a foul air fan is started or stopped.

b. Startup Operation: During start up the motorized dampers for the fan suction must be opened.

c. Abnormal Operation: None

d. Emergency Operation:

(1) Power Failure: The fans are not provided with standby power

(2) The fan shall restart upon restoration of power, without operator intervention.

B. Foul Air Fans:

1. General Description:

a. The fans are driven by variable speed motors. The VFD for these motors is controlled and monitored by SCADA.

2. Control Strategy:

a. HAND and COMPUTER controls are provided for the fans.

b. The fan will be operated at all times.

c. In COMPUTER, the fan may be started and stopped from SCADA.

3. Local Description:

a. Local Status Display:

(1) Field: None

(2) Field Control Panel: None

(3) VFD: Each Foul Air Fan VFD includes the following indication/display:

(a) Control Power On

(b) Fan Run status

(c) Fan Off status

b. Local Alarms:

(1) Field: None

(2) Field Control Panel: None

(3) VFD:

(a) Fail

(b) Alarm

c. Local Interlocks:

(1) Life Safety Permissive:

(a) Disconnect Switch

(2) Equipment Permissive:

(a) Motor High Temperature.

(b) Low Discharge Flow

(3) Other Permissive: None

d. Local Setpoints and Configuration: None

e. Local-Manual Control:

(1) Field: HAND-OFF-COMPUTER (HOC) selector switch

(2) VFD: Each VFD includes the following:

(a) Speed POT

(b) Alarm RESET pushbutton

(3) Control Description:

(a) POT: Adjusts VFD speed in HAND mode

(b) RESET: Resets any alarm conditions no longer active.

f. Local-Automatic Control: None

4. Remote Description:

a. SCADA Display: Process Screen, Auto/Manual (A/M) Station Graphic, and Configuration Screen, and Trend Screen.

b. SCADA Alarms:

(1) Fail: If the motor does not start or stop within a preset time delay after a corresponding control command has been sent, a Fail alarm is generated.

(2) Low Discharge Flow

(3) VFD Fail

(4) VFD Alarm

c. Software Interlocks:

(1) Process Disable Conditions: None

(2) Wait Mode Conditions:

(a) VFD selector not in Remote

(b) Out-of-Service selected on the Configuration Screen

(c) Low Discharge Flow

(d) VFD Fail

(e) VFD Alarm

d. Configurable Parameters: None

(1) Operator Adjustable Setpoints: None

(2) Hard-coded Setpoints:

(a) Fail to start/stop alarm Time Delay: Set in SCADA at 45 seconds

e. Remote-Manual Motor Control:

(1) Operator selects ON or OFF to control the motor at the A/M Station at SCADA.

(2) Operator may click the Reset pushbutton at the A/M Station to clear any alarm in SCADA logic requiring a reset. The alarm resets only if the condition no longer exists.

(3) Operations can place the fan Out-of-Service on the Configuration Screen.

f. Remote-Automatic Motor Control:

(1) Fan speed adjusted based on air flow

C. Motorized Dampers:

1. General Description:

a. The dampers are driven by electric motors. The controller for these motors is controlled and monitored by SCADA.

2. Control Strategy:

a. HAND and COMPUTER controls are provided for the dampers.

b. In COMPUTER, the damper may be opened and closed from SCADA.

3. Local Description:

a. Local Status Display:

(1) Field: None

(2) Field Control Panel: None

(3) Each Foul Air Fan controller includes the following indication/display:

(a) Control Power On

(b) Open status

(c) Closed status

b. Local Alarms:

(1) Field: None

(2) Field Control Panel: None

(3) Controller: None

c. Local Interlocks:

(1) Life Safety Permissive: None

(2) Equipment Permissive:

(a) Motor overload

(3) Other Permissive: None

d. Local Setpoints and Configuration: None

e. Local-Manual Control:

(1) Field: HAND-OFF-COMPUTER (HOC) selector switch

(2) Controller: Each Controller includes the following:

(a) Open

(b) Close

(3) Control Description:

(a) Open: Opens the damper

(b) Close: Closes the damper

f. Local-Automatic Control: None

4. Remote Description:

a. SCADA Display: Process Screen, Auto/Manual (A/M) Station Graphic, and Configuration Screen, and Trend Screen.

b. SCADA Alarms:

(1) Fail to open: If the damper does not open within a preset time delay after a corresponding control command has been sent, a Fail alarm is generated.

(2) Fail to close: If the damper does not close within a preset time delay after a corresponding control command has been sent, a Fail alarm is generated.

c. Software Interlocks:

(1) Process Disable Conditions: None

(2) Wait Mode Conditions:

(a) Controller selector not in Remote

(b) Out-of-Service selected on the Configuration Screen

d. Configurable Parameters: None

(1) Operator Adjustable Setpoints: None

(2) Hard-coded Setpoints:

(a) Fail to open/close alarm Time Delay: Set in SCADA at 45 seconds

e. Remote-Manual Motor Control:

(1) Operator selects OPEN or CLOSE to control the damper at the A/M Station at SCADA.

(2) Operations can place the damper Out-of-Service on the Configuration Screen.

f. Remote-Automatic Motor Control: None

AREA 76 ODOR CONTROL FANS

P&IDs: OC-76-I-300, OC-76-I-310, OC-76-I-315

CONTROLER: 76PCM01

A. Area 76 Summary and Control Strategy Overview:

1. General Description:

a. The Area 76 odor control fans are located upstream of the Area 60 odor control trains. The Area 76 odor control fans are all in-line booster fans designed to provide the static pressure needed for foul air withdrawal at upstream reaches of the foul air collection system. Area 76 consists of the centrifuge facility and the grit removal facility.

b. There are three fans, which shall have the following air flow capacities:

(1) 76-OCF-1: 2,790 cfm.

(2) 76-OCF-2: 25,340 cfm.

(3) 76-OCF-3: 3,500 cfm.

c. Each duct branch served by each of the three fans will be equipped with a sensor to detect the amount of air flow. Each fan motor will be equipped with a VFD to allow the fan speed to be controlled as required to regulate the air flow rate.

2. Control Strategy:

a. During normal operation, all three fans shall operate continuously. If the flow rate within each duct branch served by the respective fan, measured by the sensor, increases or decreases, the VFD shall regulate the fan speed up or down to return the air flow rate to the flow rates specified in the Area 76

Summary and Control Strategy Overview, paragraph 1.b above.

b. Fans can be operated in either HAND or COMPUTER.

3. Foul Air Fans

a. Normal Operation: Operations selects the fan to operate and starts in either HAND or COMPUTER.

b. Startup Operation: None

c. Abnormal Operation: None

d. Emergency Operation:

(1) Power Failure: The fans are not provided with standby power

(2) The fan shall restart upon restoration of power, without operator intervention.

B. Foul Air Fans:

1. General Description:

a. The fans are driven by variable speed motors. The VFD for these motors is controlled and monitored by SCADA.

2. Control Strategy:

a. HAND and COMPUTER controls are provided for the fans.

b. The fan will be operated at all times.

c. In COMPUTER, the fan may be started and stopped from SCADA.

3. Local Description:

a. Local Status Display:

(1) Field: None

(2) Field Control Panel: None

(3) VFD: Each Foul Air Fan VFD includes the following indication/display:

(a) Control Power On

(b) Fan Run status

(c) Fan Off status

b. Local Alarms:

(1) Field: None

(2) Field Control Panel: None

(3) VFD:

(a) Fail

(b) Alarm

c. Local Interlocks:

(1) Life Safety Permissive:

(a) Disconnect Switch

(2) Equipment Permissive: None

(3) Other Permissive: None

d. Local Setpoints and Configuration: None

e. Local-Manual Control:

(1) Field: HAND-OFF-COMPUTER (HOC) selector switch

(2) VFD: Each VFD includes the following:

(a) Speed POT

(3) Control Description:

(a) POT: Adjusts VFD speed in HAND mode

f. Local-Automatic Control: None

4. Remote Description:

a. SCADA Display: Process Screen, Auto/Manual (A/M) Station Graphic, and Configuration Screen, and Trend Screen.

b. SCADA Alarms:

(1) Fail: If the motor does not start or stop within a preset time delay after a corresponding control command has been sent, a Fail alarm is generated.

(2) VFD Fail

(3) VFD Alarm

c. Software Interlocks:

(1) Process Disable Conditions: None

(2) Wait Mode Conditions:

(a) VFD selector not in Remote

(b) Out-of-Service selected on the Configuration Screen

(c) VFD Fail

(d) VFD Alarm

d. Configurable Parameters: None

(1) Operator Adjustable Setpoints: None

(2) Hard-coded Setpoints:

(a) Fail to start/stop alarm Time Delay: Set in SCADA at 45 seconds

e. Remote-Manual Motor Control:

(1) Operator selects ON or OFF to control the motor at the A/M Station at SCADA.

(2) Operator may click the Reset pushbutton at the A/M Station to clear any alarm in SCADA logic requiring a reset. The alarm resets only if the condition no longer exists.

(3) Operations can place the fan Out-of-Service on the Configuration Screen.

f. Remote-Automatic Motor Control:

(1) Fan speed adjusted based on air flow

AREA 86 ODOR CONTROL FANS

P&IDs: OC-86-I-205

CONTROLER: 76PCM01

A. Area 86 Summary and Control Strategy Overview:

1. General Description:

a. The Area 86 odor control fans are located upstream of the Area 60 odor control trains. The Area 86 odor control fans are all in-line booster fans designed to provide the static pressure needed for foul air withdrawal at upstream reaches of the foul air collection system. Area 86 consists of the biosolids truck loading facility.

b. There are three fans, which shall have the following air flow capacities:

(1) 86-OCF-1: 6,150 cfm.

(2) 86-OCF-2: 6,150 cfm.

(3) 86-OCF-3: 11,100 cfm.

c. The duct branch served by 86-OCF-3will be equipped with a sensor to detect the amount of air flow. The fan motor will be equipped with a VFD to allow the fan speed to be controlled as required to regulate the air flow rate.

2. Control Strategy:

a. During normal operation fans shall operate continuously. If the flow rate in the duct branch served by 86-OCF-3, measured by the sensor, increases or

decreases, the VFD shall regulate the fan speed up or down to return the air flow rate to the flow rates specified in the Area 86 Summary and Control Strategy Overview, paragraph 1.b (3) above.

b. Fans can be operated in either HAND or COMPUTER.

3. Foul Air Fans

a. Normal Operation: Operations selects the fan to operate and starts in either HAND or COMPUTER.

b. Startup Operation: None

c. Abnormal Operation: None

d. Emergency Operation:

(1) Power Failure: The fans are not provided with standby power

(2) The fan shall restart upon restoration of power, without operator intervention.

B. Foul Air Fans:

1. General Description:

a. The fans are driven by variable speed motors. The VFD for these motors is controlled and monitored by SCADA.

2. Control Strategy:

a. HAND and COMPUTER controls are provided for the fans.

b. The fan will be operated at all times.

c. In COMPUTER, the fan may be started and stopped from SCADA.

3. Local Description:

a. Local Status Display:

(1) Field: None

(2) Field Control Panel: None

(3) VFD: Each Foul Air Fan VFD includes the following indication/display:

(a) Control Power On

(b) Fan Run status

(c) Fan Off status

b. Local Alarms:

(1) Field: None

(2) Field Control Panel: None

(3) VFD:

(a) Fail

(b) Alarm

c. Local Interlocks:

(1) Life Safety Permissive:

(a) Disconnect Switch

(2) Equipment Permissive: None

(3) Other Permissive: None

d. Local Setpoints and Configuration: None

e. Local-Manual Control:

(1) Field: HAND-OFF-COMPUTER (HOC) selector switch

(2) VFD: Each VFD includes the following:

(a) Speed POT

(3) Control Description:

(a) POT: Adjusts VFD speed in HAND mode

f. Local-Automatic Control: None

4. Remote Description:

a. SCADA Display: Process Screen, Auto/Manual (A/M) Station Graphic, and Configuration Screen, and Trend Screen.

b. SCADA Alarms:

(1) Fail: If the motor does not start or stop within a preset time delay after a corresponding control command has been sent, a Fail alarm is generated.

(2) VFD Fail

(3) VFD Alarm

c. Software Interlocks:

(1) Process Disable Conditions: None

(2) Wait Mode Conditions:

(a) VFD selector not in Remote

(b) Out-of-Service selected on the Configuration Screen

(c) VFD Fail

(d) VFD Alarm

d. Configurable Parameters: None

(1) Operator Adjustable Setpoints: None

(2) Hard-coded Setpoints:

(a) Fail to start/stop alarm Time Delay: Set in SCADA at 45 seconds

e. Remote-Manual Motor Control:

(1) Operator selects ON or OFF to control the motor at the A/M Station at SCADA.

(2) Operator may click the Reset pushbutton at the A/M Station to clear any alarm in SCADA logic requiring a reset. The alarm resets only if the condition no longer exists.

(3) Operations can place the fan Out-of-Service on the Configuration Screen.

f. Remote-Automatic Motor Control:

(1) Fan speed for 86-OCF-3 is adjusted based on air flow

AREA 94 ODOR CONTROL TRAINS

P&IDs: OC-94-I-218, OC-60-I-238

CONTROLER: 94PCM01, 94PCM02

A. Area 94 Summary and Control Strategy Overview:

1. General Description:

a. The Area 94 odor control trains were designed to provide treatment of 9,000 cfm of foul air that is withdrawn from the wastewater pump station. One train is operational at all times during normal operation. Each train consists of an ammonia scrubber process, a caustic/bleach scrubber process, and a carbon adsorption process. Both the chemical scrubbing processes are operated without chemical addition during normal operation, only water is recirculated. Treated air is discharged via stacks dedicated to each train.

b. Each train is equipped with one foul air fan designed to operate at a flow rate of 9,000 cfm of foul air. The motor for the foul air fan at each train will be equipped with a VFD for controlling the fan speed.

c. Each train will be equipped with a sensor to detect the amount of air flow when that train is in operation.

2. Control Strategy:

a. During normal operation, one train shall be online and operational and shall provide 9,000 cfm of air flow. If the flow rate measured by the sensor increases or decreases, the VFD shall regulate the motor to change the fan speed up or down to return the air flow rate to 9,000 cfm per train.

b. Fans can be operated in either HAND or COMPUTER.

3. Foul Air Fans

a. Normal Operation:

(1) Normal Operation: Operations selects the fan to operate and starts in either HAND or COMPUTER.

b. Startup Operation: None

c. Abnormal Operation: None

d. Emergency Operation:

(1) Power Failure: The fans are not provided with standby power

(2) The fan shall restart upon restoration of power, without operator intervention.

B. Foul Air Fans:

1. General Description:

a. The fans are driven by variable speed motors. The VFD for these motors is controlled and monitored by SCADA.

2. Control Strategy:

a. HAND and COMPUTER controls are provided for the fans.

b. The fan will be operated at all times.

c. In COMPUTER, the fan may be started and stopped from SCADA.

3. Local Description – Foul Air Fans:

a. Local Status Display:

(1) Field: None

(2) Field Control Panel: None

(3) VFD: Each Foul Air Fan VFD includes the following indication/display:

(a) Control Power On

(b) Fan Run status

(c) Fan Off status

b. Local Alarms:

(1) Field: None

(2) Field Control Panel: None

(3) VFD:

(a) Fail

(b) Alarm

c. Local Interlocks:

(1) Life Safety Permissive:

(a) Disconnect Switch

(2) Equipment Permissive:

(a) Motor High Temperature.

(3) Other Permissive: None

d. Local Setpoints and Configuration: None

e. Local-Manual Control:

(1) Field: HAND-OFF-COMPUTER (HOC) selector switch

(2) VFD: Each VFD includes the following:

(a) Speed POT

(3) Control Description:

(a) POT: Adjusts VFD speed in HAND mode

f. Local-Automatic Control: None

4. Remote Description - Foul Air Fans:

a. SCADA Display: Process Screen, Auto/Manual (A/M) Station Graphic, and Configuration Screen, and Trend Screen.

b. SCADA Alarms:

(1) Fail: If the motor does not start or stop within a preset time delay after a corresponding control command has been sent, a Fail alarm is generated.

(2) Low Discharge Flow

(3) VFD Fail

(4) VFD Alarm

c. Software Interlocks:

(1) Process Disable Conditions: None

(2) Wait Mode Conditions:

(a) VFD selector not in Remote

(b) Out-of-Service selected on the Configuration Screen

(c) Low Discharge Flow

(d) VFD Fail

(e) VFD Alarm

d. Configurable Parameters: None

(1) Operator Adjustable Setpoints: None

(2) Hard-coded Setpoints:

(a) Fail to start/stop alarm Time Delay: Set in SCADA at 45 seconds

e. Remote-Manual Motor Control:

(1) Operator selects ON or OFF to control the motor at the A/M Station at SCADA.

(2) Operator may click the Reset pushbutton at the A/M Station to clear any alarm in SCADA logic requiring a reset. The alarm resets only if the condition no longer exists.

(3) Operations can place the fan Out-of-Service on the Configuration Screen.

f. Remote-Automatic Motor Control:

(1) Fan speed adjusted based on air flow.

APPENDIX B – I/O LIST

SECTION 13300 - INSTRUMENTATION AND CONTROL

SHEET NO.	INSTR. NO.	DESCRIPTION	DCS	DI	DO	AI	AO	DATALINK	DROP	HARDWARE: I/O TYPE	HARDWARE: I/O MODULE	HARDWARE: I/O CHANNEL	NOTES
OC-60-I-218	60RI1648	Odor Control Fan No. 1 Damper Control Power On	60PCM01	X					3	Q-Line	3.4.6 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	13	Reuse existing.
	60QI1648	Odor Control Fan No. 1 Damper in Computer	60PCM01	X					3	Q-Line	3.3.6 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	13	Reuse existing.
	60ZC1648	Odor Control Fan No. 1 Damper Closed	60PCM01	X					3	Q-Line	3.3.7 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	6	Use spare.
	60ZO1648	Odor Control Fan No. 1 Damper Opened	60PCM01	X					3	Q-Line	3.3.6 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	15	Use spare.
	60HS1648A	Odor Control Fan No. 1 Damper Open CMD	60PCM01		X				3	Q-Line	3.4.9 QBO/G01 Digital Output, High Voltage, flashing	2	Use spare.
	60HS1648B	Odor Control Fan No. 1 Damper Close CMD	60PCM01		X				3	Q-Line	3.4.9 QBO/G01 Digital Output, High Voltage, flashing	4	Use spare.
	60QI0041	Odor Control Fan No. 1 In Computer	60PCM01	X					3	Q-Line	3.2.6 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	1	Reuse existing.
	60MI0041	Odor Control Fan No. 1 Run	60PCM01	X					3	Q-Line	3.2.2 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	14	Reuse existing.

SHEET NO.	INSTR. NO.	DESCRIPTION	DCS	DI	DO	AI	AO	DATALINK	DROP	HARDWARE: I/O TYPE	HARDWARE: I/O MODULE	HARDWARE: I/O CHANNEL	NOTES
	60RI0041	Odor Control Fan No. 1 Control Power On	60PCM01	X					3	Q-Line	3.4.6 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	4	Reuse existing.
	60UA0041A	Odor Control Fan No. 1 VFD Fail	60PCM01	X					3	Q-Line	3.3.8 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	9	Use spare.
	60UA0041B	Odor Control Fan No. 1 VFD Alarm	60PCM01	X					3	Q-Line	3.3.8 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	10	Use spare.
	60ST0041	Odor Control Fan No. 1 Speed Feedback	60PCM01			X			3	Q-Line	3.3.1 QAX/G05 12 Point Analog Input, 0 to 5V	10	Use spare.
	60HS0041	Odor Control Fan No. 1 Start/Stop CMD	60PCM01		X				3	Q-Line	3.1.4 QBO/G01 Digital Output, High Voltage, flashing	4	Use spare.
	60SIT0041	Odor Control Fan No. 1 Speed CMD	60PCM01				X		3	Q-Line	3.3.2 QAO/G01A Analog Output, 4 to 20.475mA (internal supply)	4	Use spare.
	60OCF01VFD	Misc Data	60PCM01					X	3	ELC Link	**NEW ETHERNET SW CISCO WS-C2960-24TC-L**	-	
OC-60-I-238	60RI1698	Odor Control Fan No. 2 Damper Control Power On	60PCM02	X					4	Q-Line	3.4.8 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	9	Reuse existing.
	60QI1698	Odor Control Fan No. 2 Damper in Computer	60PCM02	X					4	Q-Line	3.4.6 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	13	Reuse existing.
	60ZC1698	Odor Control Fan No. 2 Damper Closed	60PCM02	X					4	Q-Line	3.2.10 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	8	Use spare.

SHEET NO.	INSTR. NO.	DESCRIPTION	DCS	DI	DO	AI	AO	DATALINK	DROP	HARDWARE: I/O TYPE	HARDWARE: I/O MODULE	HARDWARE: I/O CHANNEL	NOTES
	60ZO1698	Odor Control Fan No. 2 Damper Opened	60PCM02	X					4	Q-Line	3.2.10 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	9	Use spare.
	60HS1698A	Odor Control Fan No. 2 Damper Open CMD	60PCM02		X				4	Q-Line	3.1.1 QBO/G01 Digital Output, High Voltage, flashing	1	Use spare.
	60HS1698B	Odor Control Fan No. 2 Damper Close CMD	60PCM02		X				4	Q-Line	3.1.1 QBO/G01 Digital Output, High Voltage, flashing	2	Use spare.
	60QI0042	Odor Control Fan No. 2 In Computer	60PCM02	X					4	Q-Line	3.3.5 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	10	Reuse existing.
	60MI0042	Odor Control Fan No. 2 Run	60PCM02	X					4	Q-Line	3.4.5 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	9	Reuse existing.
	60RI0042	Odor Control Fan No. 2 Control Power On	60PCM02	X					4	Q-Line	3.4.8 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	2	Reuse existing.
	60UA0042A	Odor Control Fan No. 2 VFD Fail	60PCM02	X					4	Q-Line	3.2.10 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	10	Use spare.
	60UA0042B	Odor Control Fan No. 2 VFD Alarm	60PCM02	X					4	Q-Line	3.2.10 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	11	Use spare.
	60ST0042	Odor Control Fan No. 2 Speed Feedback	60PCM02			X			4	Q-Line	3.3.1 QAX/G05 12 Point Analog Input, 0 to 5V	12	Use spare.
	60HS0042	Odor Control Fan No. 2 Start/Stop CMD	60PCM02		X				4	Q-Line	3.1.2 QBO/G01 Digital Output, High Voltage, flashing	2	Reuse existing.

SHEET NO.	INSTR. NO.	DESCRIPTION	DCS	DI	DO	AI	AO	DATALINK	DROP	HARDWARE: I/O TYPE	HARDWARE: I/O MODULE	HARDWARE: I/O CHANNEL	NOTES
	60SIT0042	Odor Control Fan No. 2 Speed CMD	60PCM02				X		4	Q-Line	3.4.2 QAO/G01A Analog Output, 4 to 20.475mA (internal supply)	4	Use spare.
	60OCF02VFD	Misc Data	60PCM02					X	4	ELC Link	**NEW ETHERNET SW CISCO WS-C2960-24TC-L**	-	
OC-60-I-258	60RI1748	Odor Control Fan No. 3 Damper Control Power On	60PCM07	X					9	Q-Line	3.3.5 QID/G01 Digital Input, 5VDC, 16ch (single ended)	6	Reuse existing.
	60QI1748	Odor Control Fan No. 3 Damper in Computer	60PCM07	X					9	Q-Line	3.3.4 QID/G01 Digital Input, 5VDC, 16ch (single ended)	10	Reuse existing.
	60ZC1748	Odor Control Fan No. 3 Damper Closed	60PCM07	X					9	Q-Line	3.2.10 QID/G01 Digital Input, 5VDC, 16ch (single ended)	9	Use spare.
	60ZO1748	Odor Control Fan No. 3 Damper Opened	60PCM07	X					9	Q-Line	3.2.10 QID/G01 Digital Input, 5VDC, 16ch (single ended)	10	Use spare.
	60HS1748A	Odor Control Fan No. 3 Damper Open CMD	60PCM07		X				9	Q-Line	3.1.10 QBO/G01 Digital Output, High Voltage, flashing	4	Use spare.
	60HS1748B	Odor Control Fan No. 3 Damper Close CMD	60PCM07		X				9	Q-Line	3.1.10 QBO/G01 Digital Output, High Voltage, flashing	5	Use spare.
	60QI0043	Odor Control Fan No. 3 In Computer	60PCM07	X					9	Q-Line	3.2.11 QID/G01 Digital Input, 5VDC, 16ch (single ended)	5	Reuse existing.
	60MI0043	Odor Control Fan No. 3 Run	60PCM07	X					9	Q-Line	3.3.6 QID/G01 Digital Input, 5VDC, 16ch (single ended)	6	Reuse existing.
	60RI0043	Odor Control Fan No. 3 Control Power On	60PCM07	X					9	Q-Line	3.4.7 QID/G01 Digital Input, 5VDC, 16ch (single ended)	10	Reuse existing.

SHEET NO.	INSTR. NO.	DESCRIPTION	DCS	DI	DO	AI	AO	DATALINK	DROP	HARDWARE: I/O TYPE	HARDWARE: I/O MODULE	HARDWARE: I/O CHANNEL	NOTES
	60UA0043A	Odor Control Fan No. 3 VFD Fail	60PCM07	X					9	Q-Line	3.2.10 QID/G01 Digital Input, 5VDC, 16ch (single ended)	11	Use spare.
	60UA0043B	Odor Control Fan No. 3 VFD Alarm	60PCM07	X					9	Q-Line	3.2.10 QID/G01 Digital Input, 5VDC, 16ch (single ended)	12	Use spare.
	60ST0043	Odor Control Fan No. 3 Speed Feedback	60PCM07			X			9	Q-Line	3.3.1 QAX/G05 12 Point Analog Input, 0 to 5V	10	Use spare.
	60HS0043	Odor Control Fan No. 3 Start/Stop CMD	60PCM07		X				9	Q-Line	3.1.6 QBO/G01 Digital Output, High Voltage, flashing	6	Reuse existing.
	60SIT0043	Odor Control Fan No. 3 Speed CMD	60PCM07				X		9	Q-Line	3.3.2 QAO/G01A Analog Output, 4 to 20.475mA (internal supply)	3	Use spare.
	60OCF03VFD	Misc Data	60PCM07					X	9	ELC Link	**NEW ETHERNET SW CISCO WS-C2960-24TC-L**	-	
OC-76-I-300	76QI0703	Odor Control Fan No. 3 In Computer	76PCM01	X					10	Q-Line	3.3.5 QID/G01 Digital Input, 5VDC, 16ch (single ended)	3	Reuse existing.
	76MI0703	Odor Control Fan No. 3 Run	76PCM01	X					10	Q-Line	3.3.5 QID/G01 Digital Input, 5VDC, 16ch (single ended)	1	Reuse existing.
	76RI0703	Odor Control Fan No. 3 Control Power On	76PCM01	X					10	Q-Line	3.3.5 QID/G01 Digital Input, 5VDC, 16ch (single ended)	4	Reuse existing.
	76UA0703A	Odor Control Fan No. 3 VFD Fail	76PCM01	X					10	Q-Line	3.3.6 QID/G01 Digital Input, 5VDC, 16ch (single ended)	1	Use spare.
	76UA0703B	Odor Control Fan No. 3 VFD Alarm	76PCM01	X					10	Q-Line	3.3.6 QID/G01 Digital Input, 5VDC, 16ch (single ended)	2	Use spare.

SHEET NO.	INSTR. NO.	DESCRIPTION	DCS	DI	DO	AI	AO	DATALINK	DROP	HARDWARE: I/O TYPE	HARDWARE: I/O MODULE	HARDWARE: I/O CHANNEL	NOTES
	76ST0703	Odor Control Fan No. 3 Speed Feedback	76PCM01			X			10	Q-Line	3.3.9 QAX/G05 12 Point Analog Input, 0 to 5V	11	Use spare.
	76HS0703	Odor Control Fan No. 3 Start/Stop CMD	76PCM01		X				10	Q-Line	3.1.1 QBO/G01 Digital Output, High Voltage, flashing	1	Use spare.
	76SIT0703	Odor Control Fan No. 3 Speed CMD	76PCM01				X		10	Q-Line	3.4.12 QAO/G01A Analog Output, 4 to 20.475mA (internal supply)	4	Use spare.
	76OCF03VFD	Misc Data	76PCM01					X	10	ELC Link	**NEW ETHERNET SW CISCO WS-C2960-24TC-L**	-	
OC-76-I-310	76QI0701	Odor Control Fan No. 1 In Computer	76PCM01	X					10	Q-Line	3.2.4 QID/G01 Digital Input, 5VDC, 16ch (single ended)	6	Reuse existing.
	76MI0701	Odor Control Fan No. 1 Run	76PCM01	X					10	Q-Line	3.2.4 QID/G01 Digital Input, 5VDC, 16ch (single ended)	5	Reuse existing.
	76RI0701	Odor Control Fan No. 1 Control Power On	76PCM01	X					10	Q-Line	3.2.4 QID/G01 Digital Input, 5VDC, 16ch (single ended)	7	Reuse existing.
	76UA0701A	Odor Control Fan No. 1 VFD Fail	76PCM01	X					10	Q-Line	3.2.6 QID/G01 Digital Input, 5VDC, 16ch (single ended)	1	Use spare.
	76UA0701B	Odor Control Fan No. 1 VFD Alarm	76PCM01	X					10	Q-Line	3.2.6 QID/G01 Digital Input, 5VDC, 16ch (single ended)	2	Use spare.
	76ST0701	Odor Control Fan No. 1 Speed Feedback	76PCM01			X			10	Q-Line	3.3.9 QAX/G05 12 Point Analog Input, 0 to 5V	11	Use spare.
	76HS0701	Odor Control Fan No. 1 Start/Stop CMD	76PCM01		X				10	Q-Line	3.4.1 QBO/G01 Digital Output, High Voltage, flashing	8	Use spare.

SHEET NO.	INSTR. NO.	DESCRIPTION	DCS	DI	DO	AI	AO	DATALINK	DROP	HARDWARE: I/O TYPE	HARDWARE: I/O MODULE	HARDWARE: I/O CHANNEL	NOTES
	76SIT0701	Odor Control Fan No. 1 Speed CMD	76PCM01				X		10	Q-Line	3.4.8 QAO/G01A Analog Output, 4 to 20.475mA (internal supply)	5	Use spare.
	76OCF01VFD	Misc Data	76PCM01					X	10	ELC Link	**NEW ETHERNET SW CISCO WS-C2960-24TC-L**	-	
OC-76-I-315	76QI0702	Odor Control Fan No. 2 In Computer	76PCM01	X					10	Q-Line	3.3.4 QID/G01 Digital Input, 5VDC, 16ch (single ended)	6	Reuse existing.
	76MI0702	Odor Control Fan No. 2 Run	76PCM01	X					10	Q-Line	3.3.4 QID/G01 Digital Input, 5VDC, 16ch (single ended)	5	Reuse existing.
	76RI0702	Odor Control Fan No. 2 Control Power On	76PCM01	X					10	Q-Line	3.3.4 QID/G01 Digital Input, 5VDC, 16ch (single ended)	7	Reuse existing.
	76UA0702A	Odor Control Fan No. 2 VFD Fail	76PCM01	X					10	Q-Line	3.2.8 QID/G01 Digital Input, 5VDC, 16ch (single ended)	5	Use spare.
	76UA0702B	Odor Control Fan No. 2 VFD Alarm	76PCM01	X					10	Q-Line	3.2.8 QID/G01 Digital Input, 5VDC, 16ch (single ended)	6	Use spare.
	76ST0702	Odor Control Fan No. 2 Speed Feedback	76PCM01			X			10	Q-Line	3.3.9 QAX/G05 12 Point Analog Input, 0 to 5V	12	Use spare.
	76HS0702	Odor Control Fan No. 2 Start/Stop CMD	76PCM01		X				10	Q-Line	3.4.1 QBO/G01 Digital Output, High Voltage, flashing	10	Use spare.
	76SIT0702	Odor Control Fan No. 2 Speed CMD	76PCM01				X		10	Q-Line	3.4.8 QAO/G01A Analog Output, 4 to 20.475mA (internal supply)	6	Use spare.
	76OCF02VFD	Misc Data	76PCM01					X	10	ELC Link	**NEW ETHERNET SW CISCO WS-C2960-24TC-L**	-	

SHEET NO.	INSTR. NO.	DESCRIPTION	DCS	DI	DO	AI	AO	DATALINK	DROP	HARDWARE: I/O TYPE	HARDWARE: I/O MODULE	HARDWARE: I/O CHANNEL	NOTES
OC-86-I-205	86QI0703	Odor Control Fan No. 3 In Computer	76PCM01	X					10	Q-Line	3.2.8 QID/G01 Digital Input, 5VDC, 16ch (single ended)	7	Use spare.
	86MI0703	Odor Control Fan No. 3 Run	76PCM01	X					10	Q-Line	3.2.8 QID/G01 Digital Input, 5VDC, 16ch (single ended)	8	Use spare.
	86RI0703	Odor Control Fan No. 3 Control Power On	76PCM01	X					10	Q-Line	3.2.8 QID/G01 Digital Input, 5VDC, 16ch (single ended)	9	Use spare.
	86UA0703A	Odor Control Fan No. 3 VFD Fail	76PCM01	X					10	Q-Line	3.2.8 QID/G01 Digital Input, 5VDC, 16ch (single ended)	10	Use spare.
	86UA0703B	Odor Control Fan No. 3 VFD Alarm	76PCM01	X					10	Q-Line	3.2.8 QID/G01 Digital Input, 5VDC, 16ch (single ended)	11	Use spare.
	86ST0703	Odor Control Fan No. 3 Speed Feedback	76PCM01			X			10	Q-Line	3.4.9 QAX/G05 12 Point Analog Input, 0 to 5V	10	Use spare.
	86HS0703	Odor Control Fan No. 3 Start/Stop CMD	76PCM01		X				10	Q-Line	3.4.1 QBO/G01 Digital Output, High Voltage, flashing	11	Use spare.
	86SIT0703	Odor Control Fan No. 3 Speed CMD	76PCM01				X		10	Q-Line	3.4.8 QAO/G01A Analog Output, 4 to 20.475mA (internal supply)	7	Use spare.
	86OCF03VFD	Misc Data	76PCM01					X	10	ELC Link	**NEW ETHERNET SW CISCO WS-C2960-24TC-L**	-	
OC-94-I-218	94QI0171	Odor Control Fan No. 1 In Computer	94PCM01	X					29	Q-Line	3.4.6 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	14	Reuse existing.

SHEET NO.	INSTR. NO.	DESCRIPTION	DCS	DI	DO	AI	AO	DATALINK	DROP	HARDWARE I/O TYPE	HARDWARE I/O MODULE	HARDWARE I/O CHANNEL	NOTES
	94MI0171	Odor Control Fan No. 1 Run	94PCM01	X					29	Q-Line	3.4.5 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	11	Reuse existing.
	94RI0171	Odor Control Fan No. 1 Control Power On	94PCM01	X					29	Q-Line	3.2.9 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	12	Reuse existing.
	94UA0171A	Odor Control Fan No. 1 VFD Fail	94PCM01	X					29	Q-Line	3.3.12 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	4	Use spare.
	94UA0171B	Odor Control Fan No. 1 VFD Alarm	94PCM01	X					29	Q-Line	3.3.12 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	5	Use spare.
	94ST0171	Odor Control Fan No. 1 Speed Feedback	94PCM01			X			29	Q-Line	3.2.1 QAX/G05 12 Point Analog Input, 0 to 5V	12	Use spare.
	94HS0171	Odor Control Fan No. 1 Start/Stop CMD	94PCM01		X				29	Q-Line	3.1.6 QBO/G01 Digital Output, High Voltage, flashing	5	Reuse existing.
	94SIT0171	Odor Control Fan No. 1 Speed CMD	94PCM01				X		29	Q-Line	3.2.2 QAO/G01A Analog Output, 4 to 20.475mA (internal supply)	4	Use spare.
	94OCF01VFD	Misc Data	94PCM01					X	29	ELC Link	**NEW ETHERNET SW CISCO WS-C2960-24TC-L**	-	
OC-94-I-238	94QI0172	Odor Control Fan No. 2 In Computer	94PCM02	X					30	Q-Line	3.3.9 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	7	Reuse existing.
	94MI0172	Odor Control Fan No. 2 Run	94PCM02	X					30	Q-Line	3.3.9 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	4	Reuse existing.

SHEET NO.	INSTR. NO.	DESCRIPTION	DCS	DI	DO	AI	AO	DATALINK	DROP	HARDWARE I/O TYPE	HARDWARE I/O MODULE	HARDWARE I/O CHANNEL	NOTES
	94RI0172	Odor Control Fan No. 2 Control Power On	94PCM02	X					30	Q-Line	3.2.10 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	I2	Reuse existing.
	94UA0172A	Odor Control Fan No. 2 VFD Fail	94PCM02	X					30	Q-Line	3.3.12 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	6	Use spare.
	94UA0172B	Odor Control Fan No. 2 VFD Alarm	94PCM02	X					30	Q-Line	3.3.12 QID/G03 Digital Input, 24VAC/DC, 16ch (single ended)	7	Use spare.
	94ST0172	Odor Control Fan No. 2 Speed Feedback	94PCM02			X			30	Q-Line	3.3.2 QAX/G05 12 Point Analog Input, 0 to 5V	4	Use spare.
	94HS0172	Odor Control Fan No. 2 Start/Stop CMD	94PCM02		X				30	Q-Line	3.1.10 QBO/G01 Digital Output, High Voltage, flashing	3	Reuse existing.
	94SIT0172	Odor Control Fan No. 2 Speed CMD	94PCM02				X		30	Q-Line	3.3.5 QAO/G01A Analog Output, 4 to 20.475mA (internal supply)	5	Use spare.
	94OCF02VFD	Misc Data	94PCM02					X	30	ELC Link	**NEW ETHERNET SW CISCO WS-C2960-24TC-L**	-	

****END OF SECTION****

SECTION 15050

PIPING SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. SCOPE: This section specifies systems of process piping and general requirements for piping systems. Detailed specifications for the components listed on the Piping System Specification Sheets are found in other sections of Division 15. This section shall be used in conjunction with those sections.

B. DEFINITIONS: Pressure terms used in Section 15050 and elsewhere in Division 15 are defined as follows:

1. MAXIMUM: The greatest continuous pressure at which the piping system operates.

2. TEST: The hydrostatic pressure used to determine system acceptance.

1.2 QUALITY ASSURANCE

A. REFERENCES:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of the commencement of the Work. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
AASHTO M36/M36M	Metallic (Zinc or Aluminum) Coated Corrugated Steel Culverts and Underdrains
ANSI A13.1	Scheme for the Identification of Piping Systems
ANSI B1.20.1	Pipe Threads, General Purpose (Inch)

Reference	Title
ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250, and 800
ANSI B16.3	Malleable Iron Threaded Fittings Class 150 and 300
ANSI B16.5	Pipe Flanges and Flanged Fittings
ANSI B16.9	Factory-Made Wrought Steel Buttwelding Fittings
ANSI B16.11	Forged Steel Fittings, Socket Welding and Threaded
ANSI B16.12	Cast Iron Threaded Drainage Fittings
ANSI B16.22	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ANSI B16.26	Cast Copper Alloy Fittings for Flared Copper Tubes
ANSI B31.1	Power Piping
ANSI B31.3	Chemical Plant and Petroleum Refinery Piping
ASME Section IX	Boiler and Pressure Vessel Code; Welding and Brazing Qualifications
ASTM A47	Malleable Iron Castings
ASTM A53	Pipe, Steel, Black and Hot Dipped, Zinc-Coated Welded and Seamless
ASTM A74	Cast Iron Soil Pipe and Fittings
ASTM A105/A105M	Forgings, Carbon Steel, for Piping Components
ASTM A106	Seamless Carbon Steel Pipe for High-Temperature Service
ASTM A126	Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A197	Cupola Malleable Iron
ASTM A234/A234M	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM A312/A312M	Seamless and Welded Austenitic Stainless Steel Pipe
ASTM A403/A403M	Wrought Austenitic Stainless Steel Piping Fittings
ASTM A536	Ductile Iron Castings
ASTM A570/A570M	Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality
ASTM B88	Seamless Copper Water Tube
ASTM C76	Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C296	Asbestos-Cement Pressure Pipe

Reference	Title
ASTM C443-REV A	Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
ASTM C564	Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM D1248	Polyethylene Plastics Molding and Extrusion Materials
ASTM D1784	Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D1785	Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D2241	Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR)
ASTM D2513	Thermoplastic Gas Pressure Pipe, Tubing, and Fittings
ASTM D2665	Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D2996	Filament-Wound Reinforced Thermosetting Resin Pipe
ASTM D3034	Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3261	Butt Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
ASTM D4174	Cleaning, Flushing, and Purification of Petroleum Fluid Hydraulic Systems
ASTM D4101	Propylene Plastic Injection and Extrusion Materials
ASTM F441	Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80
AWWA C105	Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids
AWWA C110	Ductile-Iron and Gray-Iron Fittings, 3 Inch Through 48 Inch, for Water and Other Liquids
AWWA C111	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
AWWA C115	Flanged Ductile-Iron and Gray-Iron Pipe with Threaded Flanges
AWWA C151	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
AWWA C200	Steel Water Pipe 6 Inches and Larger
AWWA C205	Cement-Mortar Protective Lining and Coating for Steel Water Pipe--4 In. and Larger--Shop Applied
AWWA C206	Field Welding of Steel Water Pipe

Reference	Title
AWWA C207	Steel Pipe Flanges for Waterworks Services--Sizes 4 In. through 144 In.
AWWA C208	Dimensions for Fabricated Steel Water Pipe Fittings
AWWA C209	Cold-Applied Tape Coating for Special Sections, Connections, and Fittings for Steel Water Pipelines
AWWA C210	Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipe
AWWA C214	Tape Coating Systems for the Exterior of Steel Water Pipelines
AWWA C301	Prestressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids
AWWA C303	Reinforced Concrete Pressure Pipe--Steel Cylinder Type, Pretensioned, for Water and Other Liquids
AWWA C600	Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C651	Disinfecting Water Mains
AWWA C900	Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inches Through 12 Inches, for Water
AWWA M11	Steel Pipe--A Guide for Design and Installation
CISPI 301	Specification Data for Hubless Cast Iron Sanitary System with No-Hub Pipe and Fittings
FEDSPEC L-C-530B(1)	Coating, Pipe, Thermoplastic Resin or Thermosetting Epoxy
MIL-H-13528B	Hydrochloric Acid, Inhibited, Rust Removing
MIL-STD-810C	Environmental Test Methods
SAE J1227	Assessing Cleanliness of Hydraulic Fluid Power Components and Systems
UPC	Uniform Plumbing Code

B. FITTINGS AND COUPLING COMPATIBILITY: To assure uniformity and compatibility of piping components, fittings and couplings for grooved end piping systems shall be furnished by the same manufacturers.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Unless otherwise specified, piping materials, including pipe, gaskets, fittings, connection and joint assemblies, linings and coatings, shall be selected from those listed on the piping system specification sheets. Piping materials shall conform to

detailed specifications for each type of pipe and piping appurtenance specified in other sections of Division 15.

2.2 PIPING IDENTIFICATION

A. PLASTIC CODING MARKERS:

1. Plastic markers for coding pipe shall conform to ANSI A13.1 and shall be as manufactured by W. H. Brady Company, Seton Name Plate Corporation, Marking Services Inc., or equal. Markers shall be the mechanically attached type that are easily removable; they shall not be the adhesive applied type. Markers shall consist of pressure sensitive legends applied to plastic backing which is strapped or otherwise mechanically attached to the pipe. Legend and backing shall be resistant to petroleum based oils and grease and shall meet criteria for humidity, solar radiation, rain, salt, fog and leakage fungus, as specified by MIL STD 810C. Markers shall withstand a continuous operating temperature range of 40 degrees F to 180 degrees F. Plastic coding markers shall not be the individual letter type but shall be manufactured and applied in one continuous length of plastic.

2. Markers bearing the legends on the background colors specified in the PIPESPEC shall be provided in the following letter heights:

Outside pipe diameter,[a] inches	**Letter height, inches**
Less than 1-1/2	1/2
1-1/2 through 3	1-1/8
Greater than 3	2-1/4

a Outside pipe diameter shall include insulation and jacketing.

3. In addition, pipe markers shall include uni and bi-directional arrows in the same sizes as the legend. Legends and arrows shall be white on blue or red backgrounds and black on other specified backgrounds.

B. PLASTIC TRACER TAPE: Not Used.

2.3 VALVES

A. Valves of the same size and service shall be provided by a single valve manufacturer. Packing shall be nonasbestos material. Actual length of valves shall be within 1/16 inch (plus or minus) of the manufacturer's specified length. Flanges shall meet the requirement of ANSI B16.5. Push on and mechanical joints shall meet the requirements of AWWA C111.

2.4 PRODUCT DATA

A. Product data on piping materials shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook where specified.

B. Piping layout drawings shall be transmitted to the Construction Manager a minimum of 2 weeks prior to construction. Drawings shall be original layouts by the Contractor; photocopies of contract drawings are not acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION

A. LOCATION: Piping shall be provided as specified except for adjustments to avoid architectural and structural features and shall be coordinated with electrical construction.

B. PIPING SIZES: Where the size of piping is not specified, the Contractor shall provide piping of the sizes required by UPC. Unless specified otherwise, small piping (less than 1 inch in diameter) required for services not described by UPC shall be 1/2 inch.

C. PIPE SUPPORT, ANCHORAGE AND SEISMIC BRACING:

1. GENERAL: Piping shall be supported by anchor brackets, guides, saddles or hangers. Acceptable types of supports, guides, saddles, hangers and structure attachments for general pipe support, expansion/ contraction and for seismic bracing, as well as anchorage details, are shown on the drawings. Minimum spacing shall be as specified for supports and for seismic bracing. Where a specific type of support or anchorage is indicated on the drawings, then only that type shall be used there. Piping shall be vertically supported by anchor brackets, guides, saddles or hangers and shall be seismically braced where indicated to resist lateral load. Supports shall be provided on each run at each change of direc-tion. Pipe supports shall be hot dip or mechanically galvanized. Unless otherwise specified, existing pipes and supports shall not be used to support new piping.

2. PIPING CONNECTIONS TO MACHINES: Piping at machine connections shall be aligned in all planes to permit insertion of bolts at bolted connections or coupling screwed connections without using jacks, come-a-longs or other mechanical means to align field piping with the connections at the machines. Bolts shall not be forced into mating flange bolt holes and shall be capable being withdrawn using finger pressure alone. The use of 'dutchmen' mitered sections or similar specials to achieve the required alignment with machine connections is strictly prohibited.

D. ANCHORAGE FOR BURIED PIPING: Not Used.

E. BEDDING AND BACKFILL: Not Used.

F. EQUIPMENT CONNECTION FITTINGS: Not Used.

3.2 PIPING IDENTIFICATION

A. PIPE CODING: After application of the specified coating and insulation systems, exposed piping, interior and exterior, and piping in ceiling spaces, pipe trenches, pipe

chases and valve boxes shall be identified with plastic markers as specified in paragraph 15050-2.02 A. Legend markers and directional arrows shall be located at each side of walls, floors and ceilings, at one side of each piece of equipment, at piping intersections, and at approximately 50 foot centers.

B. PLASTIC TRACER TAPE: Not Used.

3.3 VALVE IDENTIFICATION

A. Stainless steel tags bearing the specified valve number stamped in 1/4 inch high letters shall be installed on valve flanges in a position visible from floor level. Flangeless valves 8 inches in diameter and larger shall have tags attached to the valve body by self tapping corrosion resistant metal screws. Flangeless valves 6 inches in diameter and smaller shall have tags attached to the valve stem by stainless steel wire. Wire shall be 0.063 inch minimum.

3.4 TESTING

A. GENERAL:

1. Upon completion of piping, but prior to application of insulation on exposed piping, the Contractor shall test the piping systems. Pressures, media and test durations shall be as specified in the PIPESPEC. Equipment which may be damaged by the specified test conditions shall be isolated. Testing shall be performed using calibrated test gages and calibrated volumetric measuring equipment to determine leakage rates. Each test gage shall be selected so that the specified test pressure falls within the upper half of the gage's range. Unless otherwise specified, the Contractor shall notify the Construction Manager 24 hours prior to each test.

2. Unless otherwise specified, testing, as specified herein, shall include existing piping systems which connect with new pipe systems. Existing pipe shall be tested to the nearest existing valve. Any piping which fails the test shall be repaired. Repair of existing piping will be considered and paid for as extra work.

3. Where testing existing chlorine and sulfur dioxide systems to the nearest isolation valve, Contractor shall provide a tee in the line adjacent to the valve. The branch outlet on the tee shall be valved and used for cleaning, pressure testing, draining, and drying the line. Unless otherwise indicated, the existing chlorine or sulfur dioxide system shall not be shut down during testing or connecting the tee and valve. Prior to placing the line in service, the valve on the branch outlet shall be plugged or sealed with a blind flange or threaded plug. Contractor shall be responsible for all damage to the existing system as a result of this work.

B. GAS, AIR, AND VAPOR SYSTEMS:

1. The Contractor shall test steam lines hydrostatically in accordance with the ASME procedure for testing pressure piping.

2. Testing medium and procedures for chlorine and sulfur dioxide systems are specified in paragraph 15050 3.04 D.

3. Unless otherwise specified, the testing medium for other gas, air and vapor systems shall be as follows:

Pipeline size	Specified test pressure	Testing medium
2 inch and smaller	75 psi or less	Air or water
2 inch and smaller	Greater than 75 psi	Water
Greater than 2 inch	3 psi or less	Air or water
Greater than 2 inch	Greater than 3 psi	Water

4. The allowable leakage rate for hazardous gas systems, insulated systems, and systems tested with water shall be zero at the specified test pressure throughout the specified test period. Hazardous gas systems shall include sulfur dioxide, chlorine, propane, sludge gas and natural gas systems.

5. The allowable leakage rate for other systems tested with air shall be based on a maximum pressure drop of 5 percent of the specified test pressure for the duration of the period. Prior to starting a test interval using air, the air shall be at ambient temperature and specified test pressure.

C. LIQUID SYSTEMS: Leakage shall be zero at the specified test pressure throughout the specified duration for the following systems: exposed piping, buried insulated piping, and buried or exposed piping carrying liquid chemicals. Unless otherwise specified, leakage from other buried liquid piping systems shall be less than 0.02 gallon per hour per inch diameter per 100 feet of buried piping.

D. [NOT USED]

E. [NOT USED]

F. DRAINS: Drain systems, other than pumped drain systems, shall be tested in accordance with UPC.

3.5 CLEANING AND FLUSHING

A. GENERAL: Piping systems shall be cleaned following completion of testing and prior to connection to operating, control, regulating or instrumentation equipment. The Contractor may, at its option, clean and test sections of buried or exposed piping systems. Use of this procedure, however, will not waive the requirement for a full pressure test of the completed system. Unless specified otherwise, piping 24 inches in diameter and smaller shall first be cleaned by pulling a tightly fitting cleaning ball or swab through the system. Piping larger than 24 inches in diameter may be cleaned manually or with a cleaning ball or swab.

B. TEMPORARY SCREENS:

1. Upon completion of the cleaning, the Contractor shall connect the piping systems to related process equipment. Temporary screens, provided with locator tabs which remain visible from the outside when the screens are in place, shall be inserted in pipelines at the suction of pumps and compressors in accordance with the following table:

Equipment suction or piping size, inches	Maximum screen opening, inches
0 – 1	1/16
1-1/4 – 3	1/4
3-1/2 – 6	1/2
Over 6	1

2. The Contractor shall maintain the screens during testing, initial start up, and initial operating phases of the commissioning process. In special cases, screens may be removed as required for performance tests. The Contractor shall remove the temporary screens and make the final piping connections after the screens have remained clean for at least 24 consecutive hours of operation. Systems handling solids are exempted.

C. GAS AND AIR SYSTEMS: Unless otherwise specified, gas and air system piping 6 inches in diameter and smaller shall be blown out, using air or the testing medium specified. Piping larger than 6 inches shall be cleaned by having a swab or "pig" drawn through the separate reaches of pipe. After connection to the equipment, it shall then be blown out using the equipment. Upon completion of cleaning, the piping shall be drained and dried with an airstream.

D. LIQUID SYSTEMS: After completion of cleaning, liquid systems, unless otherwise specified, shall be flushed with clean water. With temporary screens in place, the liquid shall be circulated through the piping system using connected equipment for a minimum period of 15 minutes and until no debris is collected on the screens.

E. [NOT USED]

F. [NOT USED]

G. [NOT USED]

H. POTABLE WATER SYSTEMS: Potable water piping systems shall be flushed and disinfected in accordance with AWWA C651.

3.6 PIPING SPECIFICATION SHEETS (PIPESPEC)

A. Piping and valves for groupings of similar plant processes or types of service lines are specified on individual piping specification sheets (PIPESPECS). Piping services are grouped according to the chemical and physical properties of the fluid conveyed and/or by the temperature or pressure requirements. Each grouping of services (PIPESPEC) is identified by a piping system number.

Piping Symbol/Service: [NOT USED] System 1

Piping Symbol/Service	[NOT USED]	System--1A
Piping Symbol/Service:	[NOT USED]	System 2
Piping Symbol/Service:	[NOT USED]	System 3
Piping Symbol/Service:	[NOT USED]	System 4
Piping Symbol/Service:	[NOT USED]	System--4A
Piping Symbol/Service:	[NOT USED]	System 5
Piping Symbol/Service:	[NOT USED]	System 5A
Piping Symbol/Service	[NOT USED]	System 6
Piping Symbol/Service	[NOT USED]	System--7
Piping Symbol/Service:	[NOT USED]	System 8
Piping Symbol/Service:	RWR -- Reclaimed Water	System 9

Test Requirements:

Medium:	Water; ref. spec paragraph 15050 3.04 B.
Pressure:	125 psig
Duration:	60 minutes

Gasket Requirements:

Flange:	Compressed gasketing consisting of organic fibers (Kevlar) and neoprene binder
Push on/Mech Cpl:	Nitrile or Neoprene

Exposed Pipe and Valves:

(See drawings for pipe size and valve type)

(3" and smaller)

Pipe: Steel; ASTM A53, galvanized. Ref. spec Section 15061.
Conn; taper threaded, ANSI B1.20.1. Flanged adapters for 2 1/2 inch, 3 inch valves.
Ftgs; malleable iron, ASTM A197, ANSI B16.3, Class 150, galvanized.

(2" and smaller)

Valves: Ball; Jamesbury Fig. 351, Nibco T-580, or equal.
Globe; Crane 7TF or 17TF, Lunkenheimer 123 or 214, or equal.
Swing check; Crane 137, Lunkenheimer 230, or equal.

Piping Symbol/Service:	[NOT USED]	System 10
Piping Symbol/Service:	[NOT USED]	System 11
Piping Symbol/Service:	[NOT USED]	System 12
Piping Symbol/Service:	[NOT USED]	System 13
Piping Symbol/Service:	[NOT USED]	System 14
Piping Symbol/Service:	[NOT USED]	System 15
Piping Symbol/Service:	[NOT USED]	System 16
Piping Symbol/Service:	[NOT USED]	System 17
Piping Symbol/Service:	[NOT USED]	System 18
Piping Symbol/Service:	[NOT USED]	System--19
Piping Symbol/Service:	[NOT USED]	System--20
Piping Symbol/Service:	[NOT USED]	System--21
Piping Symbol/Service:	FA--Foul Air	System--22

Test Requirements:

Medium:	Air; ref. spec paragraph 15050-3.04 B.
Pressure:	20 inches water column
Duration:	60 minutes

Gasket Requirements:

Flange:	Gylon gasketing, Garlock style 3504
Push-on/Mech Cpl:	PTFE

Exposed Pipe and Valves:

(See drawings for pipe size and valve type)

(All sizes)	FRP Ductwork; ref. spec Section 13234

Remarks:

1. All ductwork for foul air service shall be FRP.

Piping Symbol/Service:	[NOT USED]	System--23

Piping Symbol/Service:	D--Drain V--Vent	System--24

Test Requirements:

Medium:	In accordance with Section 712, Uniform Plumbing Code.
Pressure:	In accordance with Section 712, Uniform Plumbing Code.
Duration:	In accordance with Section 712, Uniform Plumbing Code.

Gasket Requirements:

Flange:	Compressed gasketing consisting of organic fibers (Kevlar) and neoprene binder
Push-on/Mech Cpl:	Nitrile or neoprene

Exposed Pipe and Valves:
(See drawings for pipe size.)

(3" and smaller)

Pipe:	Steel; ASTM A53, galvanized. Ref. spec Section 15061. Conn; taper threaded, ANSI B1.20.1. Ftgs; cast iron, threaded drainage fittings, ASTM A126, ANSI B16.12, galvanized.
Valves:	None

(4" thru 12")

Pipe:	PVC; ASTM D1784, Class 12454-B, ASTM D2665, Sch. 40. Ref. spec Section 15064.
Valves:	None

Test Requirements:

Medium:	In accordance with Section 712, Uniform Plumbing Code.
Pressure:	In accordance with Section 712, Uniform Plumbing Code.
Duration:	In accordance with Section 712, Uniform Plumbing Code.

Gasket Requirements:

Flange:	N/A
Push on/Mech Cpl:	N/A

Exposed Pipe and Valves:
(See drawings for pipe size and valve type)

(All sizes)

Pipe:	PP; ASTM D4101, Sch. 40, flame retardant. Ref. spec Section 15064. Conn; ref. spec Section 15064. Ftgs; PP, socket type coil fused DWV. Ref. spec Section 15064.	
Valves:	None	
Piping Symbol/Service	[NOT USED]	System 26
Piping Symbol/Service:	[NOT USED]	System 27
Piping Symbol/Service:	[NOT USED]	System 28
Piping Symbol/Service:	[NOT USED]	System 29
Piping Symbol/Service:	[NOT USED]	System--30
Piping Symbol/Service	[NOT USED]	System--31

****END OF SECTION****

SECTION 15064

PLASTIC PIPE

PART 1 - GENERAL

1.1 DESCRIPTION

A. SCOPE: This section specifies polyvinylchloride, chlorinated polyvinylchloride, polyethylene, and polypropylene pipe and fittings.

B. PIPE DESIGNATIONS: For use in the Piping System Specification Sheets (PIPESPEC) in Section 15050 and in this section, the following plastic pipe designations are defined:

Designation	Definition
PVC	Polyvinylchloride
CPVC	Chlorinated polyvinylchloride
PE	Polyethylene
PP	Polypropylene

1.2 QUALITY ASSURANCE

A. REFERENCES:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of commencement of the Work. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ASTM D1248	Polyethylene Plastics Molding and Extrusion Materials
ASTM D1784	Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
ASTM D1785	Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D2241	Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR)
ASTM D2464	Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D2466	Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D2467	Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D2564	Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings
ASTM D2657	Heat-Joining Polyolefin Pipe and Fittings
ASTM D2665	Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D3034	Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D4101	Propylene Plastic Injection and Extrusion Materials
ASTM F402	Safe Handling of Solvent Cements and Primers Used for Joining Thermoplastic Pipe and Fittings
ASTM F437	Threaded Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80
ASTM F438	Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40
ASTM F439	Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80
ASTM F441	Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80
ASTM F477	Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F493	Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings

PART 2 - PRODUCTS

2.1 PVC PIPE

A. PRESSURE PIPE:

1. PVC material for pipe and fittings shall conform to ASTM D1784, Class 12454 B. Pipe and fittings shall either be in accordance with ASTM D1785 or shall conform to ASTM D2241 for standard dimension ratios: 160 psi pipe SDR 26; 200 psi pipe SDR 21; 250 psi SDR 17. Pressure rating for pipe shall be in excess of test pressure specified in Section 15050. Neoprene gaskets with push on joints shall conform to ASTM F477.

2. Schedule 80 PVC socket type fittings shall conform to ASTM D2467. Schedule 40 PVC fittings shall conform to ASTM D2466. PVC solvent weld cement for socket connections shall meet the requirements of ASTM D2564. Schedule 80 PVC threaded fittings shall conform to ASTM D2464. Fittings for gasketed pipe shall be ductile iron or steel push on IPS sized pressure fittings rated for use with the specified class of PVC pipe.

B. NONPRESSURE PIPE:

1. GRAVITY SEWER PIPE: PVC material for sewer pipe and fittings shall conform to Class 12454 B, as defined in ASTM D1784. Pipe and fittings shall meet the requirements of ASTM D3034 for SDR 35. Neoprene gaskets with push on joints shall conform to ASTM F477.

2. DRAIN, WASTE AND VENT PIPE: PVC material for drain waste and vent (DWV) pipe and fittings shall conform to Class 12454 B, ASTM D1784. Pipe and fittings shall conform to ASTM D2665. Unless otherwise specified, connections shall be solvent weld. Connections to traps, closet flanges, and nonplastic pipe shall be with approved adapter type fittings designed for intended use. Solvent weld cement for socket connections shall meet requirements of ASTM D2564.

2.2 CPVC PIPE

A. CPVC material for pipe and fittings shall conform to ASTM D1784, Class 23447 B. Pipe and fittings shall be in accordance with ASTM F441. Neoprene gaskets with push on joints shall conform to ASTM F477.

B. Schedule 80 CPVC socket type fittings shall conform to ASTM F439. Schedule 40 CPVC socket type fittings shall conform to ASTM F438. CPVC solvent weld cement for socket connections shall meet the requirements of ASTM F493. Schedule 80 CPVC threaded type fittings shall conform to ASTM F437.

2.3 PE PIPE

A. PE pipe shall meet the requirements of ASTM D1248, Type III, Grade P 34, Class C, 100 psi or as specified in Section 15050, whichever is higher. Fittings shall be of the same material, molded socket fusion for sizes 4 inch diameter and smaller and molded or fabricated butt fusion for sizes 6 inch and larger. Fittings shall be 125 psi or as specified in Section 15050, whichever is higher. Heat fusion welding shall be in conformance with ASTM D2657.

2.4 PP PIPE

A. PRESSURE PIPE: PP pipe and fittings shall be formulated of polypropylene conforming to ASTM D4101, SDR 11, butt fusion type. Pipe shall be 150 psi rated in all sizes. Heat fusion welding shall be in conformance with manufacturer's recommendation.

B. DRAIN, WASTE AND VENT PIPE: PP drain, waste and vent (DWV) pipe and fittings shall be made from flame retardant, Schedule 40, polypropylene (PPFR) plastic as defined in ASTM D4101. Pipe and fittings used for buried piping and in concealed locations shall be joined by electrical fusion coils energized by a variable low voltage power supply to completely fuse the interface between the pipe and socket and form a completely homogenous structure. Unless otherwise specified, mechanical joint fittings may be used under bench or in exposed locations where future disassembly is desired. The mechanical method shall be in conformance with the manufacturer's recommendation.

2.5 PRODUCT DATA

A. The following information shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook:

1. Manufacturer's certificates of compliance with the specified standards and Contractor's layout drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. PVC pipe 3 inches in diameter and smaller shall be joined by means of socket fittings and solvent welding in conformance with ASTM F402. Solvent-cemented joints shall be made in strict compliance with the manufacturer's/supplier's instructions and recommended procedures. Unless otherwise specified, PVC pipe 4 inches in diameter and greater shall be joined by means of gasketed push on joints and steel or ductile iron push on or mechanical joint fittings. Unless otherwise specified, PVC and CPVC piping exposed to sunlight shall be painted with coating system L 2 as specified in Section 09900.

B. Connections to different types of pipe shall be by means of flanges, specified adapters or transition fittings. Where sleeve type couplings are used, both shall be uniformly torqued in accordance with pipe manufacturer's recommendation. Foreign material shall be removed from the pipe interior prior to assembly.

C. Unless otherwise specified, PE pipe and fittings 4 inch diameter and smaller shall be joined by means of thermal socket fusion and pipe 6 inch and larger by thermal butt fusion. Butt-fusion joining of the pipes and fittings shall be performed with special joining equipment in accordance with procedures recommended by pipe manufacturer. Tensile strength at yield of butt fusion joints shall not be less than pipe. Flanged adapters shall be provided for connection to valves and where specified.

3.2 TESTING

A. Testing of plastic piping shall be as specified in Section 15050.

****END OF SECTION****

SECTION 15096

PIPE HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. SCOPE: This section specifies hangers and supports for all piping systems specified in Section 15050. This section does not include pipe supports for fire sprinkler systems, pipe anchors, guides or seismic restraints.

B. OPERATING CONDITIONS: The hangers and supports specified in this section are provided to resist pipe loads occurring primarily in the downward (gravity) direction. For the purpose of pipe hanger and support selection, this section establishes pipe support classifications based on the operating temperatures of the piping contents. Pipe support classifications are as follows:

1. HOT SYSTEMS

   (Not Used)

2. AMBIENT SYSTEMS

   B. 40 degrees F to 120 degrees F

3. COLD SYSTEMS

   (Not Used)

C. HANGER AND SUPPORT SELECTION:

1. The Contractor shall select pipe hangers and supports as specified in the project manual. Selections shall be based upon the pipe support classifications specified in this section, the piping insulation thickness and any special requirements which may be specified in the project manual.

2. The Contractor shall review the piping layout in relation to the surrounding structure and adjacent piping and equipment before selecting the type of support to be used at each hanger point.

3. Hangers and supports shall withstand all static and specified dynamic conditions of loading to which the piping and associated equipment may be subjected. As a minimum, consideration shall be given to the following conditions:

   a. Weights of pipe, valves, fittings, insulating materials, suspended hanger components, and normal fluid contents.

   b. Weight of hydrostatic test fluid or cleaning fluid if normal operating fluid contents are lighter.

   c. Reaction forces due to the operation of safety or relief valves.

   d. Wind, snow or ice loadings on outdoor piping.

4. Hangers and supports shall be sized to fit the outside diameter of pipe, tubing, or, where specified, the outside diameter of insulation.

5. Where negligible movement occurs at hanger locations, rod hangers shall be used for suspended lines, wherever practical. For piping supported from below, bases, brackets or structural cross members shall be used.

6. Hangers for the suspension of size 2 1/2 inches and larger pipe and tubing shall be capable of vertical hanger component adjustment under load.

7. The supporting systems shall provide for and control the free or intended movement of the piping including its movement in relation to that of connected equipment.

8. Where there is horizontal movement at a suspended type hanger location, hanger components shall be selected to allow for swing. The vertical angle of the hanger rod shall not, at any time, exceed 4 degrees.

9. There shall be no contact between a pipe and hanger or support component of dissimilar metals. Prevent contact between dissimilar metals when supporting copper tubing by use of copper-plated, rubber, plastic or vinyl coated, or stainless steel hanger and support components.

10. Unless otherwise specified, existing pipes and supports shall not be used to support new piping.

11. Unless otherwise specified, pipe support components shall not be attached to pressure vessels.

12. Stock hanger and support components shall be used wherever practical.

1.2 REFERENCES

A. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of commencement of the Work. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
AISC Manual of Steel Construction	American Institute of Steel Construction, Manual of Steel Construction, Allowable Stress Design - 9th Ed.
FEDSPEC WW-H-171e-78	Hangers and Supports, Pipe
MFMA-2-91	Metal Framing Standards Publication
MSS SP-69-91	Pipe Hangers and Supports - Selection and Application
MSS SP-58-93	Pipe Hangers and Supports - Materials, Design and Manufacture

PART 2 - PRODUCTS

2.1 ACCEPTABLE PRODUCTS

A. Standard pipe supports and components shall be manufactured by B-Line, Carpenter & Patterson, Kin-Line, Grinnell, Michigan, Pipe Shields Incorporated, Superstrut, Unistrut, or equal. Pipe support components shall conform to the requirements of MSS SP-69 and FEDSPEC WW-H-171e. Pipe support materials shall conform to the requirements of MSS SP-58. Metal framing system components shall conform to the metal framing manufacturers' Association Standard MFMA-2.

2.2 MATERIALS

A. GENERAL: Unless otherwise specified, pipe hangers and supports, structural attachments, fittings and accessories shall be hot-dip or mechanically galvanized after fabrication. Nuts, bolts and washers may be zinc-plated except for those subject to moisture or corrosive atmosphere, as specified in paragraph 16050-1.05 B, which shall be type 304 stainless steel.

B. PIPE HANGERS AND SUPPORTS:

1. TYPE 1 - CLEVIS PIPE HANGER: Clevis hangers shall be carbon steel with configuration and components equivalent to MSS and FEDSPEC Type 1.

a. Steel pipe (insulated) - shall be B-Line B3100, Grinnell Fig. 260, or equal, with insulation shield.

b. Steel pipe (uninsulated) - shall be B-Line B3100, Grinnell Fig. 260, or equal.

c. Cast and ductile iron pipe - shall be B-Line B3102, Grinnell Fig. 590, or equal.

d. Copper pipe (uninsulated) - shall be B-Line B3104 CT, Grinnell Fig. CT-65, or equal.

e. Copper pipe (insulated) - shall be B-Line B3100, Grinnell Fig. 260, or equal, with insulation shield.

f. Plastic pipe - shall be B-Line B3100 C, Carpenter & Patterson Fig. 100PVC, or equal.

2. TYPE 2 - "J" PIPE HANGER: Hangers shall be carbon steel with configuration and components equivalent to MSS Type 5.

a. Steel pipe - shall be B-Line B3690, Grinnell Fig. 67, Michigan model 418, or equal.

b. Copper and plastic pipe - shall be Michigan model 419, Unistrut J 1205N series, or equal.

3. TYPE 3 - DOUBLE BOLT PIPE CLAMP: Pipe clamp shall be carbon steel, with configuration and components equivalent to MSS and FEDSPEC Type 3.

a. Steel pipe (insulated) - shall be B-Line B3144, Grinnell Fig. 295, or equal, with insulation shield. Insulation shield is optional for hot and ambient systems.

b. Steel pipe (uninsulated) - shall be B-Line B3144, Grinnell Fig. 295, or equal.

c. Copper pipe (insulated only) - shall be B-Line B3144, Grinnell Fig. 295, or equal, with insulation shield.

4. TYPE 4 - ADJUSTABLE ROLLER HANGER: Rollers shall be cast iron, yoke and cross bolt shall be carbon steel. Configuration and components shall be equivalent to MSS Type 43 and FEDSPEC Type 44.

a. Steel pipe (insulated) - shall be B-Line B3110, Grinnell Fig. 181, or equal, with insulation shield.

b. Steel pipe (uninsulated) - shall be B-Line B3110, Grinnell Fig. 181, or equal.

c. Copper pipe (insulated only) - shall be B-Line B3110, Grinnell Fig. 181, or equal, with insulation shield.

d. Plastic pipe - shall be B-Line B3110, Grinnell Fig. 181, or equal.

5. TYPE 5 - SINGLE PIPE ROLL: Rollers and sockets shall be cast iron, cross rod shall be steel. Configuration and components shall be equivalent to MSS Type 41 and FEDSPEC Type 42.

a. Steel pipe (insulated) - shall be B-Line B3114, Grinnell Fig. 171, or equal, with insulation shield.

b. Steel pipe (uninsulated) - shall be B-Line B3114, Grinnell Fig. 171, or equal.

c. Plastic pipe - shall be B-Line B3114, Grinnell Fig. 171, or equal.

6. TYPE 6 - FRAMING CHANNEL PIPE CLAMP: Pipe clamps shall be steel with galvanized finish and material thickness as listed below:

a. Steel pipe (uninsulated) - Pipe size 3/8 inch and 1/2 inch shall be 16 gage; 3/4 inch through 1 1/4 inches shall be 14 gage; 1 1/2 inches through 3 inches shall be 12 gage; 3 1/2 inches through 5 inches shall be 11 gage; 6 and 8 inches shall be 10 gage; Michigan model 431, Powerstrut PS 1100, Unistrut P 1109 series, or equal.

b. Steel pipe (insulated) - Pipe clamp shall be as described in paragraph 15096-2.02 B.6.a with insulation shield.

c. Copper (uninsulated) and plastic pipe - Pipe size 3/8 inch and 1 inch shall be 16 gage; 1 1/4 inches and 1 1/2 inches shall be 14 gage; 2 inches through 3 inches shall be 12 gage; 4 inches shall be 11 gage; clamp shall be copper-plated, plastic coated or lined with dielectric material; Michigan model 432, Powerstrut PS 1200, Unistrut P 2024C and P 2024PC series, or equal.

d. Copper pipe (insulated) - Pipe clamp shall be as described in paragraph 15096-2.02 B.6.a with insulation shield.

7. TYPE 7 - U-BOLT: U-bolts shall be carbon steel with configuration equivalent to MSS and FEDSPEC Type 24.

a. Steel pipe (uninsulated) - shall be Grinnell Fig. 137, B-Line B3188, or equal.

b. Steel pipe (insulated) - shall be Grinnell Fig. 137, B-Line B3188, or equal, with insulation shield.

c. Cast and ductile iron pipe - shall be Grinnell Fig. 137, B-Line B3188, or equal.

d. Copper pipe (uninsulated) - shall be Carpenter & Patterson Fig. 222 CT, B-Line B3501 CT, Grinnell Fig. 137C, or equal.

e. Copper pipe (insulated) - shall be Grinnell Fig. 137, B-Line B3188, or equal, with insulation shield.

f. Plastic pipe - shall be Grinnell Fig. 137C, Michigan model 151, B-Line B3188 C, or equal.

8. TYPE 8 - ADJUSTABLE PIPE ROLL SUPPORT: Rollers and sockets shall be cast iron, cross rod and support rods shall be carbon steel.

a. Steel pipe (insulated) - shall be B-Line B3122, Grinnell Fig. 177, or equal, with insulation shield.

b. Steel pipe (uninsulated) - shall be B-Line B3122, Grinnell Fig. 177, or equal.

c. Copper pipe (insulated only) - shall be B-Line B3122, Grinnell Fig. 177, or equal, with insulation shield.

d. Plastic pipe - shall be B-Line B3122, Grinnell Fig. 177, or equal.

9. TYPE 9 - WELDED PIPE STANCHION: Minimum material thickness shall be standard schedule carbon steel pipe, cut to match contour of the pipe elbow. Use of this support shall be limited to ambient systems only.

10. TYPE 10 - PIPE STANCHION SADDLE: Saddles and yokes shall be carbon steel and comply with MSS Type 37 and FEDSPEC Type 38.

    a. Steel pipe (insulated) - shall be Carpenter & Patterson Fig. 125, B-Line B3090, or equal, with insulation shield.

    b. Steel pipe (uninsulated) - shall be Carpenter & Patterson Fig. 125, B-Line B3090, or equal.

    c. Cast and ductile iron pipe - shall be Carpenter & Patterson Fig. 125, B-Line B3090 NS, or equal.

    d. Copper pipe (uninsulated) - shall be Carpenter & Patterson Fig. 125, B-Line B3090, or equal, with insulation shield or lined with dielectric material.

    e. Copper pipe (insulated) - shall be Carpenter & Patterson Fig. 125, B-Line B3090, or equal, with insulation shield.

    f. Plastic pipe - shall be Carpenter & Patterson Fig. 125, B-Line B3090, or equal.

11. TYPE 11 - OFFSET PIPE CLAMP:

    a. Pipe clamp shall be carbon steel with configuration and components as specified and shall be of standard design manufactured by a pipe hanger component manufacturer.

        (1) Steel pipe (insulated) - shall be B-Line B3148, Grinnell Fig. 103, or equal, with insulation shield.

        (2) Steel pipe (uninsulated) - shall be B-Line B3148, Grinnell Fig. 103, or equal.

        (3) Cast and ductile iron pipe - shall be B-Line B3148 NS, Grinnell Fig. 103, or equal.

        (4) Copper pipe (insulated) - shall be B-Line B3148, Grinnell Fig. 103, or equal, with insulation shield.

        (5) Copper pipe (uninsulated) - shall be B-Line B3148, Grinnell Fig. 103, or equal, lined with dielectric material.

        (6) Plastic pipe - shall be B-Line B3148, Grinnell Fig. 103, or equal.

    b. Vertical pipe support applications shall be as specified above except that insulation shields shall not be used for insulated pipe.

12. TYPE 12 - RISER CLAMP: Riser clamp shall be carbon steel with configuration and components equivalent to MSS and FEDSPEC Type 8.

    a. Steel pipe (insulated) - shall be B-Line B3373, Grinnell Fig. 261, or equal.

    b. Steel pipe (uninsulated) - shall be B-Line B3373, Grinnell Fig. 261, or equal.

c. Cast and ductile iron pipe - shall be B-Line B3373, Grinnell Fig. 261, or equal.

d. Copper pipe (insulated) - shall be B-Line B3373 CT, Grinnell Fig. CT-121, Michigan model 511, or equal.

e. Copper pipe (uninsulated) - shall be B-Line B3373 CT, Grinnell Fig. CT-121, Michigan model 511, or equal.

f. Plastic pipe - shall be B-Line B3373, Grinnell Fig. 261c, or equal.

13. TYPE 13 - FRAMING CHANNEL PIPE STRAP: Pipe strap shall be carbon steel, with configuration equivalent to MSS Type 26.

a. Steel pipe (uninsulated) - shall be Superstrut No. C-708-U, Powerstrut PS 3126, Kin-Line No. 477, or equal.

b. Steel pipe (insulated) - shall be Superstrut No. C 708-U, Powerstrut PS 3126, Kin-Line No. 477, or equal, with insulation shield.

c. Copper pipe (uninsulated) - shall be Superstrut No. C-708-U, Powerstrut PS 3126, Kin-Line No. 477, or equal, with insulation shield or lined with dielectric material.

d. Copper pipe (insulated) - shall be Superstrut No. C-708-U, Powerstrut PS 3126, Kin-Line No. 477, or equal, with insulation shield.

e. Plastic pipe - shall be Superstrut No. C-708-U, Powerstrut PS 3126, Kin-Line No. 477, or equal.

C. RACK AND TRAPEZE SUPPORTS:

1. GENERAL: Unless otherwise specified, trapeze and pipe rack components shall have a minimum steel thickness of 12 gage, with a maximum deflection 1/240 of the span.

2. TYPE 20 - TRAPEZE PIPE SUPPORT: Trapeze pipe support cross members shall be framing channel as specified in paragraph 15096-2.02 E.5. Flat plate fittings shall be 1 5/8-inch square carbon steel of standard design manufactured by framing channel manufacturer, Unistrut P2471, B-Line B202-2, or equal.

3. TYPE 21 - PIPE RACK SUPPORT: Post and cross members shall be framing channel as specified in paragraph 15096-2.02 E.5. Pipe rack fittings shall be carbon steel, of standard design manufactured by framing channel manufacturer. 90 degree fittings shall be gusseted Unistrut P2484, B-Line B844, or equal. Post base fittings shall be as specified in paragraph 15096-2.02 D.5.

D. STRUCTURAL ATTACHMENTS:

1. TYPE A - MALLEABLE IRON CONCRETE INSERT: Concrete inserts shall be malleable iron and comply with MSS and FEDSPEC Type 18. Grinnell Fig. 282, Carpenter & Patterson Fig. 108, or equal.

2. TYPE B - SIDE BEAM BRACKET: Bracket shall be malleable iron and comply with MSS Type 34 and FEDSPEC Type 35. Grinnell Fig. 202, B-Line B3062, or equal.

3. TYPE C - MALLEABLE BEAM CLAMP WITH EXTENSION PIECE: Clamp and extension piece shall be malleable iron, tie rod shall be steel. Beam clamp shall comply with MSS and FEDSPEC Type 30. Grinnell Fig. 218 with Fig. 157 extension piece, B-Line B3054, or equal.

4. TYPE D - STEEL BEAM CLAMP WITH EYE NUT: Beam clamp and eye nut shall be forged steel. Configuration and components shall comply with MSS and FEDSPEC Type 28. Grinnell Fig. 292, Carpenter & Patterson Fig. 297, or equal.

5. TYPE E - FRAMING CHANNEL POST BASE: Post bases shall be carbon steel, of standard design manufactured by framing channel manufacturer. Single channel: Unistrut P2072A, B-Line B280, or equal. Double channel: Unistrut P2073A, B-Line B281, or equal.

6. TYPE F - WELDED BEAM ATTACHMENT: Beam attachment shall be carbon steel and comply with MSS and FEDSPEC Type 22. B-Line B3083, Grinnell Fig. 66, or equal.

7. TYPE G - WELDED STEEL BRACKET: Bracket shall be carbon steel and comply with MSS Type 32 and FEDSPEC Type 33 for medium welded bracket. Heavy welded bracket shall comply with MSS Type 33 and FEDSPEC Type 34.

8. TYPE H - CAST IRON BRACKET: Bracket shall be cast iron, Carpenter & Patterson Fig. 340, or equal.

9. TYPE J - ADJUSTABLE BEAM ATTACHMENT: Beam attachment shall be carbon steel, Carpenter & Patterson Fig. 151, B-Line B3082, or equal.

10. TYPE K - DOUBLE CHANNEL BRACKET: Wall channel shall be single channel framing channel as specified in paragraph 15096-2.02 E.5. Cantilever bracket shall be a carbon steel double framing channel assembly, Unistrut P2542 through P2546, B-Line B297-12 through B297-36, or equal.

11. TYPE L - SINGLE CHANNEL BRACKET: Wall channel shall be single channel framing channel as specified in paragraph 15096-2.02 E.5. Cantilever bracket shall be a carbon steel single framing channel assembly, Unistrut P2231 through P2234, B-Line B198-6, B198-12, B196-18 and B196-24, or equal.

12. TYPE M - WALL MOUNTED CHANNEL: Wall channel shall be single channel framing channel as specified in paragraph 15096-2.02 E.5.

13. TYPE N - PIPE STANCHION FLOOR ATTACHMENT: Baseplate shall be carbon steel with 1/2 inch minimum thickness. Anchor bolt holes shall be 1/16 inch larger than the anchor bolt diameter. The space between the baseplate and the floor shall be filled with nonshrink grout.

E. ACCESSORIES:

1. HANGER RODS: Rods shall be carbon steel, threaded on both ends or continuous threaded and sized as specified.

2. WELDLESS EYE NUT: Eye nut shall be forged steel and shall comply with MSS and FEDSPEC Type 17. Eye nut shall be Grinnell Fig. 290, B-Line B3200, or equal.

3. WELDED EYE ROD: Eye rod shall be carbon steel with eye welded closed. Inside diameter of eye shall accommodate a bolt diameter 1/8 inch larger than the rod diameter. Eye rod shall be Grinnell Fig. 278, B-Line B3211, or equal.

4. TURNBUCKLE: Turnbuckle shall be forged steel and shall comply with MSS and FEDSPEC Type 13. Turnbuckle shall be Grinnell Fig. 230, B-Line B3202, or equal.

5. FRAMING CHANNEL: Framing channel shall be 1 5/8 inches square, roll formed, 12-gage carbon steel. Channel shall have a continuous slot along one side with in-turned clamping ridges. Single channel: Unistrut P1000, B-Line B22, or equal. Double channel: Unistrut P1001, B-Line B22A, or equal. Triple channel: Unistrut P1004A, B-Line B22X, or equal.

2.3 THERMAL PIPE HANGER SHIELD

A. Thermal shields shall be provided at hanger, support and guide locations on pipe requiring insulation. The shield shall consist of an insulation layer encircling the entire circumference of the pipe and a steel jacket encircling the insulation layer. The thermal shield shall be the same thickness as the piping system insulation specified in Section 15250. The standard shield shall be used for hot systems and the vapor barrier shield shall be used for cold systems. Stainless steel band clamps shall be used where specified to ensure against slippage between the pipe wall and the thermal shield.

B. STANDARD SHIELD:

1. INSULATION:

a. Hydrous calcium silicate, high density, waterproof

b. Compressive strength: 100 psi average

c. Flexural strength: 75 psi average

d. K factor: 0.38 at 100 degrees F mean

e. Temperature range: 20 degrees F to 500 degrees F

2. STEEL JACKET: Galvanized steel. Gage shall be the manufacturer's standard supplied for the given pipe size.

3. CONNECTION: Shield shall have butt connection to pipe insulation. Steel jacket and insulation shall be flush with end.

C. VAPOR BARRIER SHIELD:

1. INSULATION:

a. Hydrous calcium silicate, high density, waterproof

b. Compressive strength: 100 psi average

c. Flexural strength: 75 psi average

d. K factor: 0.38 at 100 degrees F mean

e. Temperature range: 20 degrees F to 500 degrees F

2. STEEL JACKET: Galvanized steel. Gage shall be the manufacturer's standard supplied for the given pipe size.

3. CONNECTION: Shield shall have butt connection to pipe insulation. Insulation shall extend 1 inch each side of steel jacket for vaportight connection to pipe insulation vapor barrier.

2.4 PRODUCT DATA

A. Hanger and support locations and components shall be indicated on the piping layout drawings required by paragraph 15050-2.04.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT LOCATIONS

A. The Contractor shall locate hangers and supports as near as possible to concentrated loads such as valves, flanges, etc. Locate hangers, supports and accessories within the maximum span lengths specified in the project manual to support continuous pipeline runs unaffected by concentrated loads.

B. At least one hanger or support shall be located within 2 feet from a pipe change in direction.

C. The Contractor shall locate hangers and supports to ensure that connections to equipment, tanks, etc., are substantially free from loads transmitted by the piping.

D. Where piping is connected to equipment, a valve, piping assembly, etc., that will require removal for maintenance, the piping shall be supported in such a manner that temporary supports shall not be necessary for this procedure.

E. Pipe shall not have pockets formed in the span due to sagging of the pipe between supports caused by the weight of the pipe, medium in the pipe, insulation, valves and fittings.

3.2 INSTALLATION

A. Welded and bolted attachments to the building structural steel shall be in accordance with the requirements of the AISC Manual of Steel Construction. Unless otherwise specified, there shall be no drilling or burning of holes in the building structural steel.

B. Hanger components shall not be used for purposes other than for which they were designed. They shall not be used for rigging and erection purposes.

C. The Contractor shall install items to be embedded before concrete is poured. Fasten embedded items securely to prevent movement when concrete is poured.

D. Embedded anchor bolts shall be used instead of concrete inserts for support installations in areas below water surface or normally subject to submerging.

E. The Contractor shall install thermal pipe hanger shields on insulated piping at required locations during hanger and support installation. Butt joint connections to pipe insulation shall be made at the time of insulation installation in accordance with the manufacturer's recommendations.

F. Hanger and support components in contact with plastic pipe shall be free of burrs and sharp edges.

G. Rollers shall roll freely without binding.

H. Finished floor beneath Type N structural attachments and framing channel post bases shall be roughed prior to grouting. Grout between base plate and floor shall be free of voids and foreign material.

I. Baseplates shall be cut and drilled to specified dimensions prior to welding stanchions or other attachments and prior to setting anchor bolts.

J. Plastic or rubber end caps shall be provided at the exposed ends of all framing channels that are located up to 7 feet above the floor.

3.3 ADJUSTMENTS

A. The Contractor shall adjust hangers and supports to obtain required pipe slope and elevation. Shims made of material that is compatible with the piping material may be used. Stanchions shall be adjusted prior to grouting their baseplates.

****END OF SECTION****

SECTION 15856

IN-LINE CENTRIFUGAL REINFORCED THERMOSET POLYESTER (RTP) FANS

PART 1 - GENERAL

1.1 DESCRIPTION

A. SCOPE: This section specifies in-line or tubular centrifugal reinforced thermoset polyester (RTP) fans for corrosive air service.

B. TYPE: The in-line centrifugal RTP fans shall be nonoverloading, industrial duty, medium pressure, belt driven fans with backward curved or backward inclined air foil blades and electric motor drivers mounted on common bases.

1.2 QUALITY ASSURANCE

A. GENERAL:

1. Fans specified in this section shall be designed and selected for continuous operation with air containing corrosive and flammable vapors and gases generated from the treatment and conveyance of municipal wastewater and stabilization and dewatering of solids from municipal wastewater treatment processes.

2. Vapors and gases may be expected to include methane, hydrogen sulfide, chlorine gas, sulfur dioxide, gasoline vapors, ammonia, and water saturated air. The airstream may also be expected to contain droplets of dilute sulfuric acid. Air temperatures are expected to vary between 40 degrees F and 120 degrees F.

3. The fan manufacturer must certify that the fans have been tested in accordance with AMCA 211.

B. RELATED SECTIONS:

1. 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.

a. Section 11000 Equipment General Provisions

C. OPERATING REQUIREMENTS:

Equip. No.	Capacity, scfm	Static pressure, inches W.C.	Max. fan speed, rpm	Maximum fan, BHP	Motor HP	Wheel diam., inches	Construc. type
86-OCF-3	11,100	6	1440	17.7	20	33	3

D. CONNECTION REQUIREMENTS: The fans shall connect to ductwork of the sizes indicated without increasing friction drop.

E. STANDARDS: This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements

of this section and those of the listed documents, the requirements of this section shall prevail.

Reference	Title
AMCA 211	Certified Ratings Program – Product Rating Manual for Fan Air Performance
ASTM C582-84	Specification for Reinforced Laminates for Self-Supporting Structures for Use in a Chemical Environment
ASTM D4167-82	Fiber-Reinforced Plastic Fans and Blowers
ASTM D2563-70	Recommended Practice for Classifying Visual Defects in Glass-Reinforced Plastic Laminate Parts
ASTM E84-87	Standard Test Method for Surface Burning Characteristics of Building Materials (Tunnel Test)

F. FACTORY TESTING: RTP fans shall be tested for performance in accordance with AMCA Standard Test Code 211.

1.3 ENVIRONMENTAL CONDITIONS

A. Equipment shall be installed in locations as shown on the drawings. Ambient temperature ranges from 40 degrees through 120 degrees F. Relative humidity ranges from 20 to 95% (non-condensing).

1.4 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Construction Manager shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

2. Fan performance curves for the specified operation conditions.

3. Materials and construction details of the housing, wheel, guide vanes, drive units, and other fan components and accessories.

4. Motor data in accordance with the requirements of Section 16040.

5. Bearing ratings for the fan and motor at design conditions.

6. Dimensioned drawings of fans including motor V-belt drive and base.

7. Vibration isolation design data in accordance with Section 11021.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The Engineer believes the following candidate manufacturers are capable of producing equipment and/or products that will satisfy the requirements of this Section. This statement, however, shall not be construed as an endorsement of a particular manufacturer's products, nor shall it be construed that named manufacturers' standard equipment or products will comply with the requirements of this Section.

1. Fans shall be Harrington Type HPI, Hartzell Series 40, Industrial Air Model 168, or equal, modified as required to meet the provisions of these specifications.

2.2 MATERIALS

A. COMPONENTS:

Component	Material
Housing	Reinforced thermoset polyester (RTP)
Inlet cone	RTP
Wheel	RTP
Guide vanes	RTP
Door gasket	Neoprene or Teflon
Hub, bushings	Carbon steel encapsulated in RTP
Bolts	Type 316 stainless steel
Base	Steel, epoxy coated
Shaft	Type 316, 416, or 316L stainless steel
Shaft seal	Teflon

B. RTP FABRICATION:

1. HOUSING: Fan housings shall be constructed of an RTP laminate consisting of a fire-resistant resin and synthetic or fiberglass reinforcement suitable for continuous duty at 200 degrees F. Housing shall be ultraviolet light stabilized and shall achieve fire-retardant characteristics which equal or

exceed the ASTM E84 rating of 25 or less, without the use of additives. Housings shall be built up with laminate construction using Hetron 92 FR resin, or equivalent, a C glass veil for corrosion resistance and chopped strand fiberglass for structural core strength. Outer layers shall be a 100 percent resin gel coat. The next layer shall be a C glass corrosion resistant veil followed by another resin rich gel coat layer and another C glass veil. The structural core layer shall be comprised of resin and chopped strand fiberglass. Total glass content shall be 30 to 40 percent. Housing shall be graphite impregnated and grounded to prevent static buildup.

2. WHEEL: Fan wheel shall be built up using laminate construction. Wheel resin shall be Atlac 382 or its equivalent. Wheel material shall contain antimony trioxide fire retardant to limit burning to a maximum of 0.08 inch per minute. The first layer of the wheel laminate shall be a 100 percent resin gel. The next layer shall be a C glass corrosion resistant veil followed by another resin rich gel coat and another C glass veil. The structural core consisting of chopped strand fiberglass and resin shall be layed followed by a C glass veil, a resin rich gel coat, another C glass veil, and a final 100 percent resin gel coat. Total glass content shall be 30 to 40 percent. Wheel shall be graphite impregnated.

3. TYPE: Construction, by type, shall consist of the following minimum finished laminate thicknesses in inches:

Type	Sides and scroll	Flanges	Protective shield	Wheel blades	Backplate
1	3/16	3/8	1/8	3/8	3/8
2	5/16	3/8	3/16	7/16	7/16
3	5/16	3/8	3/16	7/16	1/2
4	3/8	1/2	3/16	1/2	5/8
5	7/16	1/2	1/4	5/8	3/4
6	1/2	3/4	1/4	3/4	3/4

Types 3, 4, 5, and 6 shall be provided with an access door as specified in this section.

2.3 CONSTRUCTION

A. FAN CONSTRUCTION: Fans shall be constructed in accordance with ASTM D4167. Fans shall be medium pressure, V-belt driven, centrifugal fans with backward curved or backward inclined airfoil blades. Fan housing shall be cylindrical, with a round cross-section, and AMCA Arrangement 1 configuration. Fan shall have a tubular inlet cone and stationary inlet guide vanes. Bearings shall be grease lubricated pillow block type rated for a minimum AFBMA L 10 bearing life of 50,000 hours of operation. The steel shaft hub and bushings shall be completely encapsulated. Extended lube lines to the bearings shall be provided. A sleeve

extending from the back plate of the fan wheel through the fan housing shall be provided for protection of the fan shaft. The rotor shall be statically and dynamically balanced after fabrication. Labyrinth Teflon seals with stainless steel rings and springs shall be provided to prevent any air leakage. The base shall be fabricated of steel, adequately braced, and equipped with lifting eyes. No metal parts shall be exposed to the atmosphere.

B. ACCESSORIES:

1. DRAIN AND FLANGED CONNECTIONS:

a. The fans shall be provided with a 1 inch RTP drain at the lowest point of the fan housing. Flanged inlet and flanged outlet shall be provided. All flanges shall be factory drilled. All fasteners shall be type 316 stainless steel.

b. An inspection port cleanout door and a drain coupling shall be provided.

2. FLEXIBLE CONNECTIONS: Neoprene or TFE flexible connections specifically designed for the corrosive atmosphere specified shall be provided for flexible joints at the fan to duct connections. The flexible connection on the fan inlet and discharge shall be gasketed and flanged to achieve a positive, gastight seal.

3. WEATHER COVERS: Provide RTP weather covers to protect the motor and drive units for all fans installed outdoors. Weather covers shall be used in lieu of belt guards and shall comply with OSHA requirements.

2.4 DRIVE UNIT

A. GENERAL: Each fan shall be V-belt driven by an electric motor mounted on an epoxy coated steel base. V-belts shall be the antistatic type.

B. EQUIPMENT MOUNTING: Fans shall be mounted on Type III bases with Type B mountings and seismic restraints as specified in Section 11021. Vibration isolation mountings shall have a minimum certifiable deflection of 2.5 inches. The mounting platform shall be slotted to allow tension adjustment of the drive belts and an OSHA belt guard, as specified in Section 11000, shall be supplied. Mountings shall be of the height-saving type. Seismic restraints shall be designed for a 4g lateral acceleration.

C. MOTORS: The electric motors shall be TEFC Type 2 motors designed for operation on 460V AC, three phase, 60 Hz electrical service. The electric motors shall be energy-efficient, severe duty motors as specified in Section 16040. A weatherproof, coated motor guard shall be provided.

2.5 PRODUCT DATA

A. The following information shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook:

1. Operation and maintenance information.

2. Certification that the units have been tested in accordance with the applicable AMCA Standard Test Code and Certified Ratings Program.

2.6 STANDBY COMPONENTS

A. The following shall be provided for each fan size:

1 - set shaft bearings

1 - set V-belts

1 - shaft seal

PART 3 - EXECUTION

3.1 INSTALLATION

A. Each fan shall be connected and installed as shown on the contract drawings and in accordance with the manufacturer's printed instructions.

3.2 TESTING

A. After completion of installation, each unit shall be completely field tested and balanced in accordance with Section 15990 to guarantee compliance with the contract drawings and this specification.

****END OF SECTION****

SECTION 15863

PROPELLER WALL FANS

PART 1 - GENERAL

1.1 DESCRIPTION

A. SCOPE: This section specifies wall-mounted fans complete with fans, motors, dampers and accessories required for ventilation systems.

B. EQUIPMENT LIST:

Item	Equipment No.
Area 76 General Ventilation, Second Floor	76-EF-11

C. OPERATING REQUIREMENTS: Fan motors shall be nonoverloading on all points of the operating curve. Fans shall be designed for continuous duty service and to comply with the following:

Equip. No.	Capacity, scfm	Static pressure, in., w.c.	Maximum fan speed, rpm	Motor HP	Drive type	Operating voltage / phase
76-EF-11	11,100	0.25	850	1.5	Belt	460/3

D. SOUND AND VIBRATION: Fans specified in this section shall operate at noise levels below 30 sones, as defined by AMCA Standard 301, and at tip speeds below 10,000 fpm.

1.2 QUALITY ASSURANCE

A. REFERENCES:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of commencement of the Work. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
AMCA Standard 211	Certified Ratings Program – Product Rating Manual for Fan Air Performance
AMCA Standard 301	Methods for Calculating Fan Sound Ratings from Laboratory Test Data

B. CERTIFICATION: Fans shall bear the AMCA rating seal.

1.3 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Construction Manager shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

2. A copy of the contract document control diagrams and process and instrumentation diagrams relating to the submitted equipment, with addendum updates that apply to the equipment in this section, marked to show specific changes necessary for the equipment proposed in the submittal. If no changes are required, the drawing or drawings shall be marked "no changes required". Failure to include copies of the relevant drawings with the submittal shall be cause for rejection of the entire submittal with no further review.

3. Fan performance curves for the specified operating conditions.

4. Motor data form as required in Section 16040.

1.4 ENVIRONMENTAL CONDITIONS

A. Ambient temperature ranges from 40 degrees through 122 degrees F. Relative humidity ranges from 20 to 95% (non-condensing).

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The Engineer believes the following candidate manufacturers are capable of producing equipment and/or products that will satisfy the requirements of this Section. This statement, however, shall not be construed as an endorsement of a particular manufacturer's products, nor shall it be construed that named manufacturers' standard equipment or products will comply with the requirements of this Section.

1. Fans shall be wall mounted, V-belt or direct driven propeller type. Fans shall be manufactured by Aerovent, Greenheck, Penn Ventilator, or equal, modified to provide the specified features and to meet the specified operating conditions.

2.2 MATERIALS

Component	Material
Propeller	Aluminum
Venturi	Steel
Wall panel	Steel
Fan propeller shaft	Steel
Fasteners	Stainless steel
Pillow blocks	Cast iron
Sheaves	Cast iron

A. Materials specified are considered the minimum acceptable for the purposes of durability, strength, and resistance to erosion and corrosion. The Contractor may propose alternative materials for the purpose of providing greater strength or to meet required stress limitations. However, alternative materials must provide at least the same qualities as those specified for the purpose.

2.3 EQUIPMENT

A. FAN:

1. The fan shall be V-belt or direct driven as specified in paragraph 15863-1.01 C. The fan shaft, on belt-driven fans, shall be mounted in heavy-duty ball bearing pillow blocks with grease fittings. Bearings shall be rated for a minimum AFBMA L-10 bearing life of 50,000 hours.

2. Belt-driven fans shall be furnished with adjustable pitch sheaves and adjustable motor bases suitable for a plus or minus 5 percent adjustment in operating speed. The V-belt drive shall be as specified in paragraph 11000-2.03.

B. MOTOR: Unless otherwise specified, motors shall operate at 1750 rpm and shall be Type 2 as specified in Section 16040. Motors 1 HP and larger shall be the high efficiency type. Motors 1/12 HP and smaller shall be the fan manufacturer's standard motor.

C. FAN PANEL: Each fan panel shall have a spun venturi to direct air smoothly to the propeller blades. The fan, drive motor and fan guard shall be securely attached to the fan panel by means of a four-legged angle or tubular frame and mounting pads. The fan panel, frame, and mounting pads shall receive the manufacturer's standard enamel coating unless otherwise specified.

D. ACCESSORIES:

1. The fan shall be provided with a steel mounting collar, and a spring-loaded aluminum backdraft damper where specified. Mounting collars shall be protected with a baked epoxy finish. Fans shall be provided with inlet guards constructed of steel wire with lacquer finish. Inlet guards shall conform to OSHA standards and shall be removable to provide motor access.

2. Where the motor and drive assembly are specified to be installed in a weather-exposed location, such as the exterior side of an exterior wall, a sheet metal shroud or weather hood shall be provided for the fan. This shroud shall protect the fan and drive assembly from direct exposure to the elements without restricting airflow to the fan. A bird screen shall be provided with the shroud.

2.4 PROTECTIVE COATING

A. Equipment shall be provided with the manufacturer's standard protective coatings.

2.5 SPARE PARTS

A. One set of V-belts shall be provided for each belt-driven fan.

2.6 PRODUCT DATA

A. The following information shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook:

1. Motor data as specified in paragraph 16040-2.05.

2. Certification that the units have been tested and rated in accordance with the applicable AMCA Standard Test Code and Certified Ratings Program.

3. Applicable operating and maintenance data.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Each fan shall be installed as specified and in accordance with manufacturer's recommendations.

3.2 FIELD TESTING

A. Each fan shall be completely field tested in accordance with Section 15990 to guarantee compliance with the specifications.

****END OF SECTION****

SECTION 15891

SHEET METAL DUCTWORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. SCOPE: This section specifies plenums, sheet metal housings, ductwork, equipment connections, reinforcing and other devices required to make air distribution systems complete and operational. Sheet metal ductwork shall not be used for foul air service.

B. TYPE: Ductwork and appurtenances shall be designed and fabricated specifically for the applications described under the conditions specified.

C. DESIGN CRITERIA AND CONSIDERATIONS:

1. GENERAL: Unless otherwise specified, sheet metal gage, reinforcing, hanger and support systems, ductwork joint types and other basic design construction details shall be in accordance with the 1985 Sheet Metal and Air Conditioning Contractors National Association (SMACNA) HVAC Duct Construction Standards. Ductwork shall be fabricated to the configurations and dimensions specified. Dimensions specified indicate net free area; dimensions shall be increased by the thickness of the lining where internal lining is required.

2. LOW PRESSURE DUCTWORK: Low pressure ductwork shall convey air with a velocity less than 2,000 fpm and maximum static pressure of 2 inches of water column. Low pressure ductwork shall conform to 2-inch w.c. pressure class.

3. MEDIUM PRESSURE DUCTWORK: Medium pressure ductwork, where specified, shall convey air with a velocity greater than 2000 fpm and a maximum static pressure of 6 inches of water column. Medium pressure ductwork shall conform to 6-inch w.c. pressure class.

4. SYSTEM LEAKAGE: All joints shall be sealed as required to limit total system leakage to a maximum of 1 percent of the specified equipment airflows.

5. CHANGE IN DUCT SIZE: Change in duct size shall be made by a uniformly tapering section. The change in direction of the tapering section shall not be more than 1 inch in 5 inches of run, unless otherwise specified.

6. BENDS IN DUCT: With the exception of mitered bends, all bends in ducts shall have inside radii equal to the duct width or diameter. Double wall turning vanes shall be provided at all 90-degree mitered bends.

7. DUCT SLEEVES: Whenever ducts extend through concrete or masonry walls, floors or ceilings, they shall be provided with a sleeve. Concrete inserts shall be provided before pour to support all ductwork under this section.

8. DUCT OPENINGS: Access doors or hand holes shall be provided in ducts at locations to reach modulating dampers, fusible links, controllers and any

other moveable devices in the ducts. The opening shall be 1 inch less duct size or of adequate size to reach in and maintain these devices. Two-inch diameter nipples with threaded caps shall be welded to the duct where specified or directed by the engineer for balancing the system.

9. VIBRATION ISOLATION FLEXIBLE CONNECTIONS: Flexible connections shall be provided at duct connections to motor driven air handling equipment and other locations specified. Flexible connections shall be UL approved and provided with the necessary angle, straps, bolts, clips, or other fasteners to secure the flexible material to the equipment and ducts. Flexible connections exposed to the weather shall be provided with approved sheet metal weather covers.

1.2 QUALITY ASSURANCE

A. REFERENCES:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of commencement of the Work. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ASHRAE CH 1	Handbook - Equipment Volume, Duct Construction
ASHRAE CH 33	Handbook - Fundamentals Volume, Duct Design
ASTM A525	General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
ASTM A527/A527M	Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality
ASTM B209	Aluminum and Aluminum Alloy Sheet and Plate
ASTM B211	Aluminum and Aluminum Alloy Bar, Rod, and Wire
ASTM B308	Aluminum - Alloy 6061-T6 Standard Structural Shapes, Rolled or Extruded

Reference	Title
NFPA 90A	Standard for the Installation of Air Conditioning and Ventilating Systems
SMACNA	HVAC Duct Construction Standards Metal and Flexible
UBC	Uniform Building Code
UMC	Uniform Mechanical Code
UL 181	Factory-made Air Ducts and Connectors

B. REQUIREMENTS OF REGULATORY AGENCIES: Ductwork construction, installation, and air system performance shall comply with UMC, ASHRAE CH-1 and CH-33, and SMACNA Duct Construction Standards.

1.3 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Construction Manager shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

2. An 8-1/2 inch by 11-inch manual with detail sheets or catalog data of flexible duct connectors, duct sleeves, duct access doors, turning vanes, volume dampers, supports, hangers, etc.

PART 2 - PRODUCTS

2.1 GENERAL

A. The Contractor shall provide all ductwork, plenums, and all auxiliary work and products of any kind necessary to make the HVAC systems complete and ready for operation. Ductwork shall comply with the following restrictions and conditions:

1. Ductmate systems shall be used as an option by the Contractor for low pressure systems only.

2. Snap lock seams shall not be permitted.

3. Where space conditions permit, full radius turns shall be used at offsets.

4. Turning vanes shall be provided where tees, bends, and elbows are not 1 1/2 times the width at centerline and in all rectangular elbows.

5. Ductwork elbows, takeoffs, and fittings shall be in accordance with the SMACNA and ASHRAE standards for the pressure class and conditions specified.

6. Visible duct deflection, loss of shape, or unwarranted noise or vibration resulting from faulty or inadequate support, reinforcing, metal gage, fabrication, or joint spacing shall be corrected at no expense to the Owner.

2.2 MATERIALS

A. LOW AND MEDIUM PRESSURE SYSTEMS:

Component	Material
Duct	Aluminum, alloy 3003-H14, conforming to ASTM B209 and ASTM B211
Duct sleeve	Galvanized steel, 10 gage or aluminum, alloy 3003-H14, conforming to ASTM B209 and ASTM B211
Flexible duct connector	Noncombustible, weather and ozone resistant, abrasion-proof woven fiberglass fabric with coating weighing not less than 24 ounces per square yard. Maximum flame spread rating of 25, smoke rating of 50 for all materials including connecting tape, etc. UL 181 approved.
Turning vanes	Galvanized steel or aluminum to match duct material.
Hangers and supports, rivets and bolts, reinforcing	Galvanized steel or aluminum, alloy 6061-T6 conforming to ASTM B308 to match duct material.

2.3 JOINTS AND REINFORCING

A. Transverse stiffeners and joints shall be appropriately spaced to maintain duct cross-section integrity in accordance with the pressure class specified and at the prevailing operating velocities. After joints are crimped, they shall be further secured by bottom punching or riveting. Longitudinal seams shall be Pittsburgh lock and shall be cross broken outward. Intake, or exhaust, side ducts shall be cross broken inward. Discharge ducts shall be cross-broken outward. All plenums and casings shall be

similarly cross broken and further reinforced with 1 inch x 1 inch x 1/8 inch angles running diagonally between joints, riveted to the casings.

B. Low pressure ductwork shall have slip joints. Medium pressure ductwork shall have flanged or welded joints. Joints shall not interfere with airflow in the ducts. Exterior ducts shall be stiffened, braced, and supported in a manner designed to maintain duct integrity and cross-section under wind and snow loads specified in the appropriate codes or standards for the UBC. Interior ducts shall be suitably braced and stiffened at floor and roof penetrations as well as over their unsupported length in a manner designed to maintain duct integrity and limit vibration and noise in accordance with recognized standards of the industry.

C. Ducts over 17 inches in largest dimension shall be cross broken or beaded on all four sides. In ducts over 72 inches at each transverse joint 3/8-inch stay rods shall be installed. Spacing between rods or rods on side of duct shall not exceed 48 inches.

2.4 DUCT SLEEVES

A. Sleeve flanges shall not be less than 4 inches wide and shall be installed tight against each side of the barrier. Sleeves shall be 2 inches larger than the duct or external duct insulation. The space between the duct and the sleeve shall be packed with fiberglass or material of original wall. Duct flanges not less than 4 inches wide shall be installed tight against the wall on each side and fastened to the duct sleeves.

2.5 HANGERS AND SUPPORTS

A. GENERAL: Duct support spacing shall be in accordance with the SMACNA standards for the pressure class and conditions specified and prevailing in the system. Supports shall be spaced to prevent visible duct deflection and loss of system integrity. Aluminum ductwork shall be constructed with strength and dimensional stability comparable to conventional steel duct. In the absence of other criteria, aluminum sheet and reinforcing shall have a moment of inertia three times greater than that recommended for steel ductwork. Supports shall be designed in accordance with the UBC for seismic zone 4.

B. CONCEALED CEILING SPACES: Rectangular ductwork shall be supported with metal strap hanger screwed to the sides and bottom of duct. One strap each side with minimum of two screws in side and one in bottom of each strap.

C. EXPOSED AREAS:

1. Rectangular ductwork shall be supported with shelf angle trapeze hanger or unistrut with rods or angles by welding or bolting. Sway bracing shall be provided, minimum of one at right angle to each duct run.

2. Round ductwork shall be supported with two half round bands with rods bolted to the bands. Sway bracing shall be provided, minimum of one at right angle to each duct run.

2.6 ACCESS DOORS

A. The doors shall be rigid and shall be provided with airtight gaskets and shall not vibrate or cause noise under service. Doors in insulated ducts shall be the insulated type. Doors shall be continuous hinged type with ventlock latch on outside.

B. Plenum access doors shall be 24 inches by 66 inches or as specified.

2.7 FLEXIBLE CONNECTIONS

A. Flexible connection joints shall be airtight and have a minimum allowance of 1-inch slack all around. Flexible connections shall be designed to be removed from the line and be reinstalled without disassembling adjacent ductwork.

B. Connections shall be installed with a minimum 4-inch clearance between metal parts on fan connections, equipment connections, and our distribution devices.

2.8 TURNING VANES

A. Turning vanes shall be 2 inch blades for ducts up to 18 inches in either dimension and shall be 4 1/2 inch blades for larger ducts. All turning vane assemblies shall be finished with an air dried phenolic corrosion resistant coating prior to installation. All turning vanes shall be constructed of double thickness vanes.

2.9 DAMPERS

A. Manually operated, opposed blade or single blade, quadrant type balancing dampers shall be provided in each branch duct take off after leaving the main duct on low pressure systems. Balancing dampers shall be provided on medium pressure systems where specified. Splitter dampers shall be provided only where specified.

B. Single-blade dampers shall be constructed for ducts 9-1/2 inches by 30 inches and smaller. Opposed blade dampers shall be constructed with a maximum blade size of 12 inches by 72 inches.

2.10 DUCTWORK COATING

A. Exposed uninsulated or internally insulated ductwork shall be coated on all external surfaces in accordance with Section 09900 except in mechanical rooms.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Ductwork shall be installed in accordance with SMACNA and NFPA. All ductwork indicated on the drawings is schematic. Therefore, changes in duct size, duct configuration, and location may be necessary to conform to field conditions.

B. Ductwork and accessories shall be installed to provide a system free from buckling, warping, breathing, and vibration. Ductwork installation shall permit installation of other required services without piercing, crimping, or reducing duct sizes. Where space conditions permit, full radius turns shall be used at offsets. The inside of all ducts visible through grilles and registers shall be painted flat black.

C. All ductwork shall be made airtight. Flanged joints shall be sealed with closed-cell neoprene gaskets compressed between mating flanges. All other joints and seams shall be sealed with liquid or mastic type sealants. Taped joints shall not be permitted. All joints shall comply with the requirements of SMACNA Seal Class A.

D. All duct fittings shall be fabricated with continuously welded seams and joints.

3.2 TESTS

A. Tests shall be as specified in Section 15990. Duct test holes with patches in ducts shall be provided where directed or necessary for testing and balancing purposes.

****END OF SECTION****

SECTION 15911

DAMPERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. SCOPE: This section specifies volume and control dampers for air system balancing and control.

B. EQUIPMENT SCHEDULE:

Equipment No.	Item	CFM	Maximum pressure drop, inches, W.C.*
60MD-1648	Area 60 OCF Train 1	26,000	0.50
60MD-1698	Area 60 OCF Train 2	26,000	0.50
60MD-1748	Area 60 OCF Train 3	26,000	0.50

* Damper in fully open position at rated air flow

1.2 QUALITY ASSURANCE

A. REFERENCES AND RELATED SECTIONS:

1. 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.

   a. Section 11000 Equipment General Provisions

2. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

3. Unless otherwise specified, references to documents shall mean the documents in effect at the time of commencement of the Work. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
AMCA Standard 511	Certified Ratings Program – Product Rating Manual for Air Control Devices
SMACNA	HVAC Duct Construction Standards--Metal and Flexible

B. CERTIFICATION: Multiple blade dampers shall bear the AMCA certified ratings seal for both air leakage and performance.

1.3 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Construction Manager shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

2. Product data as required by Section 2.8 of this specification.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Splitter blade damper and single blade damper material shall be the same as the material of the surrounding ductwork for which the damper is provided unless otherwise specified.

2.2 SPLITTER DAMPER (NOT USED)

2.3 SINGLE BLADE DAMPER

A. UP TO 18 INCHES WIDE: Fiberglass Reinforced Plastic.

2.4 MULTIBLADE DAMPER

A. GENERAL: Damper blades shall be 16-gage extruded aluminum. Frames shall be 2-inch by 1/2-inch by 1/8-inch thick extruded channel. Damper blade linkages shall be stamped aluminum and shall be located out of the air stream. Blades shall be provided with vinyl edge seals.

B. PARALLEL BLADE: Parallel blade dampers shall be constructed such that all damper blades rotate in the same direction when the damper is opened or closed.

C. OPPOSED BLADE: Opposed blade dampers shall be constructed such that each damper blade rotates in the opposite direction of the blades adjacent to it when the damper is opened or closed.

2.5 BACKDRAFT AND BAROMETRIC DAMPERS

A. Damper blades shall be aluminum and shall be provided with neoprene or felt edge seals to ensure tight closure. Backdraft dampers shall be counterbalanced when installed in vertical ductwork. The blade interconnecting linkage shall be located within the damper frame and out of the airstream.

2.6 OPERATORS

A. ELECTRIC ACTUATORS: Operators for automatically controlled dampers, where specified, shall be 120-volt motor actuators provided complete with all necessary linkage to position the damper throughout its full operating range. The actuator shall be mounted on the outside of the damper frame and shall have sufficient torque to position the size of damper served at the specified conditions. The damper area served by each operator shall not exceed the maximum area recommended by the actuator manufacturer. Time required for the operator's full stroke shall not exceed 1 minute.

B. CONTROLS:

1. Provide a Remote Hand Station operated on 120VAC with Local (Damper) and Remote (Computer) control and provisions for the following control and status signals and indication:

   a. Local Open Pushbutton

   b. Local Close Pushbutton

   c. In Computer

   d. Remote Open Command

   e. Remote Close Command

   f. Closed Status / Indicating Light

   g. Opened Status / Indicating Light

2. Refer to Div 16 specifications and Contract Drawing OC-60-E-319 for reference and other requirements.

2.7 MANUAL POSITIONER

A. A 3/8 inch locking quadrant shall be provided at one end of the damper, external to the ductwork, on manually adjusted dampers. Positioner extensions shall be provided for dampers installed in ductwork located in ceilings, walls or floors that is not directly accessible.

2.8 PRODUCT DATA

A. The following information shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook:

1. Catalog data and dimensional drawings.

2. Shop drawings.

3. Applicable operating and maintenance data for damper operators.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Dampers shall be aligned and installed in the connecting ductwork in accordance with SMACNA standards and the manufacturer's recommendations. The Contractor shall locate damper positioners for direct access at the duct or install extensions where necessary for accessibility. Balancing dampers shall be single blade type unless otherwise specified.

3.2 TEST AND ADJUSTMENT

A. Single blade dampers and splitter dampers shall be tested to assure operation through their full range of movement without binding or interference following installation. Multiple blade dampers shall be manually tested, prior to installation and following installation, to assure operation through their full range of movement without binding or interference. Final damper adjustments and positioning shall be performed during system balancing in accordance with Section 15990.

****END OF SECTION****

SECTION 15944

LOUVERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. SCOPE: This section specifies intake and exhaust air louvers and accessories.

B. PERFORMANCE AND DESIGN REQUIREMENTS:

1. GENERAL: Louver shall be suitable for air supply or discharge service and shall be sized as specified.

Equipment Serviced	Louver dimension, inches			Minimum free area, sq ft	Airflow, cfm	Remarks
	Width	Height	Depth			
76-EF-11	48	48	4	9	11,100	N/A

2. ACOUSTICAL LOUVERS: In addition to the requirements listed above, acoustical louvers shall provide acoustic performance in accordance with the following:

a. Octave band center frequency: 63, 125, 250, 500, 1000, 2000, 4000, 8000

b. Transmission loss in decibels: 8, 10, 13, 19, 24, 23, 20, 25

1.2 QUALITY ASSURANCE

A. REFERENCE:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of commencement of the Work. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
AA DAF 45	Designation System for Aluminum Finishes
AMCA Standard 511	Certified Ratings Program – Product Manual for Air Control Devices
ASTM B221	Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
ASTM C1071	Standard Specification for Thermal and Acoustical Insulation (Mineral Fiber, Duct Lining Material)

B. CERTIFICATION: Louvers shall bear the AMCA certified ratings seal for both air performance and water penetration.

1.3 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Construction Manager shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The Engineer believes the following candidate manufacturers are capable of producing equipment and/or products that will satisfy the requirements of this Section. This statement, however, shall not be construed as an endorsement of a particular manufacturer's products, nor shall it be construed that named

manufacturers' standard equipment or products will comply with the requirements of this Section.

1. Louvers shall be Airolite, Construction Specialties, Ruskin, or equal, modified to provide the specified features.

2.2 MATERIALS

Component	Material
Blades	ASTM B221, 6063-T52 extruded aluminum alloy
Frame	ASTM B221, 6063-T52 extruded aluminum alloy
Fasteners	Stainless steel or aluminum
Bird screen	Aluminum

2.3 EQUIPMENT FEATURES

A. BLADES: Blades shall be of the fixed, drainable type with interlocking blade braces to provide an uninterrupted horizontal line. Blades for all louvers shall be minimum 0.081 inch (12 gage) thick. Slideable interlocked mullions shall have provisions for expansion and contraction.

B. FRAME: The frame shall be minimum 0.081 inch (12 gage) thick for all louvers. The louver frame shall be assembled by welding. The head, sill, and jamb shall be one-piece structural members and shall have an integral calking slot and retaining bead.

C. SCREEN: The louver shall be furnished with a removable bird screen constructed of 1/2-inch mesh, 16-gage (0.063 inch) wire and secured within a 10-gage extruded aluminum frame. The screen shall be mounted on the interior louver face but independent of the louver.

D. FINISH: Unless otherwise specified, all louvers shall receive a 215-R1, Aluminum Association Code AA-C22A41, clear anodized finish after assembly. Minimum coating thickness shall be 0.7 mil.

2.4 ACOUSTICAL LOUVERS

A. Acoustical louvers shall be as specified in paragraph 15944-2.03 and shall be provided with the additional features specified herein. Acoustical louvers shall be the stationary type with insulated blades. The blades shall be insulated with mineral fiber conforming to ASTM C1071 requirements for acoustical insulation. The mineral fiber shall be held in place by a perforated aluminum sheet which completely covers the insulation and is securely fastened to the underside of the louver blade.

2.5 COMBINATION LOUVERS

A. Combination louver shall be a stationary blade type louver and adjustable blade damper mounted together in a common frame. The stationary louver and frame shall be as specified in paragraphs 15944-2.02 and 15944-2.03. The adjustable blades shall be extruded 6063T5 aluminum, 0.125 inch (8 gage) thick. The adjustable blade

linkage shall be concealed in the louver frame and located out of the air stream. Vinyl edge seals shall be provided on the damper blades. The adjustable blades shall pivot on 1/2-inch diameter aluminum or steel pins located at the blade ends and attached to the operator linkage. The pivot pins shall be mounted on self-lubricating nylon or oil impregnated bronze bearings. Jamb seals shall be provided to prevent air leakage around closed damper blades.

2.6 OPERATORS

A. ELECTRIC ACTUATORS: Operators for combination louvers, where specified, shall be 120-volt motor actuators provided complete with all necessary linkage to position the damper throughout its full operating range. The actuator shall be mounted on the outside of the louver frame and shall have sufficient torque to position the size of damper served at the specified conditions. The damper area served by each operator shall not exceed the maximum area recommended by the actuator manufacturer. Time required for the operator's full stroke shall not exceed 1 minute.

B. PNEUMATIC ACTUATORS: (Not Used)

2.7 PRODUCT DATA

A. The following information shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook:

1. Certified results of pressure drop test data and water penetration data for all louvers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The louver shall be aligned, connected, and installed as specified and in accordance with the manufacturer's recommendations. A bituminous coat shall be applied to all aluminum surfaces in contact with concrete or masonry.

3.2 TESTING

A. After completion of installation, all louvers with operating dampers, both manually and automatically operated, shall be completely field tested to ensure compliance with these specifications.

****END OF SECTION****

SECTION 15990

HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the labor and services necessary to test, adjust, and balance under actual operating conditions air systems design flow rates. Nothing herein shall be construed as relieving the contractor of its overall responsibility of this portion of the work.

1.2 QUALITY ASSURANCE

A. REFERENCES:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of commencement of the Work. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
NEBB	Procedural Standards for Testing Adjusting and Balancing of Environmental Systems
AABC	National Standards for Total System Balance
ASHRAE 70	Standards--Methods of Testing for Rating the Air Flow Performance of Outlets and Inlets

B. TESTING AGENCY: The Contractor shall procure the services of an independent air and hydronic balancing and testing agency, belonging to the Associated Air Balance Council (AABC) or the National Environmental Balancing Bureau (NEBB), to perform air and hydronic balancing, testing and adjustment of systems. The Contractor shall submit a copy of the National Project Certification Performance

Guaranty, issued to the testing agency by the AABC, as a part of the balancing report specified in paragraph 15990 2.01 B.

C. CODES AND STANDARDS:

1. The Contractor shall comply with applicable procedures and standards of the certification sponsoring association:

   a. "National Standards for Field Measurements and Instrumentation, Total Systems Balance, Air Distribution Hydronics Systems," AABC.

   b. "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems", NEBB.

   c. "Method of Testing for Rating the Air Flow Performance of Outlets and Inlets," ASHRAE.

2. Calibration and maintenance of instruments and accuracy of measurements shall comply with the requirements of the standards.

1.3 SPECIAL REQUIREMENTS

A. Tests and adjustments shall include the complete testing and balancing of all hydronic systems and heating, ventilating, and air conditioning systems and necessary adjustments to the heating, air conditioning, and ventilating equipment to accomplish the specified design flow rates.

B. Should any apparatus, material or work fail to meet the specified requirements in these tests, the Contractor shall make the necessary corrections and retest the apparatus, material, or work at no additional cost to the Owner.

1.4 BALANCING

A. GENERAL: The Contractor shall review plans and specifications prior to testing and balancing the air and hydronic systems. The contractor shall submit a proposed approach and schedule for approval prior to the start of testing and balancing work. Characteristics to be tested and adjusted to conform to the values specified include the following:

1. Total airflow rates delivered by fans and air-handling units.

2. Flow rates at all grilles, registers, diffusers, supply and exhaust and return ducts.

3. Distribution patterns at air outlets.

4. Operation and modulation of each control valve.

B. AIR FLOW RATE SPECIFICATIONS:

1. POSITIVE PRESSURE ROOM:

   a. Supply air specification must dictate a +0%/-10% air flow tolerance

   b. Exhaust air specification must dictate a +10%/-0% air flow tolerance

2. NEGATIVE PRESSURE ROOM:

a. Supply air specification must dictate a +10%/-0% air flow tolerance

b. Exhaust air specification must dictate a +0%/-10% air flow tolerance

C. AIR FLOW RATE MEASUREMENTS:

1. Airflow rates shall be obtained by adjustment of the fan speeds, dampers, or registers. All flow rates shall be measured with supply, return, and exhaust systems operating with heating and cooling coils wet, with filter bank resistance midway between the design values specified for clean and dirty filters, with auxiliary systems in operation and with all doors and windows closed.

2. Flow rates at grilles, registers, branch ductwork and air distribution patterns shall be tested in strict accordance with ASHRAE Standard-70.

1.5 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Construction Manager shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

2. Sample copy of each of the NEBB or AABC report forms.

3. Proposed approach and schedule of testing and balancing work as specified in paragraph 15990 1.04 A.

4. A description of each air system including equipment to be balanced.

PART 2 - PRODUCTS

2.1 BALANCING REPORT

A. REPORT DATA: The final certified balancing report shall include the following actual field verified data:

1. EQUIPMENT DATA

   a. Manufacturer and model, size, arrangement, class, location, and equipment number.

   b. Motor horsepower, voltage, phase, and full load amperage.

   c. Fan cfm, static pressure, rpm, and operating motor BHP.

2. Duct size, supply or exhaust recorded cfm, velocity, pressure measurements, location of all measurements.

3. TERMINAL UNITS:

   a. Manufacturer and model, supply or exhaust, location, and identification number.

   b. Recorded and design cfm.

   c. Recorded and design noise levels and velocities, where specified.

B. REPORT REQUIREMENTS:

1. Each individual final reporting form must bear the signature of the person who recorded the data and that of the supervisor of the reporting organization.

2. One certified organization shall perform the testing and balancing services.

3. All instruments which were used shall be listed and identified including the last date each was calibrated.

C. FINAL REPORT: Final report shall be submitted prior to Contractor's request for final inspection. In addition to providing all specified data and information on applicable reporting forms, report shall include the following:

1. A schedule for testing and balancing parts of the systems which must be delayed due to seasonal, climatic, occupancy, or other conditions beyond control of the Contractor. Delayed work shall be completed as early as the proper conditions will allow, after consultation with the Construction Manager.

2. Due to delayed testing, reports shall be submitted after execution of those services.

3. A total balance report shall include the following components:

   a. General Information and Summary

   b. Instrument Calibration

   c. Air Systems

   d. Sound and Vibration Systems

   e. Record drawings with specified and measured flow rates

2.2 CERTIFICATE OF COMPLETION

A. At completion of testing and balancing, Contractor shall submit a Certificate of Compliance stating that each apparatus, device, outlet, and system has been tested, adjusted, and balanced so that it is operating in conformance with manufacturer's recommendations and with the specified conditions.

2.3 PRODUCT DATA

A. The following information shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook:

1. The balancing report specified in paragraph 15990-2.01.

2. Documentation to confirm compliance with codes and standards.

3. NEBB or AABC certification

PART 3 - EXECUTION

3.1 GENERAL

A. The balancing agency shall conduct the above field tests in the presence of the Construction Manager.

B. Following completion of testing and balancing the system shall be left in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.2 PERFORMANCE OF WORK

A. AIR SYSTEMS:

1. GENERAL: Testing, adjusting, and balancing shall be performed after the system installation is complete but prior to acceptance of the project.

2. MEASUREMENTS:

a. The Contractor shall perform the following:

(1) Measure and adjust air supply and exhaust units to deliver at least 100 percent of the design air volume at 100 percent cooling.

(2) Measure static air pressure conditions on fans, including filter and coil pressure drops, and total pressure across the fan.

(3) Adjust fan speeds and motor drives within drive limitations, for required air volume. Set a speed to provide air volume farthest distance from the fan without excess static pressure. Check draw amps of fans on initial start up. If running amps exceed nameplate, shut off motor immediately, notify Construction Manager, and make necessary drive changes as directed.

(4) Evaluate building and room pressure conditions to determine adequate supply and return air conditions.

b. Air flow rates shall be measured with supply, return, and exhaust systems operating with heating and cooling coils wet, with filter bank resistance midway between design values specified for clean and dirty filters, with auxiliary systems in operation. The deflection pattern of supply outlets shall be adjusted to ensure uniform air distribution throughout the space served.

c. Airflow rates supplied, exhausted, or returned shall be within plus or minus 5 percent of the design values specified.

3. SYSTEMS TO BE BALANCED:

a. Area 60 Odor Control System:

(1) Airflow rates at each of the three foul air fans

b. Area 86 Truck Loadout Foul Air Capture System:

(1) Airflow rates at foul air intakes in each truck loadout lane

(2) Airflow rates in both branch ducts from truck loadout lanes

(3) Airflow rate at the inline foul air fan 86-OCF-3

c. Area 86 Supply Air System:

(1) Airflow rates at new supply air registers

(2) Airflow rates in new supply air branch ducts

d. Area 76 Ventilation and Room Exhaust System:

(1) Airflow rates at new room ventilation fan 76-EF-11

e. Area 94 Ventilation and Foul Air Capture System (Wet Well):

(1) Airflow rates at supply air registers

(2) Airflow rates in the foul air withdrawal system

(3) Airflow rates at each of the two foul air fans

B. Contractor shall perform tests and make changes necessary to balance the overall system and achieve airflow rates indicated in the design drawings, for each air system indicated herein.

3.3 FINAL INSPECTION

A. Following completion of testing and balancing, but prior to submitting the balancing report, the Contractor shall recheck, in the presence of the Construction Manager, random selections of data water and air quantities, air motion, and sound levels recorded in the report. Points and areas for recheck shall be as selected by the Construction Manager. Measurement and test procedures shall be as approved for work forming basis of the report.

B. Selections for recheck will not exceed 25 percent of the total tabulated in the report, except for special air systems, as described in Section 15891, which may require 100 percent recheck for safety reasons.

C. In the event the report is rejected, all systems shall be readjusted and tested, new data recorded, new reports submitted, and new inspection test made.

D. Following acceptance of the reports by the Construction Manager, the Contractor shall permanently mark all damper positions, circuit balancing valves, and balancing valves so that they can be restored to their correct position if disturbed at any time. If a balancing device is provided with a memory stop, it shall be set and locked. Devices shall not be marked until after final inspection.

****END OF SECTION****

SECTION 16030

ELECTRICAL ACCEPTANCE TESTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the acceptance testing of electrical materials, power distribution and utilization equipment and circuits. Contractor shall provide all labor, tools, material, power, and other services necessary to provide the specified tests.

1.2 REFERENCES:

A. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of commencement of the Work. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
NETA ATS	Acceptance Testing Specifications for Electric Power Distribution Systems
NFPA-70	National Electrical Code (NEC)

1.3 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. Functional Testing and Checkout Procedures

2. Test Schedule

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT AND MATERIALS

A. Test instruments shall be calibrated to references traceable to the National Institute of Standards and Technology and shall have a current sticker showing date of calibration, deviation from standard, name of calibration laboratory and technician, and date recalibration is required.

Form No.	Title
16050-A	Wire and Cable Resistance Test Data Form
16050-B	Installed Motor Test Data Form
16050-D	Motor Control Center Test Form
13300 A	Loop Wiring and Insulation Resistance Test Data Form
13300 G	Field Switch Calibration Test Data Form
13300 I	Miscellaneous Instrument Calibration Test Data Form
13300 J	Individual Loop Test Data Form
13300 K	Loop Commissioning Test Data Form

2.2 PRODUCT DATA

A. The following information shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook:

1. Submit the completed test report forms 16050-A and 16050-B as specified in Part 3 herein.

PART 3 - EXECUTION

3.1 TESTING

A. GENERAL:

1. The following specified tests, including correction of defects where found and the subsequent re-testing, shall be completed prior to energization of the equipment or systems. Submit all completed test report forms in a 3-ring binder type notebook at the project Substantial Completion date.

2. A megohmmeter shall be used for insulation resistance measurements.

B. INSULATION RESISTANCE MEASUREMENTS:

1. GENERAL: Insulation resistance measurements shall be made on conductors and electrical equipment that will carry current. Minimum acceptable values of insulation resistance shall be in accordance with the applicable NETA-ATS, ICEA, NEMA, or ANSI standards for the equipment

or material being tested. The ambient temperature at which insulation resistance is measured shall be recorded on the test form.

2. CONDUCTOR AND CABLE TESTS: The phase-to-ground insulation resistance shall be measured for all circuits 120 volts and above except lighting circuits. Measurements may be made with motors and other load equipment connected. Insulation resistance measurements shall be recorded in a format similar to Form 16050-A contained in Section 01999, and submitted for acceptance. Insulation with resistance of less than 10 megohms is not acceptable.

3. MOTOR TESTS:

   a. The Installed Motor Test Form, 16050-B, contained in Section 01999, shall be completed for each motor after installation and submitted for acceptance. All motors shall have their insulation resistance measured before they are connected.

   b. Motors 50 HP and larger shall have their insulation resistance measured at the time of delivery and when they are connected. Insulation resistance values less than 50 megohms are not acceptable.

   c. Verify that motors are connected to rotate in the correct direction. Verification may be accomplished by momentarily energizing the motor, provided the Contractor confirms that neither the motor nor the driven equipment will be damaged by reverse operation.

4. POWER DISTRIBUTION EQUIPMENT: Transformers, panelboards, and other power distribution equipment shall have their insulation resistance measured phase-to-phase and phase-to-ground.

5. POWER UTILIZATION EQUIPMENT: Test receptacles and power outlets using a device to verify polarity, grounding, and the correct wiring connections.

C. FUNCTIONAL TESTING:

1. Contractor shall submit a description of proposed functional test and checkout procedures conforming to the following requirements, including a schedule for conducting these procedures, not less than 30 days prior to the performance of functional testing.

2. Prior to functional testing, all protective devices shall be adjusted and made operative.

3. Prior to energization of associated equipment, perform a functional checkout of all electrical and instrumentation control circuits as specified in the following and in Division 13 Section 13300. Checkout shall consist of energizing each control circuit and operating each control, alarm, safety device, and each interlock, in turn, to verify that the specified action occurs.

****END OF SECTION****

SECTION 16040

ELECTRIC MOTORS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies single and three phase, horizontal and vertical, single-speed and two-speed, low-voltage (600 volts and less), energy efficient (900 rpm) and premium efficiency (1200, 1800, and 3600 rpm) alternating current, induction motors, 250 horsepower or less. Standard NEMA MG 1 motors are specified, as modified herein.

B. This section also specifies IEEE 841 severe-duty, totally enclosed fan-cooled (TEFC Type-2, specified herein) squirrel cage induction motors from 1 to 500 horsepower with voltage ratings of 230V, 460V, 2300V, and 4000V. See Custom Motor criteria within the driven equipment specification for voltages above 600V and for high horsepower.

C. Motors shall be provided in compliance with these specifications. Provide motors suitable for continuous operation under the ambient conditions:

1. Temperature: 40 degrees F to 120 degrees F.

2. Altitude: 300 to 500 feet above sea level.

3. Derate motors for higher ambient temperature and for higher altitude with motor size based on brake-horsepower.

D. Motors shall have copper rotor material and copper stator windings with F-insulation without exceeding the B temperature rise of 80-degree C at rated load and with Design-B torque / current characteristics rated for continuous operation duty.

E. Two-speed motors shall be two-winding motors. Two-speed, one-winding consequential-pole motors that require special motor starters are prohibited.

F. Refer to Motor Types-1, 2, and 3 Classification and Inverter Duty variable torque and constant torque specification requirements herein. Motor Types-1, 2, and 3 have the additional requirements of Inverter Duty Motors as specified or scheduled.

G. Enclosures, as specified elsewhere in the Project Contract Documents:

1. Type-1 - Open Drip Proof (ODP)

2. Type-2 – Totally Enclosed Fan Cooled (TEFC)

3. Type-3 – Explosion Proof (EP)

4. Custom Motors:

a. Weather Proof-I (WP-I)

b. Weather Proof-II (WP-II)

c. Totally Enclosed Blower-Over (TEBC) for additional cooling

5. Special Purpose Motors: Per driven equipment manufacturer.

H. Custom Motors and Special Purpose Motors, with features or ratings that are not specified herein, are specified in the particular equipment specifications. The submittal, installation, and testing requirements for all motors are specified herein.

I. Custom motors are motors over 250 horsepower, medium voltage (2300 volt, 4000 volt, or higher) for high elevations, high ambient conditions, high thrust, special enclosures, intermittent duty, varying duty, and inverter duty motors that require special cooling for slow speed operation with constant torque loads and motor limited to below base speed operation.

J. Special purpose motors are submersible motors, integral gear motors, close-coupled pump motors, crane and hoist motors, fire pump motors, brake motors, gate and valve operator motors, and high torque rated motors and other unique application motors that specified with the driven equipment.

K. Submersible motors used as inverter duty motors shall meet the motor insulation, slow speed cooling, and synthetic output sine wave mitigation requirements of this specification and the driven equipment specification. Submersible motor designs and applications shall comply with NEMA MG 1-30 and NEMA MG 1-31.

L. Standard, custom, and special purpose motors shall be provided by the manufacturer of the driven equipment under the provisions of Section 11000 Requirements for Equipment Unit Responsibility. The Contractor shall assign unit responsibility as specified in paragraph 11000 1.02C to the manufacturer for the equipment specified and a certificate of unit responsibility shall be provided.

M. This section is general in nature, so not all the requirements of this section may apply to motors being provided on this project. However, the proposed equipment motors will be held to specific requirements entailed herein as applicable.

1.2 QUALITY ASSURANCE

A. GENERAL:

1. Motors shall be built in accordance with UL 674, UL 1004, and NEMA Standard MG 1. Motor nominal and minimal efficiency shall be based on NEMA MG 1, Table 12-10.

2. Motors shall comply with Energy Policy Act of 1992 (EPAct) with full-load efficiency measurements per IEEE Standard 112, Test Method B, and shall comply with the requirements specified.

3. IEC Metric Motors and imported EPAct Motors that do not meet the NEMA standards are prohibited.

B. REFERENCES:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of commencement of the Work.

3. f referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued.

4. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ABMA 9	Load Ratings and Fatigue Life for Ball Bearings
ABMA 11	Load Ratings and Fatigue Life for Roller Bearings
IEEE 112	Standard Test Procedures for Polyphase Induction Motors and Generators
IEEE 841	Standard for Petroleum and Chemical Industry-Severe Duty Totally Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors - Up to and Including 500 HP
NEMA ICS 2	Industrial Control and Systems Controllers, Contactors and Overload Relays Rated Not More Than 2000 Volts AC or 750 Volts DC
NEMA 250	Enclosures for Electrical Equipment (1000 volts maximum)
NEMA MG 1	Motors and Generators
NEMA MG1-30	Application Considerations for Constant Speed Motors Used on a Sinusoidal Bus with Harmonic Content and General Purpose Motors Used with Adjustable-Voltage or Adjustable-Frequency Controls or Both. Note: Specifications for Standard TENV Submersible Motors rated 1/2 – 200 HP, 140TY-L360TY Frames, and rated at 200, 230, 460, 575, 600 Volt are available from motor manufactures.
NEMA MG1-31	Definite-Purpose Inverter-Fed Polyphase Motors: Rated 5000 horsepower or less at 7200 volt or less, intended for use with adjustable-voltage and adjustable frequency controls, commonly referred to as inverters.
UL 674	Electric Motors and Generators for Use in Division 1 Hazardous (Classified) Locations
UL 1004	Electric Motors

C. FACTORY TESTS:

1. The manufacturer's factory motor Prototype Tests per IEEE Standard 112 Appendix-A on motors through 250 horsepower shall be submitted as Product Data for the motor. Actual factory tests for these motors are not required. The standard routine factory tests shall be conducted, that may include:

   a. Winding resistance in ohms and converted to 25 degree C.

   b. Resistive Unbalance and Quarter Voltage Impedance, as applicable.

   c. Locked-Rotor current (Single phase).

   d. High Potential.

   e. No-Load Excitation (volts, amperes, RPM).

   f. Bearing vibration check.

   g. Efficiency, Power Factor, Current at 115%, 100%, 75%, 50%, and no load.

2. The motors larger than 250 horsepower shall be subject to the manufacture's complete factory dynamometer tests per IEEE Standard 112 Appendix-B:

   a. Standard routine factory tests.

   b. Temperature Rise at full load.

   c. Breakdown Torque.

   d. Rated Full Load Slip.

   e. Speed-Torque Curves.

D. WARRANTY:

1. Unless otherwise specified, all motors ½ horsepower and greater shall be warranted against defects in materials and workmanship for a period of 1.5 years.

2. All motors specified to conform to IEEE 841 shall be warranted against defects in materials and workmanship for a period of five years.

3. All warranties shall be submitted in writing and shall include as a minimum 100 percent full payment coverage for parts and labor for repair or replacement of the motor during the entire warranty period due to defective workmanship or materials.

1.3 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked

to indicate requested deviations from specification requirements. Check marks shall denote full compliance with a paragraph as a whole.

a. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation.

b. The Construction Manager shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications.

c. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

2. MOTOR DATA SHEETS:

   a. For all motors other than those specified to conform to IEEE 841, supplier completed "Form 16040-A" in specification Section 01999 with required factory data.

   b. For all motors specified to conform to IEEE 841, manufacturer completed IEEE Standard 841 Data Sheet for AC Squirrel Cage Induction Motors

3. Speed-Torque curve per 1.02 C Factory Tests.

4. Factory test data for motors required to be subject to manufacturer's complete factory dynamometer tests as specified in paragraph 16040-1.02 C.

5. Guaranteed vibration level when measured per MG 1, Figure 7-6:

   a. Displacement: 0.0025 inch peak-to-peak

   b. Velocity: 0.15 inches per second peak

   c. Acceleration: 1g (gravity) peak.

6. Motor heating curve for motors per 1.02 C Factory Tests.

7. Motor outline, dimensions, and weight.

8. Manufacturer's descriptive information relative to motor features.

9. Response curve where a winding over-temperature device is required.

10. For all inverter duty motors: Manufacturer's certification that the motor is compatible with the adjustable frequency drive to be used.

1.4 POWER SUPPLY VARIATIONS

A. Motors shall operate successfully under running conditions at rated load with +/- 10-percent of rated voltage with rated frequency or +/- 5-percent of rated frequency with rated voltage.

1.5 NEMA WINDING TEMPERATURES

A. NEMA MG 1 Table 12-7 motors insulation system maximum winding temperatures in degrees-Centigrade (C), with the degrees-Fahrenheit (F) insulation system class specified herein.

1. Forty degree-C ambient (104 degree-F) is the basis for temperature rise.

2. For 50 degree C ambient (122F) and above, refer to the driven equipment specifications for additional requirements.

Insulation System Class	Degrees C / F	Temperature Rise by Resistance
A	140 / 284	NA
B	165 / 329	B-rise: 40 + 80 = 120 Degrees C / 248 F
F	190 / 374	F-rise: 40 + 105 = 145 Degrees C / 293 F
H	215 / 419	H-rise: 40 + 125 = 165 Degrees C / 329 F

1.6 NEMA MOTOR TEMPERATURE PROTECTION TYPES

A. Refer to Thermal Protection in Part-2 for thermal device requirements. The NEMA design shall limit the temperatures of the windings without using a thermal device:

B. NEMA TYPE-1: Winding Running and Locked Rotor Over-temperature Protection.

C. NEMA TYPE-2: Winding Running Over-temperature Protection.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The following manufacturer's motors generally meet the class and performance requirements of this specification when furnished with appropriate modifications and additional features as specified:

1. HORIZONTAL MOTORS:

a. Type 1 - Premium efficiency guarded, open-drip-proof motors manufactured by:

(1) Baldor-Reliance:

(a) Type ODP

(b) Type XEX

(2) Emerson US Motor: Type DE or RE

(3) General Electric Inc.: Type KS

b. Type 2 - Premium efficiency totally enclosed-fan cooled, Chemical Industry severe duty motors manufactured by:

(1) Baldor-Reliance Electric Co.:

(a) Type IEEE 841 XL Severe Duty

(b) Super-E Severe Duty TEFC IEEE 841

(c) Super-E TEFC for HVAC applications over 2 horsepower

(2) Emerson US Motors: Type CE IEEE 841

(3) General Electric X$D Ultra 841;

(a) TEFC IEEE 841 Severe duty

(b) Inverter rated

(4) Siemens TEFC, Severe Duty

(a) 1 to 400 hp

(b) SD100-IEEE 841: 1-20 hp in Frames 143T – 256T

(c) RGZEESDX: 25-400 hp in Frames 284T to 449T

(5) WEG Electric Corp:

(a) TEFC IEEE 841 NEMA Premium Efficiency

(b) Motors Severe /Chemical Duty

(c) 1 hp NEMA Frame 143T to 500 hp NEMA Frame 586/7

c. Type 3 - Premium efficiency explosion-proof motors manufactured by:

(1) Baldor-Reliance:

(a) XEX-XP, IP 54 with Temperature Code: T3C

1.1. (b) Super-E Explosion Proof with Temperature Code: T3C A bidder who is not selected for contract award may protest the award of a contract to another bidder by submitting a written protest in accordance with section 22.3017 of the San Diego Municipal Code.

1.2. A bidder who is not selected for contract award may protest the award of a contract to another bidder by submitting a written protest in accordance with section 22.3017 of the San Diego Municipal Code.

1.3. A bidder who is not selected for contract award may protest the award of a contract to another bidder by submitting a written protest in accordance with section 22.3017 of the San Diego Municipal Code.

(2) Emerson US Motor: Type LCE

(3) General Electric: Type KS - Explosion Proof.

(4) Siemens: RGZZESDI with Temperature Code: T3C

B. VERTICAL MOTORS:

1. TYPES 1 AND TYPE 2: Premium efficiency ODP and TEFC motors manufactured by:

a. Baldor-Reliance:

(1) Super-E Severe Duty IEEE 841

(2) Super-E TEFC for HVAC applications over 2 horsepower

b. Emerson US Motors:

(1) Type TUCE Corroduty

(2) Titan Line

c. General Electric:

(1) Type KS

(2) Value Line WP-1 deep well, hollow-shaft, high-thrust, high-efficiency, inverter duty 4:1 turndown, speeds: 3600, 1800, 1200 rpm, 5-300 horsepower

d. Siemens:

(1) RGZVESD: solid shaft, TEFC, severe duty, normal thrust, P-Base: 1-250 hp

(2) RGZVILESD: solid shaft, TEFC, severe duty, in-line thrust, P-Base: 1-250 hp

2. TYPE 3: Premium efficiency explosion-proof motors manufactured by:

a. Baldor-Reliance: Super-E Explosion Proof

b. Emerson US Motors: Type LUCE

c. General Electric: Type KS, Class I, Group D

d. Siemens:

(1) RGZZVESD: solid shaft, EP, hazardous duty, normal thrust, P-Base: 1-250 hp with Temperature Code: T2A

(2) RGZZVILESD: solid shaft, EP, hazardous duty, in-line thrust, P-Base: 1-250 hp with Temperature Code: T2A

C. MOTOR TYPES 1, 2 OR 3 RATED FOR INVERTER DUTY SERVICE:

1. BALDOR-RELIANCE ELECTRIC INC.:

   a. V*S Master XT:

      (1) Variable Torque rated motor

      (2) Constant Torque rated motor

2. BALDOR-RELIANCE:

   a. Vertical and horizontal.

   b. TEBC, TENV, and TEFC:

      (1) Variable Torque rated motor

      (2) Constant Torque rated motor

3. GENERAL ELECTRIC INC.:

   a. KAF design for ODP, TEFC, or TEFC Severe Duty enclosures

   b. KAF design in horizontal TEFC Severe Duty and EP enclosures with A$D construction for constant torque: 1000:1

   c. X$D Ultra for Severe Duty IEEE 841

   d. Value Line WP-1 vertical deep well:

      (1) hollow-shaft, high-thrust, high-efficiency

      (2) inverter duty with 4:1 turndown,

      (3) 3600, 1800, 1200 rpm

      (4) 5-300 horsepower

4. Emerson US Electrical Motors:

   a. VFM - Horizontal (TEFC) IEEE 841 Plus S:

      (1) Variable Torque rated motor: 10:1 turndown

      (2) Constant Torque rated motor: 4:1 turndown

5. Siemens:

   a. TEFC RGZESDI:

      (1) Variable Torque rated motor

      (2) Constant Torque rated motor: 10:1 turndown

   b. TEBC RGZESDI:

      (1) Constant Torque: 1000:1 turndown

      (2) Blower cooled

   c. EP RGZZESDI:

(1) Variable Torque: 6:1 turndown

(2) Constant Torque: 6:1 turndown

2.2 GENERAL

A. NAMEPLATES:

1. Motor nameplates shall be engraved or stamped stainless steel. Information shall include those items enumerated in NEMA Standard MG 1, as applicable. Nameplates shall be permanently fastened to the motor frame and shall be visibly positioned for inspection.

2. Additionally, provide the following information on nameplates or additional nameplates for:

a. Motors 1/2 horsepower and larger: Indicate the ABMA L-10 rated life for the motor bearings based on load data.

b. Motors 2 to 50 horsepower: Indicate the NEMA nominal efficiency.

c. Motors 50 horsepower and larger: Indicate NEMA guaranteed minimum efficiency.

d. Explosion-Proof motors: Indicate UL frame temperature limit code.

e. Space heater information.

f. NEMA MG 1 Over Temperature Protection Type Number.

g. Temperature device rating and alarm and shutdown setpoint information.

B. CONSTRUCTION: All motors provided under this specification shall have the following features of construction:

1. Frames:

a. Cast iron frames for TEFC motors and motors 60 horsepower and larger.

b. Steel frames for non-TEFC motors smaller than 50 horsepower.

c. Aluminum frame motors will not be permitted.

2. Stamped steel or cast metal fan shrouds with non-sparking fan blades.

3. Non-hygroscopic motor leads.

4. NEMA Design-B as standard design. NEMA Design-A, C, or D shall be identified as custom design features in the driven equipment specifications.

6. Motor Service Factor (percent of additional horsepower):

a. SF: 1.15 for Types-1, 2, and 3 Sine-wave motors

b. SF: 1.0 for Inverter Duty motors.

c. SF dual rating: 1.15 Sine-wave and 1.0 Inverter Duty.

7. Grounding terminal in conduit box.

8. Stainless Steel nameplate.

2.3 MOTORS LESS THAN 1/2 HORSEPOWER

A. GENERAL: Motors less than 1/2 horsepower shall be squirrel cage, single phase, capacitor start, and induction run type with Class B or F insulation. Fan motors rated 1/8 horsepower or less may be split-phase or shaded-pole type. Windings shall be copper.

B. RATING: Motors shall be rated 115 volts, single phase, 60 hertz, and shall be continuous-time rated in conformance with NEMA Standard MG 1. Motors shall be non-overloading at all points of the equipment operation.

C. ENCLOSURES:

1. Motor enclosures shall be as defined in NEMA MG 1. Motors shall have totally enclosed fan cooled (TEFC) or totally enclosed non-ventilated (TENV) enclosures, unless specified otherwise in the driven equipment specification.

2. Explosion-proof (EP or XP) motors shall bear the UL Label for Class I, Division 1, Group D hazardous locations. The nameplate shall indicate the UL frame temperature limit code T2A. The enclosure surface temperature shall not exceed 280 degrees C. Provide self-protected over-temperature device in the motor to detect and automatically de energize the motor if the frame temperature limit is exceeded and automatically reset.

2.4 MOTORS 1/2 HORSEPOWER THROUGH 250 HORSEPOWER

A. GENERAL:

1. Motors 1/2 horsepower through 250 horsepower shall have copper windings and shall be three phase, squirrel cage, induction type rated for full-voltage start and continuous duty and rated for 460-Vac.

2. Motors shall have a NEMA MG 1 design for the duty service imposed by the driven equipment such as frequent starting, intermittent overload, high inertia, mounting configuration, or service environment.

B. RATING:

1. Motors shall be rated 460 volts, three-phase, 60-Hertz, and shall be continuous time rated in accordance with NEMA Standard MG 1. Refer to the driven equipment specification for custom motors or special purpose motors with voltage rating above 460 volts.

2. Unless specified otherwise, motors shall have a service factor of 1.15 with additional 15 percent horsepower. Motors shall not be required to exceed the nameplate rating at service factor 1.00.

C. MOTOR TYPE CLASSIFICATIONS:

1. GENERAL: Definition of terms shall be in accordance with NEMA MG 1.

2. TYPE 1 MOTORS:

a. Enclosure: Open drip-proof, guarded ventilation openings (ODP).

b. Class F insulation and Class B temperature rise at the motor's nominal rating.

3. TYPE 2 MOTORS:

a. Enclosure: Totally enclosed, fan cooled (TEFC).

b. Class F insulation and Class B temperature rise at the motor's nominal rating.

c. Conform to IEEE 841 Chemical Industry-Severe Duty rating through 500 Horsepower.

d. Surfaces shall be coated with a corrosion-resistant treatment such as an epoxy paint that passes ASTM B117 for 96-hours.

e. No load airborne sound power level below 90-dBA per MG 1 Part-9.

f. Breather/drain fitting instead of solid drain plug.

g. International Protection Standard IP55 bearing enclosure.

4. TYPE 3 MOTORS:

a. Enclosure: Explosion-proof motors (EP or XP).

b. UL listed in accordance with UL 674 for Class I, Group D for Hazardous Atmospheres.

c. Bear UL Label for Class I, Division 1, Group D Hazardous locations.

d. UL-approved breather/drain device in the motor drain hole.

e. Class F insulation.

f. Nameplate: Indicate the UL frame temperature limit code T2A without thermostat and T2D with thermostat.

g. Rated for the UL surface temperature limit codes for Class I Group D for gasoline, petroleum, alcohols, natural gas etc:

(1) Motor designed below the UL frame temperature limit code T2A of 280 degrees C or

(2) Provide an internal frame temperature thermostat that meets the UL frame temperature limit code T2D of 215 degree C with normally closed contact rated 5-amperes at 115-Vac.

D. THERMAL PROTECTION: Type 1, Type 2 and Type 3 motors that require motor over-temperature protection, as defined in NEMA MG 1-12, with the motor controller interface wiring and devices as indicated on the drawings for the following:

1. Inverter duty motors and totally-enclosed-air-over (TEAO) motors:

a. NEMA Type-2 motor over-temperature self-protection: Thermal-overload, self-reset bimetallic Klixon switch for motors 5 horsepower and smaller.

b. Motors larger than 5 horsepower require controller alarm / trip:

(1) Self-powered by motor temperature or by motor voltage: the motor mounted auxiliary device with two Form-C output contacts wired to variable speed or adjustable frequency drive to shut down the motor controller. Both the normally open contact and the normally closed contact shall be available at the motor terminal box for remote alarm and shutdown functions. Indicate the setpoints on the temperature device nameplate.

(2) Non-self-powered power thermal devices are prohibited.

(3) Factory set thermal protection device with alarm and trip setpoints indicated on the motor device nameplate.

(4) Factory wired to separate motor termination box.

2. Motors 300 horsepower and larger and higher voltage:

a. NEMA Type-1 thermal protection: Two-100-ohm platinum RTDs in each winding.

b. Resistance Temperature Detectors (RTD) wired to separate motor termination box with wiring diagram provide.

c. Provide RTD monitor and transmitter at the motor, as indicated or

d. Provide RTD monitor at the motor controller, as indicated.

e. Indicated alarm and trip setpoints on the motor device nameplate.

3. Auxiliary equipment shall have normally closed NEMA ICS 2 B300 contacts and shall be housed in NEMA 250 enclosures as follows:

a. Type 1 motors NEMA 12

b. Type 2 motors NEMA 4

c. Type 3 motors NEMA 7D

E. INVERTER DUTY MOTORS:

1. Motors for use with adjustable frequency controllers shall be inverter duty motors specifically designed for inverter service for the speed range and load torque characteristic required by the associated driven equipment. Inverter duty motors shall be specifically certified compatible with the adjustable frequency controller and driven equipment, as specified in Section 11000-1.01C Unit Responsibility.

2. Motors for use with adjustable frequency controllers shall not exceed NEMA MG 1, Class B temperature rise when operating over the specified speed range on the adjustable frequency controllers specified in Section 11069 with the specified load speed/torque characteristic.

3. Inverter duty rated motors shall have 4:1 turndown with variable torque motor controllers or constant torque motor controllers rating designed to operate from 25% of base speed to base speed continuously with full load

current and torque without exceeding the Class F insulation with B temperature rise.

4. Torque requirement for greater turndown and slower speed applications is a custom design; refer to the driven equipment specification for additional requirements. Inverter duty rated motors shall be designed to operate over the speed or frequency range specified.

5. Motor insulation shall be designed to meet 2000-volt peak at a minimum of 0.1 microsecond rise time which exceeds the NEMA MG 1, Part 31: 1600-volt peak requirement for the 460 volt motors.

6. Provide inverter duty motors with NEMA Type 2 over-temperature protection as specified in NEMA MG 1-12. Provide motor mounted and motor powered winding temperature device with a 5-ampere normally open and normally closed output contacts at the motor terminal box for monitoring by the adjustable frequency controller and shutdown where the temperature exceed 165 degree-Centigrade.

7. Inverter duty motors shall have electrically insulated bearings or shall be equipped with a shaft-grounding unit mounted on the fan housing with stub shaft extended from the motor shaft. Larger motors, using the shaft-grounding unit, shall be equipped with two brushes, totally enclosed, and sealed against environmental contamination.

F. VERTICAL MOTORS:

1. Vertical motors shall be solid-shaft P-base type specifically designed for vertical installation. Thrust bearing rating shall be compatible with the loads imposed by the driven equipment. Universal position motors are not acceptable.

2. Vertical motors shall conform to Type 1, Type 2, or Type 3 in accordance with the location and use. Vertical motors specified or indicated as rated for Inverter Duty Motor shall be as specified herein.

G. MOTOR EFFICIENCY:

1. NEMA Premium™ efficiency electric motor, single-speed, polyphase, 1-500 horsepower, 3600-rpm 2-pole, 1800-rpm 4-pole, and 1200-rpm 6-pole, squirrel cage induction motors, NEMA Design A or B, continuous rated. NEMA Standards Publication MG 1 2003, in Tables 12-12 and 12-13, respectively.

Table 1
Nominal Efficiencies For "NEMA Premium™" Induction Motors
Rated 600 Volts Or Less (Random Wound)

HP	Open Drip-Proof			Totally Enclosed Fan-Cooled		
	6-pole	4-pole	2-pole	6-pole	4-pole	2-pole
1	82.5	85.5	77.0*	82.5	85.5	77.0

Table 1 Nominal Efficiencies For "NEMA Premium™" Induction Motors Rated 600 Volts Or Less (Random Wound)						
HP	Open Drip-Proof			Totally Enclosed Fan-Cooled		
	6-pole	4-pole	2-pole	6-pole	4-pole	2-pole
1.5	86.5	86.5	84.0	87.5	86.5	84.0
2	87.5	86.5	85.5	88.5	86.5	85.5
3	88.5	89.5	85.5	89.5	89.5	86.5
5	89.5	89.5	86.5	89.5	89.5	88.5
7.5	90.2	91.0	88.5	91.0	91.7	89.5
10	91.7	91.7	89.5	91.0	91.7	90.2
15	91.7	93.0	90.2	91.7	92.4	91.0
20	92.4	93.0	91.0	91.7	93.0	91.0
25	93.0	93.6	91.7	93.0	93.6	91.7
30	93.6	94.1	91.7	93.0	93.6	91.7
40	94.1	94.1	92.4	94.1	94.1	92.4
50	94.1	94.5	93.0	94.1	94.5	93.0
60	94.5	95.0	93.6	94.5	95.0	93.6
75	94.5	95.0	93.6	94.5	95.4	93.6
100	95.0	95.4	93.6	95.0	95.4	94.1
125	95.0	95.4	94.1	95.0	95.4	95.0
150	95.4	95.8	94.1	95.8	95.8	95.0
200	95.4	95.8	95.0	95.8	96.2	95.4
250	95.4	95.8	95.0	95.8	96.2	95.8
300	95.4	95.8	95.4	95.8	96.2	95.8
350	95.4	95.8	95.4	95.8	96.2	95.8
400	95.8	95.8	95.8	95.8	96.2	95.8
450	96.2	96.2	95.8	95.8	96.2	95.8
500	96.2	96.2	95.8	95.8	96.2	95.8

Table 2 Nominal Efficiencies For "NEMA Premium™" Induction Motors Rated Medium Volts 5kV or Less (Form Wound)						
	Open Drip-Proof			Totally Enclosed Fan-Cooled		
HP	6-pole	4-pole	2-pole	6-pole	4-pole	2-pole
250	95.0	95.0	94.5	95.0	95.0	95.0
300	95.0	95.0	94.5	95.0	95.0	95.0
350	95.0	95.0	94.5	95.0	95.0	95.0
400	95.0	95.0	94.5	95.0	95.0	95.0
450	95.0	95.0	94.5	95.0	95.0	95.0
500	95.0	95.0	94.5	95.0	95.0	95.0

2. Motors in Table 3 shall be in accordance with IEEE 841 minimum nameplate efficiency for energy efficient 900-rpm 8-pole motors determined in accordance with IEEE 112B testing procedures.

Table 3 IEEE STD 841-2001	
Horsepower	Guaranteed Motor Minimum Efficiency (percent)
1	70.0
1.5	72.0
2	80.0
3	81.5
5	82.5
7.5	82.5
10	86.5
15	86.5
20	87.5
25	87.5
30	89.5
40	89.5
50	90.2
60	90.2
75	91.7

Table 3 IEEE STD 841-2001	
Horsepower	Guaranteed Motor Minimum Efficiency (percent)
100	91.7
125	92.4
150	92.4
200	92.4
250	93.6
300	94.1
350	94.1
400	94.1
450	94.1
500	94.1

H. CONDUIT BOXES:

1. Conduit boxes shall be sized based on the conduit number and conduit size indicated on the drawings. Provide over-sized boxes with the number of openings as required to accommodate the conduits required. Replace undersized conduit boxes.

2. Conduit boxes shall be split construction with threaded hubs and shall conform to IEEE 841 for Type 2 motors. Motors shall be furnished with petroleum-resistant gaskets at the base of the conduit box and between the halves of the conduit box

3. Conduit boxes shall be designed to rotate in order to permit installation in any of four positions 90 degrees apart. Motors shall have grounding lug located within the conduit box for the ground connection.

4. Provide separate conduit boxes for temperature devices and space heaters.

I. BEARINGS:

1. Bearings may be oil or grease lubricated ball bearings, angle contact roller bearings for axial thrust loads, and cylindrical bearings for radial-only loads. Bearings shall be rated for a minimum L-10 life of 100,000 hours in accordance with ABMA 9 or 11 at the ambient temperature specified.

2. Motor designs employing cartridge type bearings will not be accepted. Bearings shall be fitted with lubricant fill and drain or relief fittings. Belt loads shall not exceed forces calculated from NEMA MG 1 Table 14-1.

J. LIFTING EYES: Provide lifting eyes per NEMA standard with a safety factor of 5. Generally, motors weighing more than 50 pounds shall be fitted with at least one

lifting eye and motors over 150 pounds or 150 horsepower shall be fitted with two lifting eyes.

K. SPACE HEATERS:

1. Where shown on the Drawings or Schedules, furnish motors with space heaters to prevent condensation inside the motor enclosure after motor shutdown and maintain the temperature of the winding at not less than 5-degree C above outside ambient temperature.

2. Heaters shall be flexible wraparound type rated 120 volts, single phase, 60 Hertz. The space heater rating in watts and volts shall be noted on the motor nameplate or on a second nameplate. Space heater leads H1 and H2 shall be brought to a separate terminal block or pigtails in the motor conduit box or separate conduit box with a threaded conduit opening. Provide separate label on small motors.

L. MOTOR SHAFT GROUND RING

1. Provide shaft ground ring (SGR) kit during factory motor assembly on inverter duty motors with NEMA ODP enclosures and TEFC enclosures operating on AFD motor controllers, including motors with insulated or ceramic bearings.

2. SGR kits shall be factory install. If not received with the kits installed, then field install the kits: Install the shaft ground ring, adhesive ring, grounding pig tail in accordance with the manufacturer's installation instructions. Ground the motor frame to the ground grid.

3. Do not provide SGR grounding kit devices on explosion proof motors located in Division 1 or Division 2 hazardous locations, provide alternate factory provided means.

4. Provide Electro Static Technology's AEGIS Shaft Grounding Ring for Bearing Protection (http://www.est-aegis.com/index.html) or equal:

a. Install circumferential ring of conductive micro fibers to reduce the shaft voltage, to divert current away from the bearings, and to protect bearings in attached equipment.

b. Install on either drive-end or non-drive-end of motors less than 100-horsepower.

c. Insulate the one bearing and install Shaft Grounding Ring on the opposite drive-end of motors 100-horsepower and larger.

d. Install with conductive epoxy to ensure ground connection from the SGR to motor frame.

e. Verify the discharge path for shaft voltages to ground.

2.5 PRODUCT DATA

A. The following information shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook:

1. Operating and maintenance information as part of the motor driven equipment O&M manual.

2. Include overhaul instructions in operation and maintenance information for motor driven equipment that is 50 horsepower and above.

3. Factory motor prototype test results specified in paragraph 16040-1.02 C.

4. Written warranty specified in paragraph 16040-1.02 D.

PART 3 - EXECUTION

3.1 GROUNDING AND BONDING

A. Verify the circuit ground cable (green) is identified and connected to the grounding lug terminal in the conduit box.

B. Provide supplementary grounding by installing a bond from the motor frame to the grounding electrode system as indicated on the drawings.

3.2 FIELD COATING OF MOTORS

A. Provide motors with the field applied, Epoxy Coating System E-2 with thickness of 16 mils dry film in accordance with specification Section 09900 – Coating Systems for motors located in corrosive environments. Example: Clarifier Motors.

B. SERVICE CONDITION:

1. Immersed motor in nonpotable fluids

2. Non-immersed motor in corrosive environment

C. Refer to the driven equipment specification section for coating requirements.

D. Request clarification from Construction Manager with Request of Information, where motor locations are not specified in the driven equipment specification.

3.3 FIELD TESTING

A. Verify breather/drain fittings have been installed as specified herein.

B. Winding insulation resistance for motors shall be not less than 10-megohm measured with a 1000-Vac megohmmeter at 1-minute at or corrected to 40-degree C.

C. Motor phases current imbalance testing for motors 50 horsepower and larger shall be performed as specified in Section 16030.

****END OF SECTION****

SECTION 16050

GENERAL REQUIREMENTS FOR ELECTRICAL WORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. SCOPE: This section specifies general requirements for electrical work. Detailed requirements for specific electrical items are specified in other sections but are subject to the general requirements of this section. The electrical drawings and schedules included in this project manual are functional in nature and do not specify exact locations of equipment or equipment terminations. Existing information and modifications shown on the drawings are based on record drawings provided by the City. In some cases, this information may vary from actual field conditions. Contractor shall field-verify all information pertaining to this work and make adjustments as necessary to meet the intent of the design.

B. DEFINITIONS:

1. ELEMENTARY OR SCHEMATIC DIAGRAM: A schematic (elementary) diagram shows, by means of graphic symbols, the electrical connections and functions of a specific circuit arrangement. The schematic diagram facilitates tracing the circuit and its functions without regard to the actual physical size, shape, or location of the component devices or parts.

2. ONE-LINE DIAGRAM: A one-line diagram shows by means of single lines and graphical symbols the course of an electrical circuit or system of circuits and the components, devices or parts used therein. Physical relationships are usually disregarded.

3. BLOCK DIAGRAM: A block diagram is a diagram of a system, instrument, computer, or program in which selected portions are represented by annotated boxes and interconnecting lines.

4. WIRING DIAGRAM OR CONNECTION SYSTEM: A wiring or connection diagram includes all of the devices in a system and shows their physical relationship to each other including terminals and interconnecting wiring in an assembly. This diagram shall be (a) in a form showing interconnecting wiring only by terminal designation (wireless diagram), or (b) a panel layout diagram showing the physical location of devices plus the elementary diagram.

5. INTERCONNECTION DIAGRAM:

a. Interconnection diagrams shall show all external connections between terminals of equipment and outside points, such as motors and auxiliary devices. References shall be shown to all connection diagrams which interface to the interconnection diagrams. Interconnection diagrams shall be of the continuous line type. Bundled wires shall be shown as a single line with the direction of entry/exit of the individual wires clearly shown. Wireless diagrams and wire lists are not acceptable.

b. Each wire identification as actually installed shall be shown. The wire identification for each end of the same wire shall be identical. All

devices and equipment shall be identified. Terminal blocks shall be shown as actually installed and identified in the equipment complete with individual terminal identification.

c. All jumpers, shielding and grounding termination details not shown on the equipment connection diagrams shall be shown on the interconnection diagrams. Wires or jumpers shown on the equipment connection diagrams shall not be shown again on the interconnection diagram. Signal and DC circuit polarities and wire pairs shall be shown. Spare wires and cables shall be shown.

6. ARRANGEMENT, LAYOUT, OR OUTLINE DRAWINGS: An arrangement, layout, or outline drawing is one which shows the physical space and mounting requirements of a piece of equipment. It may also indicate ventilation requirements and space provided for connections or the location to which connections are to be made.

1.2 QUALITY ASSURANCE

A. REFERENCES:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of commencement of the Work. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
NECA-1	National Electrical Contractors Association – Standard Practices for Good Workmanship in Electrical Contracting
NFPA	National Fire Protection Association
NFPA-70	National Electrical Code (NEC)
NFPA-70E	National Electrical Safety Code (NESC)
ACI 318	Building Code Requirements for Structural Concrete

B. IDENTIFICATION OF LISTED PRODUCTS:

1. Electrical equipment and materials shall be listed for the purpose for which they are to be used, by an independent testing laboratory. Three such organizations are Underwriters Laboratories (UL), Canadian Standards Association (CSA), and Electrical Testing Laboratories (ETL). Independent testing laboratory shall be acceptable to the inspection authority having jurisdiction.

2. When a product is not available with a testing laboratory listing for the purpose for which it is to serve, the product may be required by the inspection authority, to undergo inspection at the manufacturer's place of assembly. All costs and expenses incurred for such inspections shall be included in the original contract price.

C. FACTORY TESTS: Where specified in the individual product specification section, factory tests shall be performed at the place of fabrication and performed on completion of manufacture or assembly. The costs of factory tests shall be included in the contract price.

1.3 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation.

   a. The Construction Manager shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications.

   b. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

2. Catalog cuts of equipment, devices, and materials requested by the individual specification sections. Catalog information shall include technical specifications and application information, including ratings, range, weight, accuracy, etc. Catalog cuts shall be edited to show only the items, model numbers, and information which apply.

   a. Catalog cuts shall be assembled in a folder. Each folder shall contain a cover sheet, indexed by item, and cross-referenced to the appropriate specification paragraph.

3. INTERCONNECTION DIAGRAM: The Contractor shall prepare interconnection diagrams depicting all cable requirements together with their actual terminations as specified in paragraph 16050-1.01 B.

4. Conduit layout drawings indicating size, location, and support, for all conduits other than single runs of 1-inch diameter or less cast in concrete construction.

   a. Conduit layout drawings shall illustrate a system which conforms to the requirements of paragraph 16050-3.01-B.

   b. For layouts that do not conform to 16050-3.01 B, provide engineering design and calculations signed and sealed by a Professional Engineer registered in the state of the project. Engineering design and calculations shall demonstrate that the proposed layout does not impair or significantly reduce the design structural strength.

5. Safety disconnect switch list including legend with equipment tag, equipment description, and power feeder circuit source and location information.

1.4 DRAWINGS

A. Where the Contractor is required to provide information on drawings as part of the specified work, such drawings shall be prepared on 22 inch by 34 inch drafting media complete with borders and title blocks clearly identifying project name, equipment and the scope of the drawing.

B. Drawing quality and size of presentation shall be such as to permit 50 percent reduction of such drawings for insertion in operation and maintenance manuals.

1.5 PROJECT/SITE CONDITIONS

A. GENERAL: Unless otherwise specified, equipment and materials shall be sized and derated for ambient conditions of 40 to 120 degrees F and an elevation ranging from 300 to 500 feet above sea level, without exceeding the manufacturer's stated tolerances.

B. CORROSIVE AREAS: The following areas are designated as corrosive:

   1. All Process areas.

C. HAZARDOUS (CLASSIFIED) AREAS: As indicated on the drawings.

D. SEISMIC: Electrical equipment, supports, and anchorage shall be designed and installed in accordance with the seismic design requirements specified in Section 01900.

1.6 STORAGE OF MATERIALS AND EQUIPMENT

A. During the interval between the delivery of equipment to the site and installation, all equipment, unless otherwise specified, shall be stored in an enclosed space affording protection from weather, dust and mechanical damage and providing favorable temperature, humidity and ventilation conditions to ensure against equipment deterioration. Manufacturer's recommendations shall be adhered to in addition to these requirements. Equipment and materials to be located outdoors may be stored outdoors if protected against moisture condensation. Equipment shall be stored at least 6 inches above ground. Temporary power shall be provided to energize space heaters or other heat sources for control of moisture condensation. Space heaters or other heat sources shall be energized without disturbing the sealed enclosure. Equipment and materials to be located indoors shall be stored indoors and sealed with plastic film wrap.

1.7 ELECTRICAL NUMBERING SYSTEMS

A. RACEWAY NUMBERS: Raceways shall be tagged as noted on the drawings.

B. CONDUCTOR NUMBERS: Refer to Section 13300 for conductor numbering requirements.

1.8 INDICATING LAMP COLORS

A. Refer to Section 13300 for indicating lights colors for process and electrical equipment.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIALS

A. GENERAL: Equipment and materials shall be new and free from defects. All material and equipment of the same or a similar type shall be of the same manufacturer throughout the work. Standard production materials shall be used wherever possible.

B. EQUIPMENT FINISH: Unless otherwise specified, electrical equipment shall be painted by the manufacturer as specified in Section 09900 Coating Systems.

C. GALVANIZING: Where specified, galvanizing shall be in accordance with Section 05910.

2.2 WIRE MARKERS

A. Each power and control conductor shall be identified at each terminal to which it is connected. Conductors size No. 10 AWG or smaller shall have identification sleeves. Conductors No. 8 AWG and larger shall use cable markers of the locking tab type. Tabs shall be white plastic with conductor identification number permanently embossed.

B. Conductors shall be identified in accordance with paragraph 16050-1.07 B. Adhesive strips are not acceptable.

C. The letters and numbers that identify each wire shall be machine printed on sleeves with permanent black ink with figures 1/8 inch high. Sleeves shall be yellow or white tubing and sized to fit the conductor insulation. Shrink the sleeves with hot air after installation to fit the conductor.

D. Conductor and Wire Marker Manufacture:

1. TMS Thermofit Marker System by Raychem Co
2. Sleeve style wire marking system by W. H. Brady Co.
3. or equal.

2.3 RACEWAY MARKERS

A. Raceway markers tags shall be:

1. Solid brass with 0.036-inch minimum thickness.
2. Raceway number stamped in 3/16-inch minimum height characters
3. Attached to the raceway with 316 stainless steel wire.

2.4 NAMEPLATES

A. Nameplates shall be made from laminated phenolic plastic.

1. Nominal size: 3/4 inch high by 2 inches long.

2. Black backgrounds with 3/16 inch white letters.

3. Fastened using self-tapping stainless steel screws.

B. Abbreviations shall be submitted to the Construction Manager prior to manufacture because of space limitations. Nameplate adhesives will not be permitted on the outside of enclosures.

2.5 TERMINAL BLOCKS

A. Unless otherwise specified, terminal blocks shall be panhead strap screw type. Terminals shall be provided with integral marking strips that permanently identify with the connecting wire numbers as shown on the drawings:

1. Terminal blocks for P-circuits (power 208-600 volts)

a. Rated not less than the conductor current rating

b. Rated less than 600 volts AC.

2. Terminal blocks for C-circuits and S-circuits:

a. Rated not less than 20 amperes

b. Rated less than 600 volts AC.

3. Terminals shall be tin-plated.

4. Insulating material shall be nylon.

2.6 600 VOLT CONDUCTORS, WIRE, AND CABLE

A. This section contains references to the following documents. They are a part of this section. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

B. Unless otherwise specified, references to document shall mean the documents in effect at the time of commencement of the Work. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, whether or not the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ASTM B3	Soft or Annealed Copper Wire
ASTM B8	Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM B33	Tinned Soft or Annealed Copper Wire for Electrical Purposes
ICEA S-68-516	Ethylene-Propylene-Rubber-Insulated Wire

NEMA WC7	Cross-Linked-Thermosetting Insulated Wire and Cable for the Transmission and Distribution of Electric Energy
NFPA 70	National Electric Code (NEC)
UL 44	Rubber-Insulated Wires and Cables
UL 83	Thermoplastic-Insulated Wires and Cables

C. UNSCHEDULED CONDUCTORS AND CABLES:

1. Where not specified on the Drawings, conductors and cables shall be sized in accordance with the National Electrical Code for the particular equipment served with the minimum size as specified herein.

2. Unscheduled conductor with insulation shall be provided in accordance with the following:

   a. CABLESPEC "MEPR/CPE" multi-conductor power and control cable

   b. CABLESPEC "XHHW-2" for single conductors

   c. CABLESPEC "XHHW or THWN" for indoor lighting and receptacles

D. CABLE SPECIFICATION SHEETS (CABLESPEC): General requirements for conductors and cables specified in this Section are listed on CABLESPEC sheets provided herein.

E. COLOR CODING:

1. CONTROL CONDUCTORS: Single-conductor control conductors shall have the following colors for the indicated voltage:

Control Conductor	120V
Power (AC)	Black
Control (AC)	Red
Neutral	White
Ground	Green
Foreign Voltage (DC)	Blue/White
Foreign Voltage (AC)	Yellow
Power (DC)	Blue
Control (DC)	Violet

2. POWER CONDUCTORS:

   a. Power conductors shall have the following colors for the indicated voltage:

Power Conductor	480V	208/120V
Phase A	Brown	Black
Phase B	Orange	Red
Phase C	Yellow	Blue
Ground	Green	Green
Neutral	Gray	White

b. Cables may be black with colored 3/4 inch vinyl plastic tape applied at each cable termination. Tape shall be wrapped with 25 percent overlay to provide 3 inches minimum coverage.

3. SIGNAL CONDUCTORS: Signal cable conductors shall be color coded black and white for pairs or black, white, and red for triads. Each conductor and each group of conductors shall be numbered.

4. SINGLE CONDUCTOR: Provide stranded conductors for all cable or wires. Provide minimum conductor size of 12 AWG for power and lighting circuits and minimum conductor size of 14 AWG for control circuits.

5. MULTICONDUCTOR CABLE: Provide multiconductor power cable and multiconductor control cable where identified on the drawings. Provide stranded conductors for all cable or wires.

6. SIGNAL CABLES:

a. Factory cable between manufactured instrument system components shall be provided in compliance with the instrument manufacturer's recommendations.

b. Signal cable shall be provided for instrument signal transmission. Single instrument cable SIC) and multiple-circuit instrument cable (MIC) shall be provided in accordance with the following examples:

(1) CABLESPEC "SIC":

(a) Cable designation: 1PR#16S shielded twisted pair (STP)

(b) Cable designation: 1TR#16S triad (STT)

(2) CABLESPEC "MIC": Cable designation example:

4PR#16S with individual shields for each of the four pair and an overall shield and jacket for the multiconductor instrument cable.

7. DATALINK CABLE: Datalink cable shall be suitable for Ethernet communications, 600V insulation enhanced Category 5e, Belden Part No. 7958A.

8. PORTABLE CORD: Portable cord shall be provided in accordance with CABLESPEC "CORD," unless otherwise specified. Cords shall contain an equipment grounding conductor.

9. SPLICING AND TERMINATING MATERIALS:

a. Connectors shall be tool applied compression type of correct size and UL listed for the specific application. Connectors shall be tin-plated high conductivity copper. Wire nuts for a splice is prohibited.

b. Signal and control conductors shall be connected to terminal blocks and field devices and instruments shall be terminated with conductor terminals as specified in paragraph 16050-2.02.

c. Connectors for wire sizes No. 8 AWG and larger shall be compression tool installed one-hole lugs up to size No. 3/0 AWG, and two-hole or four-hole lugs for size No. 4/0 and larger. Mechanical clamp, dimple, screw-type connectors are not acceptable. In-line splices and taps shall be used only by written consent of the Construction Manager.

d. Power conductor splices shall be compression type, made with a compression tool die approved for the purpose, as made by Thomas and Betts Corp., or equal. Splices shall be covered with electrical products designed for the application, insulated, and covered with a heat-shrinkable sleeve or boot, as specified elsewhere.

e. Motor connection kits shall consist of heat-shrinkable, polymeric insulating material over the connection area and high dielectric strength mastic to seal the ends against ingress of moisture and contamination. Motor connections may use the Tyco Electronics removable boot product line.

f. Motor connection kits shall accommodate a range of cable sizes for both in-line and stub-type configurations. Connection kits shall be independent of cable manufacturer's tolerances. Refer to the electric motor specification Section 16040.

10. CORD GRIPS: Cord grips shall be provided where indicated on the Drawings to attach flexible cord to equipment enclosures. Cord grips shall consist of a threaded aluminum body and compression nut with a neoprene bushing and stainless steel wire mesh for strain relief. Cord grip shall provide a watertight seal at enclosure interface and sized to accommodate the flexible cord.

2.7 RACEWAYS, BOXES, AND SUPPORTS

A. Unless otherwise specified, references to documents shall mean the documents in effect at the time of commencement of the Work. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ANSI C80.1	Rigid Steel Conduit-Zinc Coated
ANSI C80.3	Electrical Metallic Tubing-Zinc Coated
ASTM F512	Smooth-Wall Polyvinylchloride Conduit and Fittings for Underground Installation
FEDSPEC WW-C-581E	Conduit, Metal, Rigid and Intermediate; and Coupling, Elbow, and Nipple, Electrical Conduit; Zinc Coated
FEDSPEC W-C-1094A	Conduit and Conduit Fittings, Plastic, Rigid
JIC EMP-1	Electrical Standards for Mass Production Equipment
NEMA ICS 6	Industrial Control and Systems Enclosures
NEMA TC2	Electrical Plastic Tubing (EPT) and Conduit (EPC 40 and EPC 80)
NEMA TC6	PVC and ABS Plastic Utilities Duct for Underground Installation
NEMA VE1	Cable Tray Systems
NEMA 250	Enclosures for Electrical Equipment (1000 volts maximum)
NFPA 70	National Electrical Code (NEC)
NFPA 79	Electrical Standards for Industrial Machinery
IBC	International Building Code
UL 1	Flexible Metal Electrical Conduit
UL 6	Rigid Metal Electrical Conduit
UL 360	Liquid Tight Flexible Electrical Conduit
UL 514	Nonmetallic Outlet Boxes, Flush-Device Boxes and Covers
UL 651	Rigid Nonmetal Electrical Conduit
UL 797	Electrical Metallic Tubing
UL 870	Wireways, Auxiliary Gutters, and Associated Fittings
UL 884	Underfloor Raceways and Fittings
UL 886	Outlet Boxes and Fittings for Hazardous (Classified) Locations

B. RACEWAYS AND FITTINGS: General requirements for raceway materials specified in this section are listed in the RACESPECS sheets at the end of this section. The type of raceways and raceway fittings to be used for any given area and application shall conform to the requirements in this section.

C. BOXES, GUTTERS, TERMINAL CABINETS, MANHOLES, AND HANDHOLES:

1. Provide Type 316L (low carbon), 317, or Type 316 stainless products where specified. Enclosure constructed of mild sheet steel shall be hot-dipped galvanized after fabrication. Hinges shall be continuous type and for NEMA-4X cabinets hinges shall be stainless steel.

2. Table-A specifies the electrical enclosure material and rating for the location and application.

Table-A

Location	Electrical Enclosure Material and NEMA Rating
Indoor: Architecturally Finished Area	NEMA 1: mild steel
Indoor: Electrical Room	NEMA 1: mild steel
Indoor: Process Areas	**NEMA 4X:** Stainless Steel
Indoor: Corrosive Area	**NEMA 4X:** Stainless Steel
Outdoor: Corrosive Area	**NEMA 4X:** Stainless Steel
Outdoor: Non-Corrosive Areas	**NEMA 4X:** Stainless Steel
Corrosive Area (Hypochlorite)	NEMA 4X: Fiberglass
Corrosive Area (Polymer)	NEMA 4X: Stainless Steel
Hazardous Area: Class I Division 2	NEMA 4X: Stainless Steel
Hazardous Area: Class I Division 1	NEMA 7: Galvanized Malleable Iron or Aluminum

D. PULL BOXES AND WIRING GUTTERS:Indoor boxes and enclosures larger than FD boxes shall be constructed of sheet steel and galvanized after fabrication. Outdoor boxes and enclosures shall be provided with neoprene gaskets on the hinged doors or removable covers. Box and gutter sizes, metal thickness, and grounding shall comply with the National Electrical Code. Bolt-on junction box covers 3 feet square or larger, or heavier than 25 pounds, shall have a rigid handle. Covers larger than 3 x 4 feet shall be split.

E. TERMINAL CABINETS: Terminal cabinets shall be provided with adjustable terminal strip mounting, back-panels for equipment mounting, print pockets in the doors, continuous door hinges, and three-point lockable latches. Terminal cabinets located indoors shall be NEMA 12. Terminal cabinets located outdoors and in corrosive areas shall be modified NEMA 4X with stainless steel door hinge, three-point latch, and filtered ventilation, if required. Terminal block shall conform to Section 16050.

F. CONDUIT SUPPORTS:

1. Framing channel with end caps and straps shall be provided to support groups of conduit. Individual conduit supports shall be one-hole pipe straps used with clamp backs and nesting backs where required. Material as specified herein.

2. Conduit supports for PVC coated rigid steel and PVC conduit systems shall be one-hole PVC coated rigid steel clamps or oversized stainless steel clamps.

G. CEILING HANGERS: Ceiling hangers shall be adjustable steel rod hangers and fittings. Provide J-Type conduit support for single conduit. Straps or hangers of plumber's perforated tape are not acceptable. Unless otherwise shown, hanger rods shall meet ASTM A193 and be sized as 3/8-inch up to 2-inch conduit and shall be 1/2 inch all-thread rod over 2-inch conduit. Material as specified herein.

H. SUSPENDED RACEWAY SUPPORTS AND RACKS:

1. Suspended raceway supports shall consist of concrete inserts, steel rod hangers, and jamb nuts supporting framing channel or lay-in pipe hangers as required. Framing channel shall be a minimum of 12-gauge. Material as specified herein.

2. Hanger rods shall be 1/2-inch diameter all-thread rod and shall meet ASTM A193. Suspended raceway supports and racks shall be braced for seismic forces as specified in Section 16050.

I. MATERIALS: Table-B specifies the type of raceway supports required for each location and application.

Table-B

Location	Framing Channel	Threaded Rod, Hardware, & Fittings
Indoor, Architecturally finished Area	Steel, HDG	Steel, HDG
Indoor, Electrical Room	Steel, HDG	Steel, HDG
Indoor, Process Areas	Stainless Steel	Stainless Steel
Corrosive Area (hypochlorite area)	Fiberglass	Fiberglass
Corrosive Area (polymer area)	Stainless Steel	Stainless Steel
Indoor, Corrosive Area (general)	Stainless Steel	Stainless Steel
Outdoor, Corrosive Area (general)	Stainless Steel	Stainless Steel
Outdoor Areas, Non-corrosive	Stainless Steel	Stainless Steel

HDG = Hot Dip Galvanized Finish
PVC = PVC Coated

J. NAMEPLATES: Nameplates shall be provided for boxes in accordance with the requirements of Section 16050. Nameplate wording shall be as shown on the drawings. Provide the functional description of the device on the nameplate, where wording is not specified

K. FIRESTOPS: Firestops and seals shall be Flamemastic 77, Vimasco No. 1-A, or equal, and shall be applied in accordance with manufacturer's recommendations. Products which are affected by water are not acceptable.

L. ELECTRICAL SEALANT: Electrical sealant putty shall be non-hardening, non-oxidizing, non-corrosive, non-poisonous, and non-injurious to human skin with service temperature range of 30 to 200 degrees Fahrenheit. Product shall be used to seal against the entrance of water.

M. HAZARDOUS AREA AND CORROSIVE AREA CONDUIT SEALS:

1. Sealing compound shall be non-hardening type for corrosive areas. Seal fittings for conduit systems in hazardous atmosphere locations shall be hot-dip galvanized cast ferrous alloy or aluminum alloy. Seal fittings shall be 40-percent fill type.

2. Sealing compound shall be hard type installed in UL listed for explosion-proof sealing fittings after the conductors are installed, tested, and accepted.

3. Provide PVC-coated seal fittings used for PVC-coated conduit with 40-mil factory coating. Seal fitting and sealing compound manufacture: Appleton, Crouse-Hinds, or equal.

N. PULLING LINE: Pulling line shall be polyethylene type, mildew and rot resistant with minimum of 200-pound tensile strength and minimum 1/4-inch diameter. Install in all "future" raceways. Manufacture: Greenlee, Ideal, or equal.

O. CONDUIT THREAD LUBRICANT: Thread lubricant shall be conductive with anti-seize and anti-corrosion properties, compatible with steel and aluminum conduit materials. Manufacture: T&B CP8 KOPR-Shield; Robroy Threadcompound; or equal.

P. Table-C specifies the type of raceway required for each location and application by RACESPEC sheet. Unscheduled conduit shall be galvanized, rigid steel, RACESPEC type GRS.

Table-C

Location	Application/Condition	RACESPEC
Indoor noncorrosive	Exposed	GRS
Indoor corrosive	Exposed	PGRS
Outdoor	Exposed (WWTP) Exposed (other)	PGRS GRS

Table-C		
Location	Application/Condition	RACESPEC
Concealed	Power circuits embedded in concrete structure or beneath slab-on-grade	PVC4
Concealed	Instrumentation, communications and data signals encased in concrete, duct bank	PVC4
Underground	Power circuits encased in concrete, duct bank	PVC4
Underground	Instrumentation, communications and data signals directly buried	PVC4
Nonhazardous	Final connection to equipment and light fixtures	LFS
Hazardous corrosive	Exposed	PGRS
Hazardous	Final connection to equipment	XPFS
Architecturally finished areas	Final connection to light fixtures	FLEX

Q. CONDUIT:

1. In general, Contractor shall be responsible for determining conduit routing that conforms to the specified installation requirements:
   a. Conduits for lighting and outlets: exposed
   b. Conduits for process equipment: exposed
   c. Conduit inside structures: exposed
   d. Conduit concealed inside water chambers slabs and walls
2. Conduit installation shall conform to the requirements of the RACESPEC sheets and the following specified installation requirements:
   a. Exposed conduit: Install parallel or perpendicular to structural members and surfaces. Install conduit horizontally and allow minimum headroom of 7 feet.
   b. Route two or more exposed conduits in the same general routing parallel with symmetrical bends.
   c. Space exposed conduit installed on supports not more than 10 feet apart. Space multiple conduits in parallel and use framing channel.
   d. Comply with the requirements of Section 16050 and herein, where conduits are suspended from the ceiling.
   e. Secure conduit rack supports to concrete walls and ceilings with cast-in-place anchors or framing channel concrete inserts.

f. Install conduits at least 6 inches from high temperature piping, ducts, and flues with temperatures higher than 90 degree C.

g. Install conduits between the reinforcing steel in walls or slabs that have reinforcing in both faces.

h. Place conduits under the reinforcement in slabs with only a single layer of reinforcing steel. Separation between conduits, conduits and reinforcement, and conduits and surfaces of concrete shall be maintained in accordance with UBC.

i. Route conduit clear of structural openings and indicated future openings.

j. Provide conduits with flashed and watertight seals routed through roofs or metal walls.

k. Grout conduits into openings cut into concrete and masonry structures.

l. Cap conduits or plug flush conduits during construction to prevent entrance of dirt, trash, and water. Cap or plug empty conduits designated as "future", "spare", or "empty" and include a pulling line accessible at both ends. Use anti-seize compound on cap and plug threads prior to installation.

m. Determine concealed conduit stubup locations from the manufacturer's shop drawings. Terminate concealed conduit for future use in specified equipment.

n. Install conduit flush with structural surfaces with galvanized couplings and plugs. Caps and plugs shall match the conduit system.

o. Provide concealed portions of conduits for future equipment where the drawings indicate future equipment. Match the existing installation for duplicate equipment.

p. Terminate conduits that enter enclosures with fittings that match the NEMA rating of the enclosure.

q. Underground metallic or nonmetallic conduit that turn out of concrete, masonry or earth: Install a 90-degree elbow of PVC-coated rigid steel conduit before emergence above ground.

r. Provide O-Z Gedney "Type DX" or Crouse-Hinds "Type XD" bonded, weathertight expansion and deflection fitting for the conduit size where conduit across structural joints that allows structural movement.

R. CONDUIT SEAL-OFF FITTINGS:

1. CONDUITS PASSING:

a. Between Class I, Division 1 area and Class I, Division 2 area; provide sealing fittings located at the boundary in accordance with NEC Article-500.

b. From hazardous or corrosive area into a non-hazardous or non-corrosive area.

c. Install the seal-off material in the conduit seal-off fittings after inspection.

S. CONDUIT AND INNERDUCT SEALING MATERIAL:

1. Provide HYDRA-SEAL® Handi-Polyurethane-Foam or equal product to seal conduits and innerducts. Sealing product required features:

a. Compatible with common cable jacket materials.

b. ASTM E-84 flame spread requirements and UL Classified.

c. Pre-pressurized, portable, one-component closed-cell foam sealing system.

d. Dries tack-free within 15 minutes and cures within 24 hours.

e. Reacts with applied moisture or with ambient humidity.

f. Remove over-spray with acetone and remove cured foam mechanically

2. APPLICATION CRITERIA:

a. Apply in ambient temperatures between 60° to 100° F.

b. Apply bead onto clean surface.

T. RACEWAY NUMBERING: Each new and reused conduit shall be provided with a number tag at each end and in each manhole, handhole, or pull box. Cable trays shall be identified by stencils at intervals not exceeding 50 feet, at intersections, and at each end to identify power cable tray voltage, control cable tray, or instrument cable tray.

PART 3 - EXECUTION

3.1 GENERAL

A. CONSTRUCTION:

1. The work under Division 16 shall be performed in accordance with these specifications.

2. Refer to the National Electrical Contractors Association's (NECA) National Electrical Installation Standards (NEIS) for Standard Practices for Good Workmanship in Electrical Contracting (NECA-1) as a minimum baseline of quality and workmanship for installing electrical products and systems that defines what is meant by "neat and workmanlike" as required by the National Electrical Code Section 110-12. Specified requirements supersede NECA practices.

3. Electrical layout drawings are diagrammatic, unless otherwise detailed or dimensioned. The Contractor shall coordinate the location of electrical material or equipment with the work.

4. Major electrical openings may compromise the structural integrity of the slab and wall elements. Major electrical openings are defined as openings or penetrations greater than two times the wall thickness in any dimension, and include duct bank transitions into a building through structural elements. Major electrical

openings shall be constructed according to standard details on the drawings, up to an opening dimension of three feet. For opening dimensions greater than three feet, construct walls and slabs as specifically detailed on the drawings for that case. Major electrical openings proposed by the Contractor shall be submitted to the Structural Engineer of Record for the project for review.

5. Minor changes in location of electrical material or equipment made prior to installation shall be made at no cost to the Owner.

B. CONDUITS IN CONCRETE CONSTRUCTION: Conduits for power, control and instrumentation may be embedded in and pass through concrete construction subject to the limitations in this paragraph. Where concrete strength or serviceability requirements prevent the direct embedment of conduit, provide adequate support, bracing, and serviceability details:

1. Concrete strength shall not be impaired significantly by the embedment of conduits in or through structural sections.

2. Conduit layout shall conform to the requirements of ACI 318, Sections 3.3 – Aggregates and 6.3 – Conduits and Pipes Embedded in Concrete.

3. Conduits shall be treated similarly to reinforcing steel for purposes of clearance. In general, code sections require conduit spacing the greater of:

   a. 1.33 times the maximum concrete aggregate size, clear

   b. Three diameters center to center

   c. Alternate spacing and layout shall be as reviewed and accepted by the Engineer.

4. Conduit and raceway penetrations through walls and slabs where:

   a. one side is a conditioned or an occupied space and the other side not, or

   b. one side has liquid or groundwater contact and the other not, shall be detailed and constructed to prevent liquid and moisture penetration through the wall or slab section for each conduit.

C. HOUSEKEEPING:

1. Electrical equipment shall be protected from dust, water and damage. Motor control centers, switchgear, and buses shall be wiped free of dust and dirt, kept dry, and shall be vacuumed on the inside within 30 days of acceptance of the work.

2. Before final acceptance, the Contractor shall touch up any scratches on equipment as specified in paragraph 09900-3.03 H.

3. Electrical equipment temporarily exposed to weather, debris, liquids, or damage during construction shall be protected. After installation, all equipment shall be protected from damage from, including but not limited to, dust, abrasive particles, debris and dirt generated by the placement, chipping, sandblasting, cutting, finishing and grinding of new or existing concrete, terrazzo and metal; and from the fumes, particulate matter, and splatter from welding, brazing and painting of new or existing piping and equipment. As a minimum, vacuum cleaning, blowers with filters, protective shieldings, and other dust suppression

methods will be required at all times to adequately protect all equipment. During concreting, including finishing, all equipment that may be affected by cement dust must be completely covered. During painting operations, all grease fittings and similar openings shall be covered to prevent the entry of paint. Electrical switchgear, unit substation, and motor load centers shall not be installed until after all concrete work and sand-blasting in those areas have been completed and accepted and the ventilation systems installed.

D. HOUSEKEEPING PADS: Provide concrete housekeeping pads for all floor-mounted electrical equipment. Housekeeping pads shall match existing.

E. ELECTRICAL EQUIPMENT LABELING:

1. All new electrical equipment shall have field marked signs and labeling to warn qualified persons of the potential electric arc flash hazards per NEC Article 110.16 Flash Protection.

2. All new electrical distribution equipment and utilization equipment shall be field labels to identify the power source and the load as specified. Refer to NEC Article 110.22 for Identification of Disconnecting Means installation criteria. Specific information is required such as the equipment tag number and equipment description of both the power source and the load equipment.

F. SAFETY DISCONNECT SWITCHES:

1. Heavy duty fused and non-fused disconnect switches with current range of 30 to 600 amperes shall be provided as shown on the drawings with the enclosure type matching the area rating. Provide lock-off provision for a hasp padlock. Provide visible knife blades through a cover viewing window. Provide shielded or insulated line terminals with quick-make / quick-break switch operator. Provide internal barrier kit for additional personnel barrier from accidental contacts with live parts. Provide a legend plate with equipment tag, equipment description, and power feeder circuit source and location identification.

2. Disconnects shall include one auxiliary contact that operates with the power switch blades. The auxiliary contact shall be wired as shown on the drawings for remote status monitoring of the disconnect position where shown or for disconnecting motor space heater where shown.

3. Fuse clips shall be Class R rejection type and sized for UL Class R, one-time, time-delay fuses. Fuse assembly shall have a minimum short circuit capacity of 100,000 amps symmetrical. Provide fuses as shown and one set of spare fuses with each switch.

G. MOTOR CONNECTIONS: Verify that the motors are purchased with the correct size motor termination boxes for the circuit content specified as shown on the power single line diagrams or submit custom fabrication drawing indicating proposed motor termination box material, size, gasket, termination kit, grounding terminal, motor lead connection method, and motor terminal box connection/support system. Verify the motor termination box location prior to raceway rough-in.

H. CONDUCTOR INSTALLATION

1. An enclosure containing disconnecting means, overcurrent devices, or electrical equipment shall not be used as a wireway or raceway for conductors not

terminating within the enclosure. Provide wireways, raceways, termination boxes, or junction boxes external to the enclosure for the other conductors.

2. Conductors shall be identified at each connection terminal and at splice points. The identification marking system shall comply with Section 16050.

3. Pulling wire and cable into conduit or trays shall be completed without damaging or putting undue stress on the insulation or jacket. Manufacture recommended and UL Listed pulling compounds are acceptable lubricants for pulling wire and cable. Grease is not acceptable.

4. Raceway construction shall be complete, cleaned, and protected from the weather before cable is installed. Where wire or cable exits a raceway, a wire or cable support shall be provided.

5. Provide tin-plated bus bar. Scratch-brush the contact areas and tin plate the connection where flat bus bar connections are made with un-plated bar. Bolts shall be torqued to the bus manufacturer's recommendations.

6. Conductors in panels and electrical equipment shall be bundled and laced at intervals not greater than 6 inches, spread into trees and connected to their respective terminals. Lacing shall be made up with plastic cable ties. Cable ties shall be tensioned and cut off by using a tool specifically designed for the purpose such as a Panduit GS2B. Other methods of cutting cable ties are unacceptable.

7. Conductors crossing hinges shall be bundled into groups not exceeding 10 to 15 conductors and protected using nylon spiral flexible covers to protect conductors. Provide oversized plastic panel wiring duct within panels and panelboards.

8. Slack shall be provided in junction and pull boxes, handholes and manholes. Slack shall be sufficient to allow cables or conductors to be routed along the walls. Amount of slack shall be equal to largest dimension of the enclosure. Provide dedicated electrical wireways and insulated cable holders mounted on unistrut in manholes and handholes.

9. Lighting and receptacle circuits may be in the same conduit in accordance with de-rating requirements of the NEC. Lighting and receptacle circuits shall not be in conduits with power or control conductors. Signal conductors shall be in separate conduits from power conductors. Motor feeder circuits shall be in separate conduits including small fan circuit unless combination fan-light fixture.

10. Power conductors derived from uninterruptible power supply systems shall not be installed in raceways with conductors of other systems. Install in separate raceways.

11. Slices and terminations are subject to inspection by the Construction Manager prior to and after insulating.

12. Motor terminations at 460-volt motors shall be made by bolt-connecting the lugged connectors.

13. In-line splices and tees, where approved by the Construction Manager, shall be made with tubular compression connectors and insulated as specified for motor

terminations. Splices and tees in underground handholes or pull boxes shall be insulated using Scotch-cast epoxy resin or Raychem splicing kits.

14. Terminations at solenoid valves, 120 volt motors, and other devices furnished with pigtail leads shall be made using self-insulating tubular compression connectors within the termination box.

15. Terminations at valve and gate motor actuators shall be made directly into the actuator where possible. Power termination shall be made in the actuator power disconnect. Control and signal cable may be routed to a termination box near the actuator on 20-ampere rated terminal strips with label identification for the control and signal conductors. Single wire control conductors and analog cable (SIC or MIC) then installed in flexible conduit to the actuator control and signal termination compartments.

16. Provide terminal blocks at instrument cable junctions within dedicated terminal boxes provided by the installer. Signal circuits shall be run without splices between instruments, terminal boxes, or panels.

17. Circuits shall not be made using conductors from different pairs or triads. Triads shall be used wherever 3 wire circuits are required.

18. Shields are not acceptable as a signal path, except for circuits operating at radio frequencies utilizing coaxial cables. Common ground return conductors for two or more circuits are not acceptable.

19. Shields shall be bonded to the signal ground bus at the control panel only and isolated from ground at the field instrument or analyzer and at other locations. Shields or drain wires for spare circuits shall not be grounded at either end of the cable run. Terminals shall be provided for running signal leads and shield drain wires through junction boxes.

20. Spare circuits and the shield drain wire shall be terminated on terminal blocks at both ends of the cable run and be electrically continuous through terminal boxes.

21. Where instrument cable splicing is required, provide an instrument stand with terminal box rated for the area and environment and mounted approximately 3 feet above grade for instrument cable splices with the circuits and individual conductors provided with label as specified in Section 16050.

22. Cable for paging, security, voice communication, and telephone systems shall be installed and terminated in compliance with the manufacturers and the Utilities recommendations.

23. Portable power cords feeding permanent equipment, such as pendant cords feeding motors for pumps, cranes, hoists, and portable items shall have a wire mesh cord grip of flexible stainless steel wire to relieve the tension from the cable termination. Connection of portable cords to permanent wiring shall be accomplished with dedicated boxes and terminals blocks.

3.2 TESTING

A. GENERAL: Prior to energizing the electrical circuits, insulation resistance measurements tests shall be performed using a 1000-volt megohmmeter to verify the conductor is acceptable for use on the project. The test measurements shall be recorded on the specified forms and provided in accordance with paragraph 16050-1.03.

B. INSULATION RESISTANCE MEASUREMENTS:

1. GENERAL:

a. Insulation resistance measurements shall be made on conductors and energized parts of electrical equipment. Minimum acceptable values of insulation resistance shall be in accordance with the applicable ICEA, NEMA or ANSI standards for the equipment or material being tested, unless otherwise specified. The ambient temperature at which insulation resistance is measured shall be recorded on the test form.

b. Insulation resistance measurements shall be recorded in a format similar to Form 16040-A, contained in Section 01999. Insulation with resistance of less than 10 megohms is not acceptable.

2. CONDUCTOR AND CABLE TESTS: The phase-to-ground insulation resistance shall be measured for all circuits rated 120 volts and above except lighting circuits. Measurements may be made with motors and other equipment connected. Solid state equipment shall be disconnected, unless the equipment is normally tested by the manufacturer at voltages in excess of 1000 volts DC.

3. MOTOR TESTS:

a. The Installed Motor Test Form, 16050-B, specified in Section 01999, shall be completed for each motor after installation.

b. Motors shall have their insulation resistance measured before they are connected. Motors 50 HP and larger shall have their insulation resistance measured at the time of delivery as well as when they are connected. Insulation resistance values less than 10 megohms are not acceptable.

C. PRE-FUNCTIONAL TEST CHECKOUT:

1. Functional testing shall be performed in accordance with the requirements of Section 16030. Prior to functional testing, all protective devices shall be adjusted and made operative.

a. Submit a description of the proposed functional test procedures prior to the performance of functional checkout.

b. Prior to energization of equipment, perform a functional checkout of the control circuit. Checkout:

(1) Energizing each control circuit.

(2) Operating each control device, alarm device, or monitoring device.

(3) Operate each interlock to verify that the specified action occurs.

2. Verify motors are connected to rotate in the correct direction. Verification may be accomplished by momentarily energizing the motor, provided the Contractor confirms that neither the motor nor the driven equipment will be damaged by reverse operation or momentary energization.

3.3 RECORD DOCUMENTS

A. Contract documents shall be maintained and annotated by the Contractor during construction, including the record drawings specified in Section 2-5 of the Standard Specifications for Public Works Construction.

3.4 CABLE SPECIFICATION SHEETS (CABLESPEC)

A. GENERAL: Conductor, wire, and cable types for different locations, service conditions and raceway systems are specified on individual cable specification sheets. Scheduled and unscheduled conductors, wires, and cables shall be installed in accordance with the CABLESPEC SHEETS.

B. CABLESPEC SHEETS: The following CABLESPEC sheets are included in this section:

Type	Volt	Product	Purpose
MIC	600	SP-OS: MULTIPLE PAIR PR#18 or 16SH WITH OVERALL SHIELD AND JACKET	CABLE TRAY RATED INSTRUMENT CABLE
SIC	600	P-OS: 1-PR#18 or 16SH or 1-TR#18 or 16SH	CABLE TRAY RATED INSTRUMENT CABLE
THWN	600	PVC INSULATED WITH NYLON JACKET BUILDING GRADE CONDUCTOR	ONLY LIGHTS & RECEPTACLES
XHHW-2	600	XLP INSULATED INDUSTRIAL GRADE CONDUCTOR	POWER, CONTROL, LIGHTING, & RECEPTACLES

Cable System Identification:	MIC
Description:	Multiple twisted, shielded pairs, 18 or 16 AWG, with overall shield instrumentation cable; Number of pairs as shown; UL listed, Cable Tray rated.
Voltage:	600 volts
Conductor Material:	Bare annealed copper; Class-B stranded per ASTM B-8
Insulation:	15 mil, Polyvinyl Chloride (PVC) with 4 mil nylon, 90 degree C temperature rated Color Code per ICEA Method-1: Pairs- Black and White with one conductor in each pair printed alpha-numerically for identification
Lay:	Twisted on a 2-inch lay
Shield:	100 percent, 1.35 mil aluminum/polyester or mylar tape with 7-strand tinned copper drain wire
Overall Shield:	2.35 mil aluminum-Mylar tape with 7-strand tinned copper drain wire
Jacket:	Flame-retardant, moisture and sunlight resistant 45 mil Polyvinyl Chloride (PVC)
Flame Resistance:	UL 1277 and UL 1581 vertical tray flame test
Manufacturer(s):	Okonite, Okoseal-N type SP-OS (Shielded Pairs with Overall Shield); or Cooper Industries-Belden equal; or General Cable equal
Execution:	
Installation:	Install in accordance with paragraph 16120-3.03.
Testing:	Test in accordance with paragraph 16120-3.05.
Cable System Identification:	SIC
Description:	Single twisted, shielded pair or triad, 18 or 16 AWG, instrumentation and signal cable; UL listed; Cable Tray rated
Voltage:	600 volts

Conductor Material:	Bare annealed copper; stranded per ASTM B8
Insulation:	15 mil, Polyvinyl Chloride (PVC) with 4 mil nylon, 90 degree C temperature rated Color Code per ICEA Method-1: Pairs- Black and White with one conductor in each pair printed alpha-numerically for identification
Lay:	Twisted on a 2-inch lay
Shield:	100 percent, 1.35 mil aluminum-Mylar tape with a 7-strand tinned copper drain wire
Jacket:	45 mil Polyvinyl Chloride (PVC)
Flame Resistance:	UL 1277
Manufacturer(s):	Okonite, Okoseal-N Type P-OS (Pair(s) Overall Shield) and Type TOS (Triad(s) Overall Shield); or Cooper Industries-Belden equal; or General Cable equal
Execution:	
Use:	Analog signal cable and RTD device Triad extension cable.
Installation:	Install in accordance with paragraph 16120-3.03.
Testing:	Test in accordance with paragraph 16120-3.05.
Cable System Identification:	THWN
Description:	Single conductor lighting and receptacle type; Indoor branch circuit conductor.
Voltage:	600 volts
Conductor Material:	Bare annealed copper; stranded per ASTM B8
Insulation:	THWN/THHN, 90 degree C dry, 75 degree C wet, Polyvinyl Chloride (PVC) per UL 83.
Jacket:	Nylon
Flame Resistance:	UL 83

Manufacturer(s):	Okonite, Okoseal-N, series 116-67-XXXX; or equal.
Uses Permitted:	Lighting, receptacle and appliance circuits
Execution:	
Installation:	Install in accordance with paragraph 16120-3.02.
Testing:	Test in accordance with paragraph 16050-3.02 and Section 16030.

Cable System Identification:	XHHW-2
Description:	Industrial grade single conductor Sizes: 14 AWG through 750 kcmil as shown
Voltage:	600 volts
Conductor Material:	Bare annealed copper; stranded per ASTM B8
Insulation:	NEC Type XHHW-2; 90 degree C dry and C wet; Cross-Linked Polyethylene (XLP) per ICEA S-66-524 and UL-44; Color in sizes 14, 12 and 10 AWG: Black, Green, Yellow, White, Orange, Brown, Red, Blue
Jacket:	None
Flame Resistance:	UL 83
Manufacturer(s):	Okonite, X-Olene; Cablec, Durasheath XLP; or equal.
Uses Permitted:	Power, control, lighting and outlet circuits.
Execution:	
Installation:	Install in accordance with paragraph 16120-3.02.
Testing:	Test in accordance with paragraph 16050-3.02 and Section 16030.

Raceway Identification:	GRS
Description:	Galvanized Rigid Steel Conduit (GRS)
Compliance:	ANSI and UL
Finish:	Hot-dip galvanized after fabrication, inside and outside. Smooth finished surfaces.
Manufacturers:	Allied Tube and Conduit Corp., Wheatland Tube Co., or equal.
Minimum size:	Unless otherwise specified, 3/4 inch for exposed, 1 inch for embedded, encased, or otherwise inaccessible.
Fittings:	Locknuts, Rings, Hubs: Hot-dip galvanized insulated throat with bonding locknut or ring,. The hubs shall utilize a neoprene "O" ring and provide a watertight connection. O-Z Gedney, CHM-XXT, or equal Unions: Electro-galvanized ferrous alloy type Appleton UNF or UNY, Crouse-Hinds UNF or UNY, or equal. Threadless fittings are not acceptable.
Conduit Bodies:	Oversized conduit bodies: Ferrous alloy type with screw taps for fastening covers to match the conduit system. Gaskets shall be made of neoprene.
Boxes:	Indoor: Type FD cast ferrous for all device boxes and for junction boxes less than 6 inches square. Outdoor: Type FD cast ferrous for all device boxes and for junction boxes less than 6 inches square. Corrosive: NEMA 4X stainless steel or nonmetallic, as specified. Hazardous: NEMA Class 7 cast ferrous.

Elbows:	
(3/4" thru 1-1/2")	Factory fabricated or field bent.
(2" thru 6")	Factory fabricated only.
Conduit Bodies (Oversized):	
(3/4" thru 4")	Malleable iron, hot-dip galvanized, unless otherwise noted. Neoprene gaskets for all access plates. Tapered threads for conduit entrances.
(5" and 6")	Electro-galvanized iron or cast iron box.
Expansion Fittings:	Expansion fittings in embedded runs shall be watertight with an internal bonding jumper. The expansion material shall be neoprene allowing for 3/4-inch movement in any direction.
Manufacturers:	Appleton, Crouse-Hinds, Hubbell, O. Z. Gedney, or equal.
Installation:	Rigid steel conduit shall be made up tight and with conductive thread compound. Joints shall be made with standard couplings or threaded unions. Steel conduit shall be supported away from the structures using hot-dip galvanized malleable iron straps with nesting backs or framing channel. Conduit entering boxes shall be terminated with a threaded hub with a grounding bushing. Exposed male threads on rigid steel conduit shall be coated with zinc-rich paint.

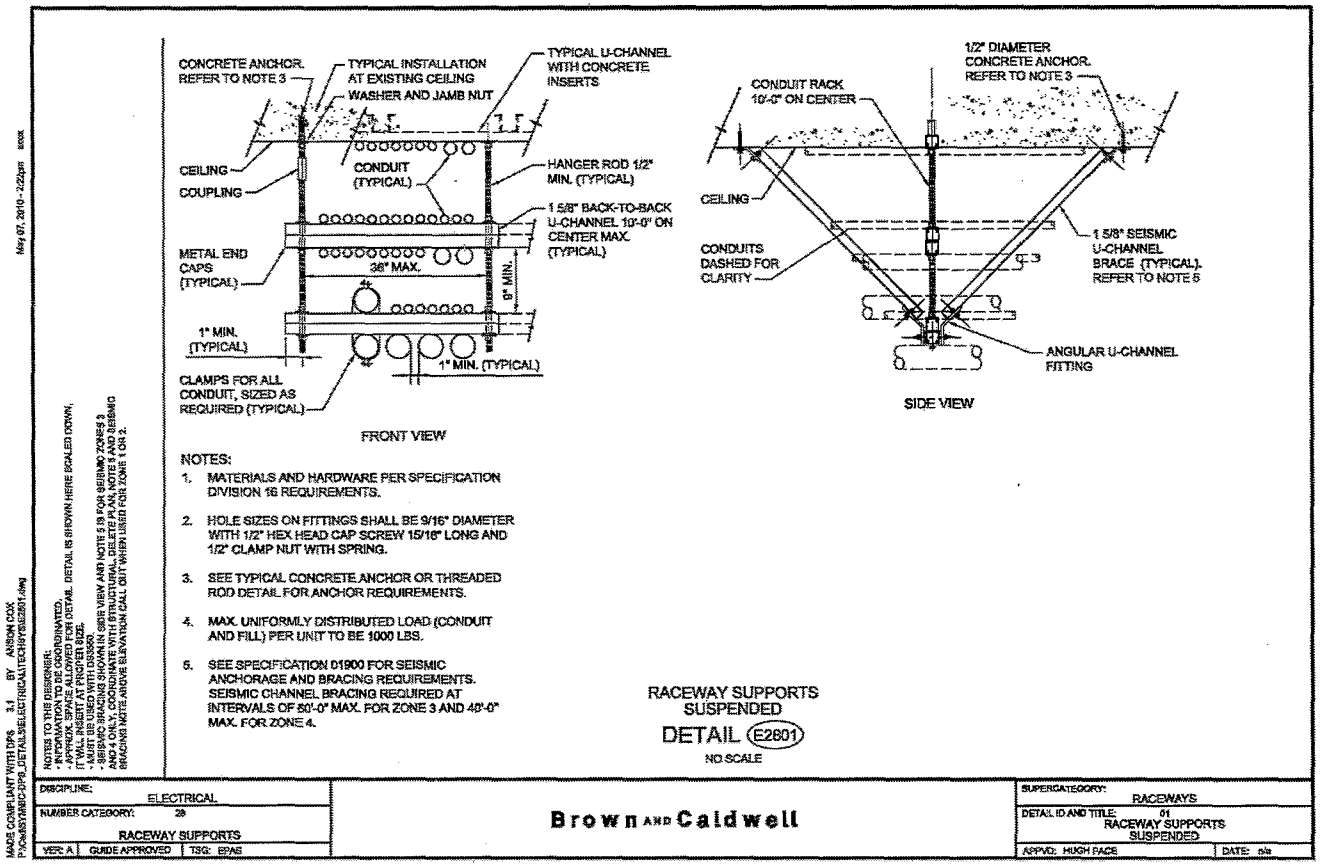
Raceway Identification:	LFS
Description:	Liquidtight Flexible Steel Conduit
Application:	Final connection to equipment subject to vibration or adjustment.
Compliance:	UL 360
Construction:	Spirally wound galvanized steel strip with successive convolutions securely interlocked and jacketed with liquidtight plastic cover.
Minimum size:	3/4 inch
Fittings:	Cadmium-plated malleable iron body and gland nut with cast-in lug, brass grounding ferrule threaded to engage conduit spiral. O-ring seals around the conduit and box connection and insulated throat. Provide forty-five and ninety degree fittings where applicable. Provide PVC coated flexible conduit and fittings where the conduit system is PVC coated.
Installation:	Length of flexible liquidtight conduit shall not exceed 15 times the trade diameter of the conduit and not exceed 36 inches in length. Use conductive thread compound.

Raceway Identification:	PGRS
Description:	Rigid Steel Conduit, Corrosion-Resistant, Polyvinyl Chloride (PVC) Coated. Provide factory made and coated elbows.
Compliance:	ANSI, ETL and UL. The PVC coated rigid galvanized steel conduit shall be stamped with the ETL Verification Mark "ETL Verified to PVC-001".
Finish:	PGRS shall be hot-dip galvanized rigid steel conduit as specified in 16110-3.03 GRS, with a PVC Coating. The PVC coating shall be gray, minimum 40 mils thick, bonded to the outside and continuous over the entire length of the conduit except at the threads, and be free of blisters, bubbles, or pinholes. Thread protectors shall be used on the exposed threads of the PVC coated conduit. A 2-mil coat of urethane enamel coating shall be bonded to the inside. Coating shall be free of pinholes. Bond strength shall exceed the tensile strength of the PVC coat.
Minimum size:	3/4 inch
Fittings:	Similarly coated to the same thickness as the conduit and provided with Type 316 stainless steel hardware. Conduit and fittings shall be manufactured by the same company Conduit and fittings shall be coated by the same company. Male threads on elbows and nipples, and female threads on fittings or conduit couplings shall be protected by application of urethane coating. Covers: PVC coated covers shall have V-groove seal and stainless steel hardware. Hubs: Hubs for connection of conduit to junction, device, or terminal boxes shall be threaded cast ferrous alloy. Hubs shall have the same PVC coating as the conduit and insulating grounding bushings. Hubs shall utilize a neoprene "O" ring and shall provide a watertight connection.

Boxes:	Nonhazardous: NEMA Class 4X stainless steel or nonmetallic. Hazardous: NEMA Class 7 cast ferrous.
Manufacturers:	PVC coated conduit that bears the ETL Verified PVC-001 label by Robroy Industries, Plasti-Bond, Perma-Cote, KorKap or equal.
Installation:	Plastic coated conduit shall be made up tight, threaded, and installed using tools approved by the PVC-coated conduit manufacturer. Exposed conduit threads shall be covered by a plastic overlap coated and sealed per manufacturer's recommendations. Pipe wrenches and channel locks shall not be used for tightening plastic coated conduits. Damaged areas shall be patched, using manufacturer's recommended material. The area to be patched shall be built up to the full thickness of the coating. Painted fittings are not acceptable. PVC coated conduit shall be supported away from the structure using PVC coated conduit wall hangers or PVC coated conduit mounting hardware. Damaged work shall be replaced
Training:	Installers shall be trained and certified in the proper installation techniques provided by the PVC-coated conduit system manufacture. Proof of certification shall be provided under paragraph 16110-1.03.

Raceway Identification:	PVC4
Description:	Rigid Nonmetallic Conduit.
Application:	Heavy wall thickness for direct bury, concrete encasement or surface mounting where not subject to physical damage.
Compliance:	NEMA TC2, UL 651
Construction:	Schedule 40, high-impact, polyvinylchloride (PVC)
Minimum size:	3/4 inch exposed; 1 inch embedded or encased
Fittings:	PVC solvent weld type
Boxes:	
	Indoor: NEMA Class 4, nonmetallic
	Outdoor and corrosive: NEMA Class 4X, nonmetallic
Installation:	PVC conduit entering fiberglass boxes or cabinets shall be secured by threaded bushings on the interior of the box and shall be terminated with a threaded male terminal adapter having a neoprene O ring.
	Joints shall be made with standard PVC couplings.
	PVC conduit shall have bell ends where terminated at walls and boxes.

Raceway Identification:	XPFS
Description:	Explosion-proof Flexible Steel Conduit
Application:	XPFS Conduit coupling shall be used for final connections to motors and other equipment subject to vibration or adjustment in Class I Division 1 hazardous areas and shall be watertight.
Size:	1/2 inch – 4-inch
Length:	4-inch – 36-inch



NOTES:

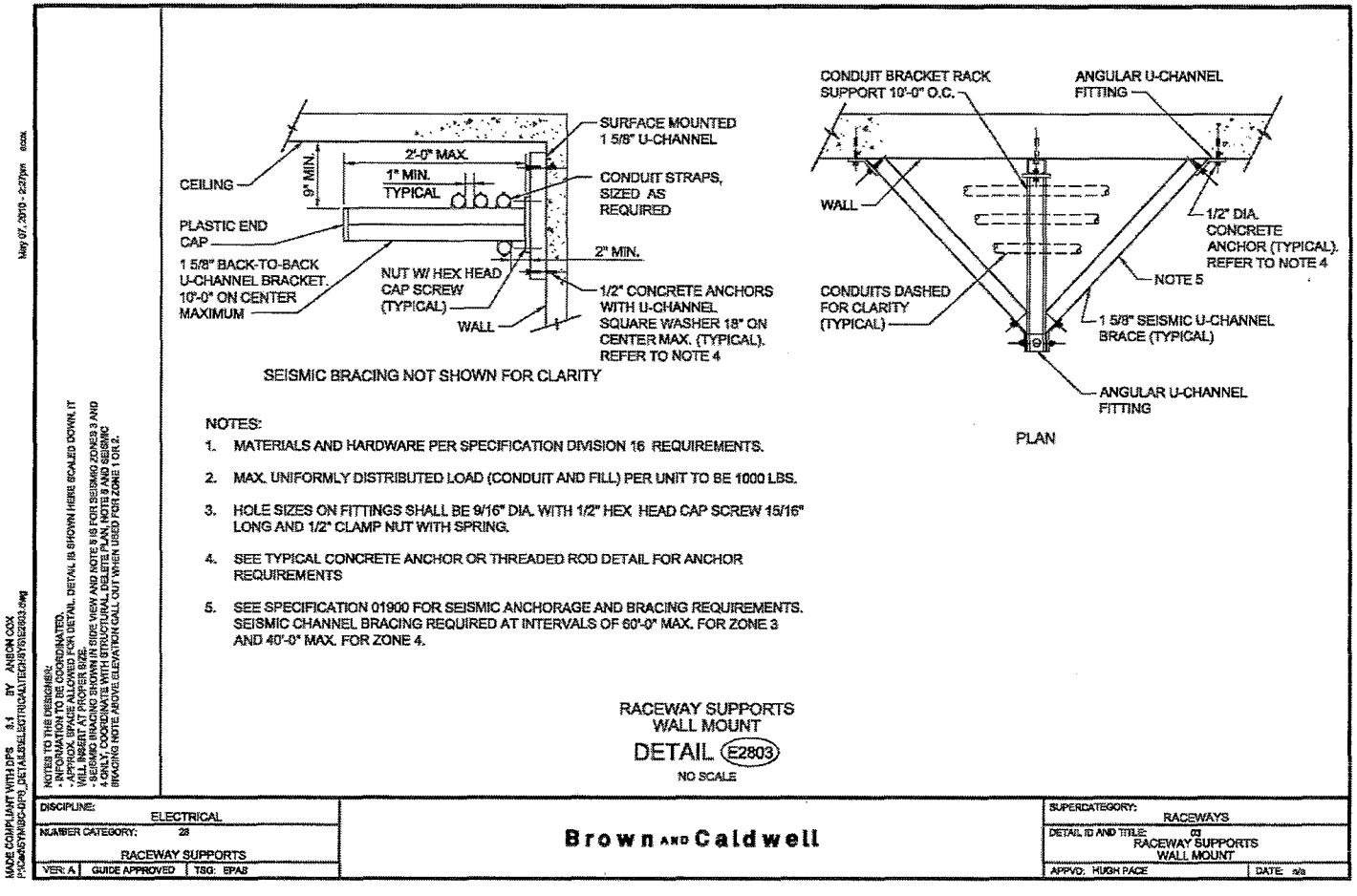
1. MATERIALS AND HARDWARE PER SPECIFICATION DIVISION 16 REQUIREMENTS.
2. HOLE SIZES ON FITTINGS SHALL BE 9/16" DIAMETER WITH 1/2" HEX HEAD CAP SCREW 15/16" LONG AND 1/2" CLAMP NUT WITH SPRING.
3. SEE TYPICAL CONCRETE ANCHOR OR THREADED ROD DETAIL FOR ANCHOR REQUIREMENTS.
4. MAX. UNIFORMLY DISTRIBUTED LOAD (CONDUIT AND FILL) PER UNIT TO BE 1000 LBS.
5. SEE SPECIFICATION 01900 FOR SEISMIC ANCHORAGE AND BRACING REQUIREMENTS. SEISMIC CHANNEL BRACING REQUIRED AT INTERVALS OF 60'-0" MAX. FOR ZONE 3 AND 40'-0" MAX. FOR ZONE 4.

RACEWAY SUPPORTS SUSPENDED

DETAIL E2801

NO SCALE

DISCIPLINE: ELECTRICAL	Brown AND Caldwell	SUPERCATEGORY: RACEWAYS
NUMBER CATEGORY: 28 RACEWAY SUPPORTS		DETAIL ID AND TITLE: 01 RACEWAY SUPPORTS SUSPENDED
VER: A | GUIDE APPROVED | TSG: EPAS		APPVD: HUGH PAGE | DATE: n/a



NOTES:

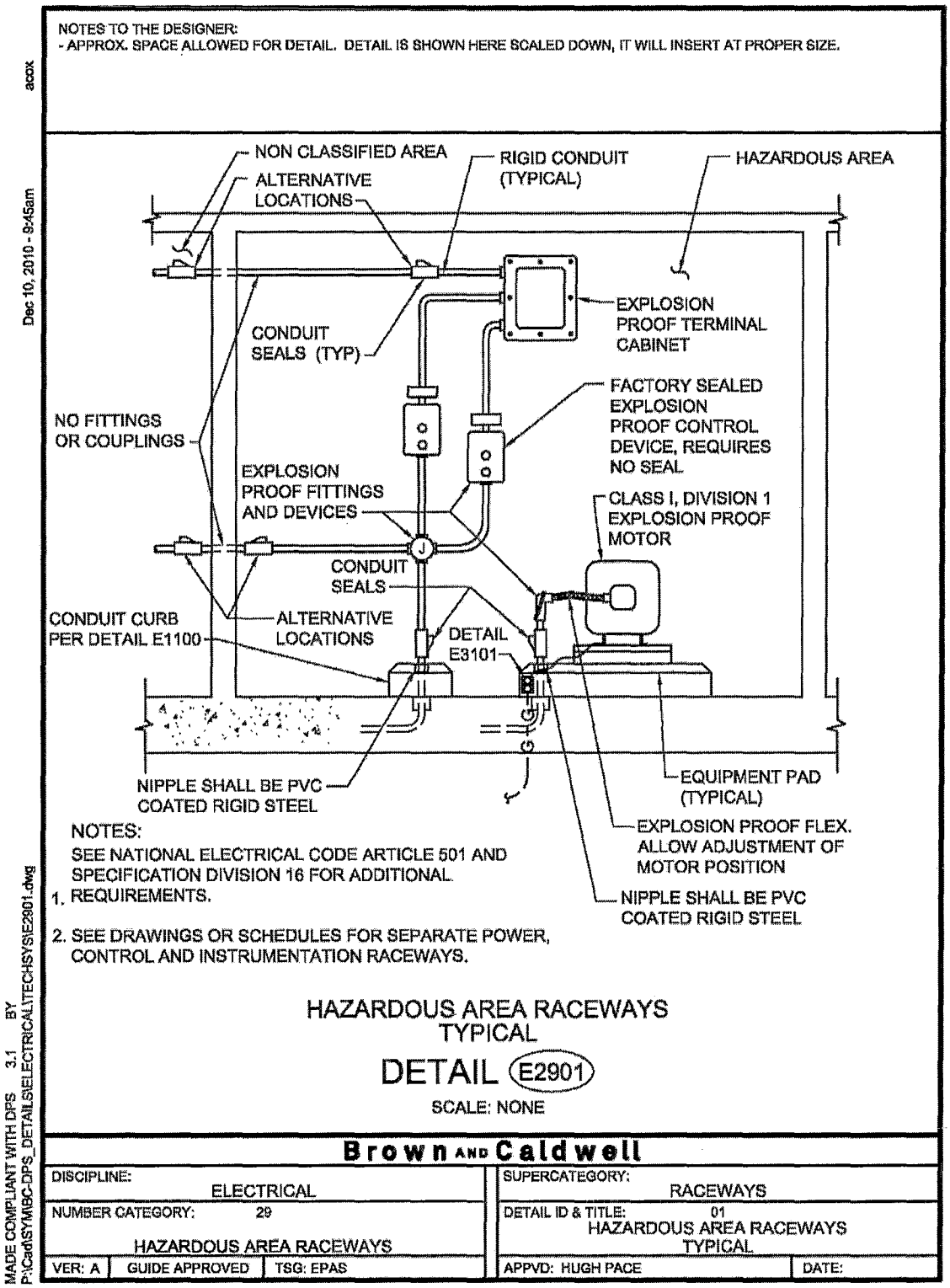
1. MATERIALS AND HARDWARE PER SPECIFICATION DIVISION 16 REQUIREMENTS.
2. MAX. UNIFORMLY DISTRIBUTED LOAD (CONDUIT AND FILL) PER UNIT TO BE 1000 LBS.
3. HOLE SIZES ON FITTINGS SHALL BE 9/16" DIA. WITH 1/2" HEX HEAD CAP SCREW 15/16" LONG AND 1/2" CLAMP NUT WITH SPRING.
4. SEE TYPICAL CONCRETE ANCHOR OR THREADED ROD DETAIL FOR ANCHOR REQUIREMENTS
5. SEE SPECIFICATION 01900 FOR SEISMIC ANCHORAGE AND BRACING REQUIREMENTS. SEISMIC CHANNEL BRACING REQUIRED AT INTERVALS OF 60'-0" MAX. FOR ZONE 3 AND 40'-0" MAX. FOR ZONE 4.

RACEWAY SUPPORTS
WALL MOUNT
DETAIL E2803
NO SCALE

NOTES TO THE DESIGNER:
- INFORMATION TO BE COORDINATED.
- APPROX. SPACE ALLOWED FOR DETAIL. DETAIL IS SHOWN HERE SCALED DOWN. IT WILL NEED TO BE ENLARGED TO FIT.
- SEISMIC BRACING SHOWN IN SIDE VIEW AND NOTE 5 IS FOR SEISMIC ZONES 3 AND 4 ONLY. COORDINATE WITH STRUCTURAL. DELETE PLAN, NOTE 5 AND SEISMIC BRACING NOTE ABOVE ELEVATION CALL OUT WHEN USED FOR ZONE 1 OR 2.

MADE COMPLIANT WITH DPS 8.1 BY ANSON COX
P:\CAD\STYMBC-DPS_DETAILS\ELECTRICAL\TECH\STY01E2803.dwg
May 07, 2010 - 2:27pm anson

DISCIPLINE: ELECTRICAL	Brown AND Caldwell	SUPERCATEGORY: RACEWAYS
NUMBER CATEGORY: 28 RACEWAY SUPPORTS		DETAIL ID AND TITLE: 03 RACEWAY SUPPORTS WALL MOUNT
VER: A | GUIDE APPROVED | TSG: EPA8		APPVD: HUGH PACE | DATE: n/a



****END OF SECTION****

SECTION 16170

GROUNDING SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the system for grounding electrical distribution and utilization equipment, including but not limited to cabinets, motor frames, manholes, instrumentation, metal surfaces of process/mechanical equipment that contain energized electrical components, metal structures and buildings, outdoor metal enclosures, fences and gates.

B. The Equipment Grounding Conductor shall ground or bond equipment, structures, or equipment frames to the Grounding Electrode System as defined in the National Electrical Code Article 250 and addressed herein.

C. The minimum size of the Equipment Grounding Conductors installed with the circuit conductors shall be per the National Electrical Code Table 250.122. The circuit grounding conductor size routed with a feeder or branch circuit conductors is as shown on the drawings.

D. Existing equipment ground plates shall be primarily utilized to ground new electrical enclosures and equipment provided on this project. Contractor shall make any necessary modifications to existing ground plates, including providing a new ground plate adjacent to an existing ground plate if necessary, and provide grounding conductors supported and terminated in accordance with the requirements of this section.

1.2 REFERENCES:

A. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of commencement of the Work. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
IEEE 81	Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System

Reference	Title
IEEE Std 81.2-1991	Guide to Measurement of Impedance and Safety Characteristics of Large, Extended or Interconnected Grounding Systems
NETA - ATS	InterNational Electrical Testing Association Inc. - Acceptance Testing Specifications
NFPA 70	National Electric Code (NEC) Article 250

1.3 SUBMITTALS:

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. PRODUCT LITERATURE:

a. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. A check mark shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Construction Manager shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

b. Marked product literature for ground rods, test wells, and equipment ground plate.

PART 2 - PRODUCTS

2.1 GROUND CONDUCTORS

A. The System Ground Conductor shall be soft-drawn, bare annealed copper, concentric stranded, as specified. The minimum sizes shall be as follows, where American Wire Gage (AWG) conductor sizes are not shown or specified unless shown otherwise:

480V MCC and VFD 2/0 or 4/0 AWG

Lighting & Power panels	2 AWG
Exposed metal cabinets	2 AWG
Electrical equipment	2 AWG
Motors 25 hp to 250 hp	2 AWG
Motors 1 hp to 25 hp	6 AWG

2.2 COMPRESSION CONNECTORS

A. Compression connections shall be irreversible, cast copper as manufactured by Thomas and Betts, or equal.

2.3 BOLTED CONNECTORS

A. Bolted connectors shall be Burndy, O. Z. Gedney, or equal.

2.4 EQUIPMENT GROUND BARS

A. Copper equipment ground bars shall be Erico Eritech EGB Series or equal, sized as required for the installation.

2.5 EQUIPMENT GROUND PLATE

A. Equipment ground plate shall be two-hole copper flush mounted grounding plate, Erico Cadweld, Burndy YGF Series, or equal.

2.6 PRODUCT DATA

A. The following information shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook:

1. Ground resistance readings specified in paragraph 16170-3.05.

PART 3 - EXECUTION

3.1 GENERAL

A. Grounding system shall be provided in compliance with the NFPA 70 National Electrical Code (NEC). Grounding conductor shall not be used as a system neutral.

B. Tools and dies shall be approved for this purpose; dimple compressions are not acceptable. Compression connections shall be prepared in accordance with the manufacturer's instructions. Compression-type lugs shall be used in accordance with manufacturer's recommendations. Exposed ground connections to equipment shall be made by bolted clamps unless otherwise specified. No solder material shall be used in any part of the ground circuits.

C. Exposed grounding conductors shall be supported by noncorrosive metallic hardware at 4 foot intervals or less. Grounding conductors for shown and future equipment shall be terminated using an equipment grounding plate.

D. Ground conductors entering electrical enclosures shall be bonded to a single ground bus or terminal strip in the enclosure and to metallic raceways within or terminating

at the enclosure. Direct ground connections to enclosure chassis or back plate are not acceptable. Prior to making ground connections or bonds, the metal surface at the point of connection shall be cleaned.

E. Metallic sheaths or shields of shielded power cable shall be terminated by a copper ground bus provided with cable connection for connection to the grounding system.

3.2 RACEWAY GROUND

A. All service, feeder and branch circuit raceways shall contain a green insulated ground conductor sized per applicable NFPA 70 National Electrical Code (NEC) tables:

1. T250.66 - Grounding Electrode Conductor for Alternating-Current Systems or

2. T250.122 - Minimum Size Equipment Grounding Conductors for Grounding Raceways and Equipment.

B. Metallic conduits terminating at concentric knock-outs or reducing washers shall be bonded using insulated grounding bushings. Grounding bushings shall be connected to the grounding system using conductors sized in compliance with NEC.

3.3 EQUIPMENT AND ENCLOSURE BONDING

A. Electrical distribution and utilization equipment enclosure ground bus, motor frames, manholes, metal structures and buildings, outdoor metal enclosures, fences and gates shall be bonded to the grounding system with conductor sizes as specified.

B. Connect the conductor to the metal enclosure using a UL listed connector, where the enclosure does not contain an internal ground bus

C. Non-electrical equipment with metallic enclosures, that are located outdoor and without a cover or a shade, shall be connected to the grounding system.

3.4 GROUNDING SYSTEM TESTS

A. The Contractor shall test the equipment grounding system to determine the ground resistance. The grounding test shall be IEEE Standard 81 using the NETA Fall-of-Potential procedure as applicable and not exceed 5 ohms.

****END OF SECTION****

SECTION 16480

600 VOLT MOTOR CONTROL CENTER MODIFICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. SCOPE: This section pertains to existing (480) volt Motor Control Center (MCC) modifications. Not all requirements in the specification may apply to the work on this project. Contractor shall apply the requirements entailed in this section as applicable to make the necessary modifications to specific MCC buckets as shown on the drawings to meet the intent of the design. Existing information and modifications shown on the drawings are based on record drawings provided by the City. In some cases, this information may vary from actual field conditions. Contractor shall field-verify all information pertaining to this work and make adjustments as necessary to meet the intent of the design.

1.2 QUALITY ASSURANCE

A. REFERENCES:

1. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of commencement of the Work. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ANSI/NEMA ICS 1	Industrial Control Systems: General Requirements
ANSI/NEMA ICS 18	Motor Control Centers
NFPA 79	Electrical Standards for Industrial Machinery
UL 845	Motor Control Centers

B. CODES AND STANDARDS: Motor Control Center modifications and all components shall be Underwriters Laboratory listed to UL 845 and shall conform to NEMA ICS-1 and ICS-18 standards.

1.3 SUBMITTALS

A. Submittals shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook, and shall include the following information:

1. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. A check mark shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Construction Manager shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

2. Elementary connection and interconnection diagrams of the modified MCC buckets as required in paragraph 16480-2. 7, in accordance with NFPA 79 and/or NEMA ICS 18 Part 1 standards.

3. Nameplate schedule.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Motor Control Center bucket components shall match existing as practicable.

2.2 WIRING

A. GENERAL:

1. All starter units shall have terminal blocks for control wiring. Terminal blocks shall be provided for power wiring for starters size 2 and smaller.

2. Motor control center modifications shall include all necessary interconnecting wiring and interlocking.

3. Provide elementary and connection diagrams for each starter unit.

B. POWER WIRE: Power wire shall be copper 90 degrees C insulated, sized to suit load; minimum power wire size shall be No. 12 AWG copper stranded.

C. CONTROL WIRE: Control wire shall be No. 16 AWG stranded copper wire, rated 90 degrees C machine tool wiring (MTW) and UL listed for panel wiring.

D. TERMINATIONS AND CABLE CONNECTIONS:

1. TERMINALS: Control wiring shall be lugged with ring-tongue or locking spade crimp type terminals made from electrolytic copper, tin-plated.

2. CABLE CONNECTORS: Cable connectors for use with stranded copper wire, sizes No. 8 AWG to 1000 kCmil shall be UL listed. Dished conical washers shall be used for each bolted connection. Connectors shall be reusable and shall be rated for use with copper conductors. Incoming line and outgoing feeder compartments shall be provided with crimp type lugs, 3M Company, Burndy Company, or equal.

E. CONDUCTOR MARKERS: Markers used for identification shall meet the requirements of Section 16050.

2.3 FEEDER CIRCUIT PROTECTION

A. GENERAL: Feeder tap units shall consist of fused disconnect switches or circuit breakers, as specified or shown. Series ratings for overcurrent devices to meet specified short circuit withstand ratings is prohibited.

B. CIRCUIT BREAKERS (THERMAL MAGNETIC): Thermal-magnetic circuit breakers shall be molded case equipped with toggle type handle, quick-make, quick-break over center switching mechanism that is trip-free so that breaker cannot be held closed against short circuits and abnormal currents. The tripped position shall be clearly indicated by breaker handle maintaining a position between "ON" and "OFF." All poles shall open, close, and trip simultaneously. Minimum short circuit capacity shall be 65,000 amperes symmetrical.

C. CONTROL TRANSFORMERS:

1. Each control transformer shall be rated 480/240-120V, single phase, 2-wires, 60 Hertz. The transformer shall be sized for the load it feeds but shall not be less than 300VA for buckets with adjustable frequency drives.

2. Each control transformer shall be provided with time-delay, slow-blow secondary fuse rated to interrupt 10,000 amperes short circuit at 250 volts AC. Two primary fuses rated to interrupt 200,000 amperes at 600 volts shall be provided on all starters.

3. Fuse holder for secondary fuse shall be drawout indicating type and mounted on the door of the compartment. Fuse holders for primary fuses shall be fuse clips with full barriers between fuses.

D. AUXILIARY CONTACTS: Contactors shall be equipped with auxiliary contacts, rated 10 amperes at 120 volts AC. Refer to drawings for actual quantities required. As a minimum, each contactor shall be equipped with two normally open and two normally closed electrically isolated auxiliary contacts with the used and auxiliary contacts wired out to terminal blocks.

E. TERMINAL BLOCKS:

1. Terminal blocks shall be screw type rated 600 volts; 20 amperes for control wiring and 30 amperes power wiring with starters Size 3 and larger shall terminate the power leads directly to the contactor.

2. The number of terminal blocks shall be specified on the drawings. Terminal blocks shall be provided with integral marking strips and shall be permanently marked with the conductor number as specified on the drawings. Internal wiring shall be connected on one side of the terminal block; outgoing conductors shall be connected to the other side.

F. ADJUSTABLE FREQUENCY DRIVES: Provide adjustable frequency drives in MCC buckets where shown on the drawings. Refer to Section 11069 for adjustable frequency drive requirements.

2.4 MISCELLANEOUS

A. GENERAL:

1. Control devices such as pushbuttons, selector switches, indicating lights and reset pushbuttons shall be mounted on the unit compartment door where required.

2. The control devices shall comply with the requirements of Section 16175.

B. NAMEPLATES: Nameplates shall be provided in accordance with the requirements of Section 16050. Nameplates shall be provided for all cubicles and compartments and identify the load per NEC. A Nameplate shall be provided identifying the motor control center. Provide equipment tag numbers and descriptions as shown.

2.5 SPARE PARTS

A. One set consisting of the following spare parts shall be provided:

1--set each fuse size and type

10--indicating light bulbs

2.6 PRODUCT DATA

A. The following information shall be provided in accordance with Section 2-5 and applicable subsections of the Greenbook and the Whitebook:

1. Manufacturer's certification that the following items are capable of interrupting and/or withstanding the specified short circuit condition:

a. Circuit breaker

b. Adjustable frequency drives

2. Operation and maintenance information.

3. Dimensions and weights.

4. Installation instructions.

5. Manufacturer's product data.

PART 3 - EXECUTION

3.1 GENERAL

A. The motor control centers shall be modified in accordance with the recommendations of the manufacturer and with the details specified herein and on the drawings.

B. Field wiring shall meet the requirements of paragraph 16120-3.02. Cables larger than No. 6 AWG which hang from their vertical connections shall be supported within 2 feet of the connection.

3.2 FIELD TESTS

A. Motor control center modifications shall be tested in accordance with Section 16030.

****END OF SECTION****

SUPPLEMENTARY SPECIAL PROVISIONS

APPENDICES

APPENDIX A

NOTICE OF EXEMPTION

NOTICE OF EXEMPTION

(Check one or both)

TO: X RECORDER/COUNTY CLERK
P.O. BOX 1750, MS A-33
1600 PACIFIC HWY, ROOM 260
SAN DIEGO, CA 92101-2422

_____ 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
Ernest J. Dronenburg, Jr., Recorder/County Clerk
JUL 11 2012
BY J. Samuela DEPUTY

PROJECT NO.: WBS S-00323

PROJECT TITLE: **MBC Odor Control Systems Upgrades**

PROJECT LOCATION-SPECIFIC: The project is located within Areas 60, 86, 76, and 94 of the Metro Biosolids Center located at 5240 Convoy Street, on USMCAS Miramar property.

PROJECT LOCATION-CITY/COUNTY: City of San Diego/ County of San Diego.

DESCRIPTION OF NATURE AND PURPOSE OF THE PROJECT: The project will provide upgrades to the existing Odor Control System (OCS) and Distributed Control System (DCS). Upgrades include new fans, motors, dampeners, and ducting at Area 60, the Odor Control Facility. Other improvements to Area 60 include new access platforms/ catwalks and other instrumentation required to operate the odor control system. At Area 86, improvements will include installation of new "fume-hoods", new fans and ducting. Improvements at Area 76 include installation of new fume-hood enclosures above the two Grit bins and upgraded motors, fans, ducting, exhaust outlets, air supply grilles. Area 94 will include installation of new fans, access platforms, dampeners, acid/caustic scrubbers, new valves for chemical feed systems, and new access platforms. All construction access will use existing paved roads within the treatment plant and the proposed improvements will be located within existing developed areas of the plant and inside existing facility buildings. 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)

(X) CATEGORICAL EXEMPTION: 15302 (REPLACEMENT OR RECONSTRUCTION)

REASONS WHY PROJECT IS EXEMPT: The City of San Diego conducted an environmental review 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 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: M. 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

Martha Blake

MARTHA BLAKE/SENIOR PLANNER
(X) SIGNED BY LEAD AGENCY

June 25, 2012
DATE
DATE RECEIVED FOR FILING WITH COUNTY CLERK OR OPR:

FILED IN THE OFFICE OF THE COUNTY CLERK
San Diego County on JUL 11 2012
Posted JUL 11 2012 Removed
Returned to agency on
Deputy J. Samuela

State of California—The Resources Agency
DEPARTMENT OF FISH AND GAME

2012 ENVIRONMENTAL FILING FEE CASH RECEIPT

RECEIPT #
SD2012 0594

STATE CLEARING HOUSE # *(If applicable)*
--

SEE INSTRUCTIONS ON REVERSE. TYPE OR PRINT CLEARLY

LEAD AGENCY			DATE
CITY OF SAN DIEGO - DSD			07/11/2012
COUNTY/STATE AGENCY OF FILING			DOCUMENT NUMBER
SAN DIEGO			*20120594*
PROJECT TITLE			
MBC ODOR CONTROL SYSTEMS UPGRADES			
PROJECT APPLICANT NAME			PHONE NUMBER
CITY OF SAN DIEGO, E&CP DEPT/MANUEL DA ROSA			619-533-4629
PROJECT APPLICANT ADDRESS	CITY	STATE	ZIP CODE
600 B STREET, STE 800 (MS 908A)	SAN DIEGO	CA	92101

PROJECT APPLICANT *(Check appropriate box)*:
☑ Local Public Agency ☐ School District ☐ Other Special District ☐ State Agency ☐ Private Entity

CHECK APPLICABLE FEES:

☐ Environmental Impact Report	$2,919.00	$
☐ Negative Declaration	$2,101.50	$
☐ Application Fee Water Diversion *(State Water Resources Control Board Only)*	$850.00	$
☐ Projects Subject to Certified Regulatory Programs	$992.50	$
☑ County Administrative Fee	$50.00	$ $50.00
☐ Project that is exempt from fees		
☑ Notice of Exemption		
☐ DFG No Effect Determination (Form Attached)		
☐ Other		$

PAYMENT METHOD:
☐ Cash ☐ Credit ☑ Check ☐ Other #0001199615 TOTAL RECEIVED $ $50.00

SIGNATURE	TITLE
X J. Samuela	Deputy

ORIGINAL - PROJECT APPLICANT COPY - DFG/ASB COPY - LEAD AGENCY COPY - COUNTY CLERK FG 753.5a (Rev. 7/08)

APPENDIX B

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 C

SAMPLE CITY INVOICE

City of San Diego, Field Engineering Div., 9485 Aero Drive, SD CA 92123		**Contractor's Name:**	
Project Name:		Contractor's Address:	
Work Order No or Job Order No.			
City Purchase Order No.		Contractor's Phone #:	**Invoice No.**
Resident Engineer (RE):		Contractor's fax #:	**Invoice Date:**
RE Phone#:	Fax#:	Contact Name:	Billing Period: (to

Item #	Item Description	Contract Authorization				Previous Totals To Date		This Estimate		Totals to Date	
		Unit	Price	Qty	Extension	%/QTY	Amount	% / QTY	Amount	% / QTY	Amount
1					$ -		$ -		$ -	0.00%	$ -
2					$ -		$ -		$ -	0.00%	$ -
3					$ -		$ -		$ -	0.00%	$ -
4					$ -		$ -		$ -	0.00%	$ -
5					$ -		$ -		$ -	0.00%	$ -
6					$ -		$ -		$ -	0.00%	$ -
7					$ -		$ -		$ -	0.00%	$ -
8					$ -		$ -		$ -	0.00%	$ -
9					$ -		$ -		$ -	0.00%	$ -
10					$ -		$ -		$ -	0.00%	$ -
11					$ -		$ -		$ -	0.00%	$ -
12					$ -		$ -		$ -	0.00%	$ -
13					$ -		$ -		$ -	0.00%	$ -
14					$ -		$ -		$ -	0.00%	$ -
15					$ -		$ -		$ -	0.00%	$ -
16					$ -		$ -		$ -	0.00%	$ -
17	**Field Orders**				$ -		$ -		$ -	0.00%	$ -
18					$ -		$ -		$ -	0.00%	$ -
	CHANGE ORDER No.				$ -		$ -		$ -	0.00%	$ -
					$ -		$ -		$ -	0.00%	$ -
	Total Authorized Amount (including approved Change Order)				**$ -**		$ -		$ -	**Total Billed**	$ -

SUMMARY

A. Original Contract Amount	$ -
B. Approved Change Order #00 Thru #00	$ -
C. Total Authorized Amount (A+B)	$ -
D. Total Billed to Date	$ -
E. Less Total Retention (5% of D)	$ -
F. Less Total Previous Payments	$ -
G. Payment Due Less Retention	**$0.00**
H. Remaining Authorized Amount	$0.00

I certify that the materials have been received by me in the quality and quantity specified

Resident Engineer

Construction Engineer

Retention and/or Escrow Payment Schedule

Total Retention Required as of this billing (Item E)	$0.00
Previous Retention Withheld in PO or in Escrow	$0.00
Add'l Amt to Withhold in PO/Transfer in Escrow:	***$0.00***
Amt to Release to Contractor from PO/Escrow:	

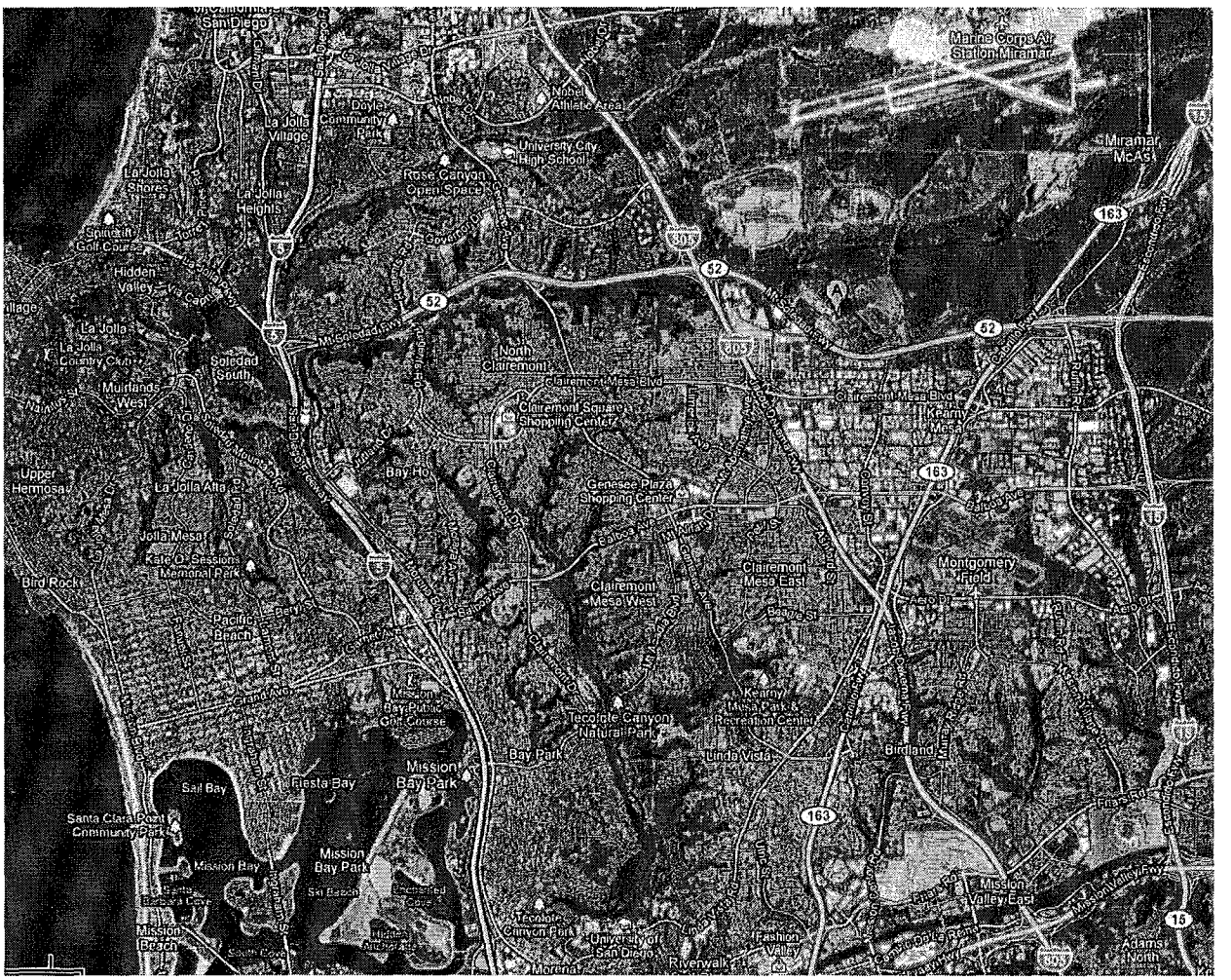
Contractor Signature and Date: _____

APPENDIX D

LOCATION MAP

APPENDIX D

LOCATION MAP



Metropolitan Biosolids Center

5240 Convoy Street

San Diego, CA 9211

ATTACHMENT F

INTENTIONALLY LEFT BLANK

City of San Diego

CITY CONTACT: Lisa Nguyen - Contract Specialist, Email: LTNguyen@sandiego.gov
Phone No. (619) 533-3435, **Fax No.** (619) 533-3633

ADDENDUM "A"

FOR

MBC - ODOR CONTROL FACILITY UPGRADES

BID NO.: K-16-6313-DBB-3
SAP NO. (WBS/IO/CC): S-00323
CLIENT DEPARTMENT: 2011
COUNCIL DISTRICT: 6
PROJECT TYPE: BO

BID DUE DATE:

2:00 PM
SEPTEMBER 17, 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 **REVISED AS STATED ON THE COVER PAGE.**

B. VOLUME 1

1. To Notice Inviting Bids, page 6, Item 5. Pre-Bid Meeting, subsection 5.1. Change Pre-Bid Meeting from **10:00AM on August 8, 2015 to 10:00AM on August 18, 2015.**

2. To Attachment D, CWSRF Funding Agency Provisions, pages 47 through 76, Item 9, Wage Rates **DELETE** in their entirety and SUBSTITUTE with pages 3 through 34 of this Addendum.

James Nagelvoort, Director
Public Works Department

Dated: *August 3, 2015*
San Diego, California

JN/RWB/Lad

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

General Decision Number: CA150001 07/31/2015 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
4	05/29/2015
5	06/19/2015
6	07/10/2015
7	07/17/2015
8	07/24/2015

9 07/31/2015

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/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 06/01/2015

	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

ELEC0569-006 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 06/01/2015

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

HOLIDAYS: New Year's Day, M.L. King Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day and day after Thanksgiving, Christmas Day

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ELEV0018-001 01/01/2015

	Rates	Fringes
ELEVATOR MECHANIC	$ 49.90	28.38

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

ENGI0012-003 07/06/2015

	Rates	Fringes
OPERATOR: Power Equipment (All Other Work)		
GROUP 1	$ 39.95	23.35
GROUP 2	$ 40.73	23.35
GROUP 3	$ 41.02	23.35
GROUP 4	$ 42.51	23.35
GROUP 5	$ 41.86	23.35
GROUP 6	$ 41.83	23.35
GROUP 8	$ 42.84	23.35
GROUP 9	$ 42.19	23.35
GROUP 10	$ 42.96	23.35
GROUP 11	$ 42.31	23.35
GROUP 12	$ 43.13	23.35
GROUP 13	$ 43.23	23.35
GROUP 14	$ 43.26	23.35
GROUP 15	$ 43.34	23.35
GROUP 16	$ 43.46	23.35
GROUP 17	$ 43.63	23.35
GROUP 18	$ 43.73	23.35
GROUP 19	$ 43.84	23.35
GROUP 20	$ 43.96	23.35
GROUP 21	$ 44.13	23.35
GROUP 22	$ 44.23	23.35
GROUP 23	$ 44.34	23.35
GROUP 24	$ 44.46	23.35
GROUP 25	$ 44.63	23.35
OPERATOR: Power Equipment (Cranes, Piledriving & Hoisting)		
GROUP 1	$ 41.30	23.35
GROUP 2	$ 42.08	23.35
GROUP 3	$ 42.37	23.35
GROUP 4	$ 42.51	23.35

GROUP 5	$ 42.73	23.35
GROUP 6	$ 42.84	23.35
GROUP 7	$ 42.96	23.35
GROUP 8	$ 43.13	23.35
GROUP 9	$ 43.30	23.35
GROUP 10	$ 44.30	23.35
GROUP 11	$ 45.30	23.35
GROUP 12	$ 46.30	23.35
GROUP 13	$ 47.30	23.35

OPERATOR: Power Equipment
(Tunnel Work)

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

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

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

SEE ZONE DEFINITIONS AFTER CLASSIFICATIONS

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

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

GROUP 2: Asphalt-rubber plant operator (nurse tank operator); Concrete mixer operator-skip type; Conveyor operator; Fireman; Forklift operator (includes loed, lull or similar

types over 5 tons; Hydrostatic pump operator; oiler crusher (asphalt or concrete plant); Petromat laydown machine; PJU side dum jack; Screening and conveyor machine operator (or similar types); Skiploader (wheel type up to 3/4 yd. without attachment); Tar pot fireman; Temporary heating plant operator; Trenching machine oiler

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

GROUP 4: Asphalt plant fireman; Backhoe operator (mini-max or similar type); Boring machine operator; Boxman or mixerman (asphalt or concrete); Chip spreading machine operator; Concrete cleaning decontamination machine operator; Concrete Pump Operator (small portable); Drilling machine operator, small auger types (Texoma super economatic or similar types - Hughes 100 or 200 or similar types - drilling depth of 30' maximum); Equipment greaser (grease truck); Guard rail post driver operator; Highline cableway signalman; Hydra-hammer-aero stomper; Micro Tunneling (above ground tunnel); Power concrete curing machine operator; Power concrete saw operator; Power-driven jumbo form setter operator; Power sweeper operator; Rock Wheel Saw/Trencher; Roller operator (compacting); Screed operator (asphalt or concrete); Trenching machine operator (up to 6 ft.); Vacuum or much truck

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

GROUP 6: Articulating material hauler; Asphalt plant engineer; Batch plant operator; Bit sharpener; Concrete joint machine operator (canal and similar type); Concrete planer operator; Dandy digger; Deck engine operator; Derrickman (oilfield type); Drilling machine operator, bucket or auger types (Calweld 100 bucket or similar types - Watson 1000 auger or similar types - Texoma 330, 500 or 600 auger or similar types - drilling depth of 45' maximum); Drilling machine operator; Hydrographic seeder machine operator (straw, pulp or seed), Jackson track maintainer, or similar type; Kalamazoo Switch tamper, or similar type; Machine tool operator; Maginnis internal full slab vibrator, Mechanical berm, curb or gutter(concrete or asphalt); Mechanical finisher operator (concrete, Clary-Johnson-Bidwell or similar); Micro tunnel system

(below ground); Pavement breaker operator (truck mounted); Road oil mixing machine operator; Roller operator (asphalt or finish), rubber-tired earth moving equipment (single engine, up to and including 25 yds. struck); Self-propelled tar pipelining machine operator; Skiploader operator (crawler and wheel type, over 3/4 yd. and up to and including 1-1/2 yds.); Slip form pump operator (power driven hydraulic lifting device for concrete forms); Tractor operator-bulldozer, tamper-scraper (single engine, up to 100 h.p. flywheel and similar types, up to and including D-5 and similar types); Tugger hoist operator (1 drum); Ultra high pressure waterjet cutting tool system operator; Vacuum blasting machine operator

GROUP 8: Asphalt or concrete spreading operator (tamping or finishing); Asphalt paving machine operator (Barber Greene or similar type); Asphalt-rubber distribution operator; Backhoe operator (up to and including 3/4 yd.), small ford, Case or similar; Cast-in-place pipe laying machine operator; Combination mixer and compressor operator (gunite work); Compactor operator (self-propelled); Concrete mixer operator (paving); Crushing plant operator; Drill Doctor; Drilling machine operator, Bucket or auger types (Calweld 150 bucket or similar types - Watson 1500, 2000 2500 auger or similar types - Texoma 700, 800 auger or similar types - drilling depth of 60' maximum); Elevating grader operator; Grade checker; Gradall operator; Grouting machine operator; Heavy-duty repairman; Heavy equipment robotics operator; Kalamazoo balliste regulator or similar type; Kolman belt loader and similar type; Le Tourneau blob compactor or similar type; Loader operator (Athey, Euclid, Sierra and similar types); Mobark Chipper or similar; Ozzie padder or similar types; P.C. slot saw; Pneumatic concrete placing machine operator (Hackley-Presswell or similar type); Pumpcrete gun operator; Rock Drill or similar types; Rotary drill operator (excluding caisson type); Rubber-tired earth-moving equipment operator (single engine, caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds. up to and including 50 cu. yds. struck); Rubber-tired earth-moving equipment operator (multiple engine up to and including 25 yds. struck); Rubber-tired scraper operator (self-loading paddle wheel type-John Deere, 1040 and similar single unit); Self-propelled curb and gutter machine operator; Shuttle buggy; Skiploader operator (crawler and wheel type over 1-1/2 yds. up to and including 6-1/2 yds.); Soil remediation plant

operator; Surface heaters and planer operator; Tractor compressor drill combination operator; Tractor operator (any type larger than D-5 - 100 flywheel h.p. and over, or similar-bulldozer, tamper, scraper and push tractor single engine); Tractor operator (boom attachments), Traveling pipe wrapping, cleaning and bendng machine operator; Trenching machine operator (over 6 ft. depth capacity, manufacturer's rating); trenching Machine with Road Miner attachment (over 6 ft depth capacity): Ultra high pressure waterjet cutting tool system mechanic; Water pull (compaction) operator

GROUP 9: Heavy Duty Repairman

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

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

GROUP 12: Auto grader operator; Automatic slip form operator; Drilling machine operator, bucket or auger types (Calweld, auger 200 CA or similar types - Watson, auger 6000 or similar types - Hughes Super Duty, auger 200 or similar types - drilling depth of 175' maximum); Hoe ram or similar with compressor; Mass excavator operator less tha 750 cu. yards; Mechanical finishing machine operator; Mobile form traveler operator; Motor patrol operator (multi-engine); Pipe mobile machine operator; Rubber-tired earth- moving equipment operator (multiple engine, Euclid, Caterpillar

and similar type, over 50 cu. yds. struck); Rubber-tired self- loading scraper operator (paddle-wheel-auger type self-loading - two (2) or more units)

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

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

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

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

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

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

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

operator, operating in tandem (scrapers, belly dumps and similar types in any combination, excluding compaction units - multiple engine, up to and including 25 yds. struck)

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

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

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

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

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

struck)

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

CRANES, PILEDRIVING AND HOISTING EQUIPMENT CLASSIFICATIONS

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

GROUP 2: Truck crane oiler

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

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

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

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

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

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

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

GROUP 10: Crane operator (over 50 tons and up to and including 100 tons mrc); Derrick barge operator (over 50 tons up to and including 100 tons mrc); Hoist operator,

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

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

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

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

TUNNEL CLASSIFICATIONS

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

GROUP 2: Power-driven jumbo form setter operator

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

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

GROUP 5: Backhoe operator (up to and including 3/4 yd.); Small Ford, Case or similar; Drill doctor; Grouting machine operator; Heading shield operator; Heavy-duty repairperson; Loader operator (Athey, Euclid, Sierra and similar types); Mucking machine operator (1/4 yd., rubber-tired, rail or track type); Pneumatic concrete placing machine operator

(Hackley-Presswell or similar type); Pneumatic heading shield (tunnel); Pumpcrete gun operator; Tractor compressor drill combination operator; Tugger hoist operator (2 drum); Tunnel locomotive operator (over 30 tons)

GROUP 6: Heavy Duty Repairman

GROUP 7: Tunnel mole boring machine operator

ENGINEERS ZONES

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

That area within the following Boundary: Begin in San Bernardino County, approximately 3 miles NE of the intersection of I-15 and the California State line at that point which is the NW corner of Section 1, T17N,m R14E, San Bernardino Meridian. Continue W in a straight line to that point which is the SW corner of the northwest quarter of Section 6, T27S, R42E, Mt. Diablo Meridian. Continue North to the intersection with the Inyo County Boundary at that point which is the NE corner of the western half of the northern quarter of Section 6, T25S, R42E, MDM. Continue W along the Inyo and San Bernardino County boundary until the intersection with Kern County, as that point which is the SE corner of Section 34, T24S, R40E, MDM. Continue W along the Inyo and Kern County boundary until the intersection with Tulare County, at that point which is the SW corner of the SE quarter of Section 32, T24S, R37E, MDM. Continue W along the Kern and Tulare County boundary, until that point which is the NW corner of T25S, R32E, MDM. Continue S following R32E lines to the NW corner of T31S, R32E, MDM. Continue W to the NW corner of T31S, R31E, MDM. Continue S to the SW corner of T32S, R31E, MDM. Continue W to SW corner of SE quarter of Section 34, T32S, R30E, MDM. Continue S to SW corner of T11N, R17W, SBM. Continue E along south boundary of T11N, SBM to SW corner of T11N, R7W, SBM. Continue S to SW corner of T9N, R7W, SBM. Continue E along south boundary of T9N, SBM to SW corner of T9N, R1E, SBM. Continue S along west boundary of R1E, SMB to Riverside County line at the SW corner of T1S, R1E, SBM. Continue E along south boundary of T1s, SBM (Riverside County Line) to SW corner of T1S, R10E, SBM. Continue S along west boundary of R10E, SBM to Imperial County line at the SW corner of T8S, R10E, SBM. Continue W along Imperial and Riverside county line to NW

corner of T9S, R9E, SBM. Continue S along the boundary between Imperial and San Diego Counties, along the west edge of R9E, SBM to the south boundary of Imperial County/California state line. Follow the California state line west to Arizona state line, then north to Nevada state line, then continuing NW back to start at the point which is the NW corner of Section 1, T17N, R14E, SBM

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

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

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

That area within the following Boundary: Begin at the intersection of the northern boundary of Mono County and the California state line at the point which is the center of Section 17, T10N, R22E, Mt. Diablo Meridian. Continue S then SE along the entire western boundary of Mono County, until it reaches Inyo County at the point which is the NE corner of the Western half of the NW quarter of Section 2, T8S, R29E, MDM. Continue SSE along the entire western boundary of Inyo County, until the intersection with Kern County at the point which is the SW corner of the SE 1/4 of Section 32, T24S, R37E, MDM. Continue E along the Inyo and Kern County boundary until the intersection with San Bernardino County at that point which is the SE corner of section 34, T24S, R40E, MDM. Continue E along the Inyo and San Bernardino County boundary until the point which is the NE corner of the Western half of the NW quarter of Section 6, T25S, R42E, MDM. Continue S to that point which is the SW corner of the NW quarter of Section 6, T27S, R42E, MDM. Continue E in a straight line to the California and Nevada state border at the point which is the NW corner of Section 1, T17N, R14E, San Bernardino Meridian. Then continue NW along the state line to the starting point, which is the center of Section 18, T10N, R22E, MDM.

REMAINING AREA NOT DEFINED ABOVE RECIEVES BASE RATE

ENGI0012-004 08/01/2014

	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 07/01/2015

	Rates	Fringes

Ironworkers:
Fence Erector.....$ 27.08 20.21
Ornamental, Reinforcing
and Structural.....$ 33.50 28.85

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 07/01/2014

Rates Fringes

LABORER (BUILDING and all other Residential Construction)
Group 1.....$ 27.57 16.19
Group 2.....$ 28.25 16.19
Group 3.....$ 28.96 16.19
Group 4.....$ 29.76 16.19
Group 5.....$ 31.69 16.19
LABORER (RESIDENTIAL CONSTRUCTION - See definition below)
(1) Laborer.....$ 25.47 14.52
(2) Cleanup, Landscape, Fencing (Chain Link & Wood).$ 24.18 14.52

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

LABORER CLASSIFICATIONS

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

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

GROUP 3: Buggymobile; Concrete cutting torch; Concrete cutting torch; Concrete pile cutter; Driller, jackhammer, 2 1/2 feet drill steel or longer; Dri Pak-it machine; High sealer (including drilling of same); Hydro seeder and

similar type; Impact wrench, mult-plate; Kettlemen, potmen and mean applying asphalt, lay-kold, creosote, line caustic and similar type materials (applying means applying, dipping, brushing or handling of such materials for pipe wrapping and waterproofing); Operators of pneumatic, gas, electric tools, vibratring machines, pavement breakers, air blasting, come-along, and similar mechanical tools not separately classified herein; Pipelayers back up man coating, grouting, making of joints, sealing, caulking, diapering and inclduing rubber gasket joints, pointing and any and all other services; Rotary Scarifier or multiple head concrete chipping scaarifier; Steel header board man and guideline setter; Tampers, Barko, Wacker and similar type; Trenching machine, handpropelled

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

GROUP 5: Blasters Powderman-All work of loading holes, placing and blasting of all pwder and explosives of whatever type, regardless of method used for such loading and placing; Driller-all power drills, excluding jackhammer, whether core, diamond, wagon, track, multiple unit, and any and all other types of mechanical drills without regard to the form of motive power.

LABO0089-002 11/01/2012

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

LABO0089-004 07/01/2015

HEAVY AND HIGHWAY CONSTRUCTION

	Rates	Fringes
Laborers:		
Group 1.....	$ 27.57	16.19
Group 2.....	$ 28.25	16.19
Group 3.....	$ 28.96	16.19
Group 4.....	$ 29.76	16.19
Group 5.....	$ 31.69	16.19

LABORER CLASSIFICATIONS

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

GROUP 2: Asphalt abatement; Buggymobile; Cement dumper (on 1 yd. or larger mixers and handling bulk cement); Concrete curer, impervious membrane and form oiler; Chute man, pouring concrete; Concrete cutting torch; Concrete pile cutter; driller/Jackhammer, with drill steel 2 1/'2 feet or longer; Dry pak-it machine; Fence erector; Pipeline wrapper, gas, oil, water, pot tender & form man; Grout man;

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

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

GROUP 4: Any worker exposed to raw sewage. Asphalt Raker, Luteman, Asphalt Dumpman, Asphalt Spreader Boxes, Concrete Core Cutter, Concrete Saw Man, Cribber, Shorer, Head Rock Slinger. Installation of subsurface instrumentation, monitoring wells or points, remediation system installer; Laborer, asphalt-rubber distributor bootman; Oversize

concrete vibrator operators, 70 pounds or over. Pipelayer, Prfefabricated Manhole Installer, Sandblast Nozzleman (Water Balsting-Porta Shot Blast), Traffic Lane Closure.

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

LABO0300-005 01/01/2014

	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

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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.

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* PAIN0036-001 07/01/2015

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

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

PAIN0036-010 10/01/2014

	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

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* PAIN0036-019 07/01/2015

	Rates	Fringes
SOFT FLOOR LAYER	$ 26.77	13.00

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 07/01/2015

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER		
GROUP 1	$ 26.47	17.32
GROUP 2	$ 28.12	17.32
GROUP 3	$ 30.75	17.27

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 07/01/2015

	Rates	Fringes

PLUMBER, PIPEFITTER,
STEAMFITTER
Camp Pendleton.....$ 50.46 20.71
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.....$ 45.96 20.71
Work ONLY on new additions
and remodeling of
commercial buildings,
bars, restaurants, and
stores not to exceed 5,000
sq. ft. of floor space.....$ 44.51 19.73
Work ONLY on strip malls,
light commercial, tenant
improvement and remodel
work.....$ 35.16 18.06

PLUM0016-011 07/01/2015

Rates Fringes

PLUMBER/PIPEFITTER
Residential.....$ 37.17 16.63

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

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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.

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END OF GENERAL DECISION

City of San Diego

CITY CONTACT: Lisa Nguyen - Contract Specialist, Email: LTNguyen@sandiego.gov
Phone No. (619) 533-3435, **Fax No.** (619) 533-3633

ADDENDUM "B"

FOR

MBC - ODOR CONTROL FACILITY UPGRADES

BID NO.: K-16-6313-DBB-3
SAP NO. (WBS/IO/CC): S-00323
CLIENT DEPARTMENT: 2011
COUNCIL DISTRICT: 6
PROJECT TYPE: BO

BID DUE DATE:

2:00 PM
SEPTEMBER 17, 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.

B. VOLUME 1

1. To Notice Inviting Bids, page 7, Item 7, Pre-Bid Site Visit, **CHANGE** Pre-Bid Site Visit from 1:00PM on August 11, 2015 to 1:00PM on August 18, 2015.

James Nagelvoort, Director
Public Works Department

Dated: *August 4, 2015*
San Diego, California

JN/RWB/Lad

City of San Diego

CITY CONTACT: LISA NGUYEN, Contract Specialist, Email: LTNguyen@sandiego.gov
Phone No. (619) 533-3435, **Fax No.** (619) 533-3633

ADDENDUM "C"

FOR

MBC - ODOR CONTROL FACILITY UPGRADES

BID NO.: K-16-6313-DBB-3
SAP NO. (WBS/IO/CC): S-00323
CLIENT DEPARTMENT: 2011
COUNCIL DISTRICT: 6
PROJECT TYPE: BO

BID DUE DATE:

2:00 PM
SEPTEMBER 22, 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 — Sep 3, 2015 — Date — Seal

2) For City Engineer — 9/8/15 — 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. Sheet's 37241-192-D states to reference Spec Section 13251 for the two FRP Odor Control Blowers (94-OCF-1 & 94-OCF-2) , but this section does not exist. The MBC Odor Control Facility Upgrades specifications do not list any requirements for the Odor Control Centrifugal Blowers other than the accessories, such as the AFD. Please provide a clarification on the specifications for these two FRP Blowers.

A1. The "ODOR CONTROL FAN SCHEDULE" table on sheet 37241-192-D is greyed (scaled back) to indicate that it is part of the record drawing information. The specification section referenced (13251) is part of the original project. The information in the table is presented for completeness and also because that sheet is being used as a background sheet for the project. New information and work of this project is presented in dark or bold black text. The work of this project only includes accessories such as inverter duty motors and AFDs for the referenced blowers.

Q2. Area 76 includes Adjustable Frequency Drive for Odor Control Fan 86-OCF-3, and 76-OCF-2. The One Line Diagram, (Sht. OC-76-E-11) shows the AFD's as being outside the MCC but I have not been able to locate them on the plans. Where is the physical location for these Adjustable Frequency Drives?

A2. 76-OCF-02-VFD and 86-OCF-03-VFD are shown on drawing OC-76-E-116A. However, due to a plotting error, that drawing in the bid set was incomplete. That sheet should be replaced with the attached revised drawing OC-76-E-116A (Addendum C).

Q3. Spec section 11250 is missing (ref. drawing OC-86-M-501).

A3. The parts of sheet OC-86-M-501 greyed out (scaled back) indicate that those were part of the record drawing information. The specification section referenced (11250) is part of the original project. The information in the table is presented for completeness and also because that sheet is being updated with the current project. New information and work of this project is presented in dark or bold black text. The work of this project only includes fan 86-OCF-3 (refer to odor control fan schedule).

Q4. Sht. 60-E-401A shows a Conduit and a Terminal Box serving Equipment # 60MD-1602, (coordinates B1). Said Conduit and Terminal Box call out Key Note 10 which refers us to Sht. 60-E-514. This page shows the existing conduits serving the valves on the Odor Control Train. Said conduit are attached to Key

Note 2 directing us to provide a terminal box and conduits as required. The other conduits and terminal boxes shown at Equipment # 60MD-1602 going to HS and PP are not referenced back to Key Note 10. We assume these conduits and terminal boxes do not require modifications and we will not include this in our proposal unless directed otherwise.

A4. KN#1 through KN#9 on Drawing OC-60-E-401A provide general information and guidelines for work associated with all the valves on this drawing. Typical conduits/circuits for 60MD-1603 have been shown on this drawing. Conduit/circuit configuration for other valves will be basically similar. Conduits/circuits that have their information included on the plan drawings are not included on the Cable and Conduit Schedule. Therefore, conduits/circuits associated with HS and PP are not referenced to Drawing OC-60-E-514 per KN#10. Per KN#5, each conduit (for each valve shown on this drawing) shall be intercepted and rerouted as required to avoid conflict with the proposed platforms and ladders as shown on the Structural drawings. It should be assumed that all conduits associated with these valves would require modification and should be included in the scope of work.

C. ADDENDUM

1. To Addendum A, pages 3 through 34, Item 9, Wage Rates, **DELETE** in its entirety and **SUBSTITUTE** with pages 5 through 35 of this Addendum.

D. PLANS

1. To Drawing number 37241-001-D (OC-CS-1), **DELETE** in its entirety and **REPLACE** with page 36 of this Addendum.

2. To Drawing number 37241-116-D (OC-76-E-116A), **DELETE** in its entirety and **REPLACE** with page 37 of this Addendum.

James Nagelvoort, Director
Public Works Department

Dated: *September 9, 2015*
San Diego, California

JN/RWB/egz

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

General Decision Number: CA150001 09/04/2015 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
4	05/29/2015
5	06/19/2015
6	07/10/2015
7	07/17/2015
8	07/24/2015
9	07/31/2015
10	08/07/2015
11	08/14/2015
12	09/04/2015

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/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 06/01/2015

	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

ELEC0569-006 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.

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* ELEC0569-008 06/01/2015

	Rates	Fringes
ELECTRICIAN (Residential, 1-3 Stories)	$ 22.37	3.98

ELEC1245-001 06/01/2015

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

HOLIDAYS: New Year's Day, M.L. King Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day and day after Thanksgiving, Christmas Day

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ELEV0018-001 01/01/2015

	Rates	Fringes
ELEVATOR MECHANIC	$ 49.90	28.38

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

Labor Day, Veterans Day, Thanksgiving Day, Friday after Thanksgiving, and Christmas Day.

ENGI0012-003 07/06/2015

	Rates	Fringes
OPERATOR: Power Equipment (All Other Work)		
GROUP 1	$ 39.95	23.35
GROUP 2	$ 40.73	23.35
GROUP 3	$ 41.02	23.35
GROUP 4	$ 42.51	23.35
GROUP 5	$ 41.86	23.35
GROUP 6	$ 41.83	23.35
GROUP 8	$ 42.84	23.35
GROUP 9	$ 42.19	23.35
GROUP 10	$ 42.96	23.35
GROUP 11	$ 42.31	23.35
GROUP 12	$ 43.13	23.35
GROUP 13	$ 43.23	23.35
GROUP 14	$ 43.26	23.35
GROUP 15	$ 43.34	23.35
GROUP 16	$ 43.46	23.35
GROUP 17	$ 43.63	23.35
GROUP 18	$ 43.73	23.35
GROUP 19	$ 43.84	23.35
GROUP 20	$ 43.96	23.35
GROUP 21	$ 44.13	23.35
GROUP 22	$ 44.23	23.35
GROUP 23	$ 44.34	23.35
GROUP 24	$ 44.46	23.35
GROUP 25	$ 44.63	23.35
OPERATOR: Power Equipment (Cranes, Piledriving & Hoisting)		
GROUP 1	$ 41.30	23.35
GROUP 2	$ 42.08	23.35
GROUP 3	$ 42.37	23.35
GROUP 4	$ 42.51	23.35
GROUP 5	$ 42.73	23.35
GROUP 6	$ 42.84	23.35
GROUP 7	$ 42.96	23.35
GROUP 8	$ 43.13	23.35
GROUP 9	$ 43.30	23.35
GROUP 10	$ 44.30	23.35

GROUP 11	$ 45.30	23.35
GROUP 12	$ 46.30	23.35
GROUP 13	$ 47.30	23.35

OPERATOR: Power Equipment
(Tunnel Work)

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

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

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

SEE ZONE DEFINITIONS AFTER CLASSIFICATIONS

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

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

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

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

GROUP 4: Asphalt plant fireman; Backhoe operator (mini-max or similar type); Boring machine operator; Boxman or mixerman (asphalt or concrete); Chip spreading machine operator; Concrete cleaning decontamination machine operator; Concrete Pump Operator (small portable); Drilling machine operator, small auger types (Texoma super economatic or similar types - Hughes 100 or 200 or similar types - drilling depth of 30' maximum); Equipment greaser (grease truck); Guard rail post driver operator; Highline cableway signalman; Hydra-hammer-aero stomper; Micro Tunneling (above ground tunnel); Power concrete curing machine operator; Power concrete saw operator; Power-driven jumbo form setter operator; Power sweeper operator; Rock Wheel Saw/Trencher; Roller operator (compacting); Screed operator (asphalt or concrete); Trenching machine operator (up to 6 ft.); Vacuum or much truck

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

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

Tractor operator-bulldozer, tamper-scraper (single engine, up to 100 h.p. flywheel and similar types, up to and including D-5 and similar types); Tugger hoist operator (1 drum); Ultra high pressure waterjet cutting tool system operator; Vacuum blasting machine operator

GROUP 8: Asphalt or concrete spreading operator (tamping or finishing); Asphalt paving machine operator (Barber Greene or similar type); Asphalt-rubber distribution operator; Backhoe operator (up to and including 3/4 yd.), small ford, Case or similar; Cast-in-place pipe laying machine operator; Combination mixer and compressor operator (gunite work); Compactor operator (self-propelled); Concrete mixer operator (paving); Crushing plant operator; Drill Doctor; Drilling machine operator, Bucket or auger types (Calweld 150 bucket or similar types - Watson 1500, 2000 2500 auger or similar types - Texoma 700, 800 auger or similar types - drilling depth of 60' maximum); Elevating grader operator; Grade checker; Gradall operator; Grouting machine operator; Heavy-duty repairman; Heavy equipment robotics operator; Kalamazoo balliste regulator or similar type; Kolman belt loader and similar type; Le Tourneau blob compactor or similar type; Loader operator (Athey, Euclid, Sierra and similar types); Mobark Chipper or similar; Ozzie padder or similar types; P.C. slot saw; Pneumatic concrete placing machine operator (Hackley-Presswell or similar type); Pumpcrete gun operator; Rock Drill or similar types; Rotary drill operator (excluding caisson type); Rubber-tired earth-moving equipment operator (single engine, caterpillar, Euclid, Athey Wagon and similar types with any and all attachments over 25 yds. up to and including 50 cu. yds. struck); Rubber-tired earth-moving equipment operator (multiple engine up to and including 25 yds. struck); Rubber-tired scraper operator (self-loading paddle wheel type-John Deere, 1040 and similar single unit); Self-propelled curb and gutter machine operator; Shuttle buggy; Skiploader operator (crawler and wheel type over 1-1/2 yds. up to and including 6-1/2 yds.); Soil remediation plant operator; Surface heaters and planer operator; Tractor compressor drill combination operator; Tractor operator (any type larger than D-5 - 100 flywheel h.p. and over, or similar-bulldozer, tamper, scraper and push tractor single engine); Tractor operator (boom attachments), Traveling pipe wrapping, cleaning and bendng machine operator; Trenching machine operator (over 6 ft. depth capacity, manufacturer's rating); trenching Machine with Road Miner attachment (over 6 ft depth capacity): Ultra high pressure

waterjet cutting tool system mechanic; Water pull (compaction) operator

GROUP 9: Heavy Duty Repairman

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

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

GROUP 12: Auto grader operator; Automatic slip form operator; Drilling machine operator, bucket or auger types (Calweld, auger 200 CA or similar types - Watson, auger 6000 or similar types - Hughes Super Duty, auger 200 or similar types - drilling depth of 175' maximum); Hoe ram or similar with compressor; Mass excavator operator less tha 750 cu. yards; Mechanical finishing machine operator; Mobile form traveler operator; Motor patrol operator (multi-engine); Pipe mobile machine operator; Rubber-tired earth- moving equipment operator (multiple engine, Euclid, Caterpillar and similar type, over 50 cu. yds. struck); Rubber-tired self- loading scraper operator (paddle-wheel-auger type self-loading - two (2) or more units)

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

GROUP 14: Canal liner operator; Canal trimmer operator; Remote- control earth-moving equipment operator (operating

a second piece of equipment: $1.00 per hour additional); Wheel excavator operator (over 750 cu. yds.)

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

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

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

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

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

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

Euclid, Caterpillar and similar, over 25 yds. and up to 50 yds. struck)

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

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

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

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

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

CRANES, PILEDRIVING AND HOISTING EQUIPMENT CLASSIFICATIONS

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

GROUP 2: Truck crane oiler

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

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

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

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

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

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

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

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

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

GROUP 12: Crane operator (over 200 tons up to and including 300 tons mrc); Derrick barge operator (over 200 tons up to

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

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

TUNNEL CLASSIFICATIONS

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

GROUP 2: Power-driven jumbo form setter operator

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

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

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

GROUP 6: Heavy Duty Repairman

GROUP 7: Tunnel mole boring machine operator

ENGINEERS ZONES

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

That area within the following Boundary: Begin in San Bernardino County, approximately 3 miles NE of the intersection of I-15 and the California State line at that point which is the NW corner of Section 1, T17N,m R14E, San Bernardino Meridian. Continue W in a straight line to that point which is the SW corner of the northwest quarter of Section 6, T27S, R42E, Mt. Diablo Meridian. Continue North to the intersection with the Inyo County Boundary at that point which is the NE corner of the western half of the northern quarter of Section 6, T25S, R42E, MDM. Continue W along the Inyo and San Bernardino County boundary until the intersection with Kern County, as that point which is the SE corner of Section 34, T24S, R40E, MDM. Continue W along the Inyo and Kern County boundary until the intersection with Tulare County, at that point which is the SW corner of the SE quarter of Section 32, T24S, R37E, MDM. Continue W along the Kern and Tulare County boundary, until that point which is the NW corner of T25S, R32E, MDM. Continue S following R32E lines to the NW corner of T31S, R32E, MDM. Continue W to the NW corner of T31S, R31E, MDM. Continue S to the SW corner of T32S, R31E, MDM. Continue W to SW corner of SE quarter of Section 34, T32S, R30E, MDM. Continue S to SW corner of T11N, R17W, SBM. Continue E along south boundary of T11N, SBM to SW corner of T11N, R7W, SBM. Continue S to SW corner of T9N, R7W, SBM. Continue E along south boundary of T9N, SBM to SW corner of T9N, R1E, SBM. Continue S along west boundary of R1E, SMB to Riverside County line at the SW corner of T1S, R1E, SBM. Continue E along south boundary of T1s, SBM (Riverside County Line) to SW corner of T1S, R10E, SBM. Continue S along west boundary of R10E, SBM to Imperial County line at the SW corner of T8S, R10E, SBM. Continue W along Imperial and Riverside county line to NW corner of T9S, R9E, SBM. Continue S along the boundary between Imperial and San Diego Counties, along the west edge of R9E, SBM to the south boundary of Imperial County/California state line. Follow the California state line west to Arizona state line, then north to Nevada state line, then continuing NW back to start at the point which is the NW corner of Section 1, T17N, R14E, SBM

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

That area within the following Boundary: Begin approximately 5 miles north of the community of Cholame, on the Monterey County and San Luis Obispo County boundary at the NW corner of T25S, R16E, Mt. Diablo Meridian. Continue south along the west side of R16E to the SW corner of T30S, R16E, MDM. Continue E to SW

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

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

That area within the following Boundary: Begin at the intersection of the northern boundary of Mono County and the California state line at the point which is the center of Section 17, T10N, R22E, Mt. Diablo Meridian. Continue S then SE along the entire western boundary of Mono County, until it reaches Inyo County at the point which is the NE corner of the Western half of the NW quarter of Section 2, T8S, R29E, MDM. Continue SSE along the entire western boundary of Inyo County, until the intersection with Kern County at the point which is the SW corner of the SE 1/4 of Section 32, T24S, R37E, MDM. Continue E along the Inyo and Kern County boundary until the intersection with San Bernardino County at that point which is the SE corner of section 34, T24S, R40E, MDM. Continue E along the Inyo and San Bernardino County boundary until the point which is the NE corner of the Western half of the NW quarter of Section 6, T25S, R42E, MDM. Continue S to that point which is

the SW corner of the NW quarter of Section 6, T27S, R42E, MDM. Continue E in a straight line to the California and Nevada state border at the point which is the NW corner of Section 1, T17N, R14E, San Bernardino Meridian. Then continue NW along the state line to the starting point, which is the center of Section 18, T10N, R22E, MDM.

REMAINING AREA NOT DEFINED ABOVE RECIEVES BASE RATE

ENGI0012-004 08/01/2015

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

IRON0377-002 07/01/2015

	Rates	Fringes
Ironworkers:		
Fence Erector	$ 27.08	20.21
Ornamental, Reinforcing and Structural	$ 33.50	28.85

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 07/01/2014

	Rates	Fringes
LABORER (BUILDING and all other Residential Construction)		
Group 1	$ 27.57	16.19
Group 2	$ 28.25	16.19
Group 3	$ 28.96	16.19
Group 4	$ 29.76	16.19
Group 5	$ 31.69	16.19
LABORER (RESIDENTIAL CONSTRUCTION - See definition below)		
(1) Laborer	$ 25.47	14.52
(2) Cleanup, Landscape, Fencing (Chain Link & Wood)	$ 24.18	14.52

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

LABORER CLASSIFICATIONS

GROUP 1: Cleaning and handling of panel forms; Concrete Screeding for Rought Strike-off; Concrete, water curing; Demolition laborer; Flagman; Gas, oil and/or water pipeline laborer; General Laborer; General clean-up laborer; Landscape laborer; Jetting laborer; Temporary water and

air lines laborer; Material hoseman (walls, slabs, floors and decks); Plugging, filling of Shee-bolt holes; Dry packing of concrete; Railroad maintenance, Repair Trackman and road beds, Streetcar and railroad construction trac laborers; Slip form raisers; Slurry seal crews (mixer operator, applicator operator, squeegee man, Shuttle man, top man), filling of cracks by any method on any surface; Tarman and mortar man; Tool crib or tool house laborer; Window cleaner; Wire Mesh puling-all concrete pouring operations

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

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

GROUP 4: Asphalt raker, luterman, ironer, apshalt dumpman and asphalt spreader boxes (all types); Concrete core cutter

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

GROUP 5: Blasters Powderman-All work of loading holes, placing and blasting of all pwder and explosives of whatever type, regardless of method used for such loading and placing; Driller-all power drills, excluding jackhammer, whether core, diamond, wagon, track, multiple unit, and any and all other types of mechanical drills without regard to the form of motive power.

LABO0089-002 11/01/2012

	Rates	Fringes
LABORER (MASON TENDER)	$ 27.98	13.39

LABO0089-004 07/01/2015

HEAVY AND HIGHWAY CONSTRUCTION

	Rates	Fringes
Laborers:		
Group 1	$ 27.57	16.19
Group 2	$ 28.25	16.19
Group 3	$ 28.96	16.19
Group 4	$ 29.76	16.19
Group 5	$ 31.69	16.19

LABORER CLASSIFICATIONS

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

GROUP 2: Asphalt abatement; Buggymobile; Cement dumper (on 1 yd. or larger mixers and handling bulk cement); Concrete curer, impervious membrane and form oiler; Chute man, pouring concrete; Concrete cutting torch; Concrete pile cutter; driller/Jackhammer, with drill steel 2 1/'2 feet or longer; Dry pak-it machine; Fence erector; Pipeline wrapper, gas, oil, water, pot tender & form man; Grout man; Installation of all asphalt overlay fabric and materials used for reinforcing asphalt; Irrigation laborer; Kettleman-Potman hot mop, includes applying asphalt, lay-klold, creosote, lime caustic and similar tyhpes of materials (dipping, brushing, handling) and waterproofing; Membrane vapor barrier installer; Pipelayer backup man (coating, grouting, making of joints, sealing caulkiing, diapering including rubber basket joints, pointing); Rotary scarifier, multiple head concrete chipper; Rock slinger; Roto scraper & tiller; Sandblaster pot tender; Septic tank digger/installer; Tamper/wacker operator; Tank scaler & cleaner; Tar man & mortar man; Tree climber/faller, chainb saw operator, Pittsburgh chipper & similar type brush shredders.

GROUP 3: Asphalt, installation of all frabrics; Buggy Mobile Man, Bushing hammer; Compactor (all types), Concrete Curer - Impervious membrane, Form Oiler, Concrete Cutting Torch,

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

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

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

LABO0300-005 01/01/2014

	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.

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* LABO1184-001 08/01/2015

	Rates	Fringes
Laborers: (HORIZONTAL DIRECTIONAL DRILLING)		
(1) Drilling Crew Laborer...	$ 32.60	12.16
(2) Vehicle Operator/Hauler.	$ 32.77	12.16
(3) Horizontal Directional Drill Operator.....	$ 34.62	12.16
(4) Electronic Tracking Locator.....	$ 36.62	12.16
Laborers: (STRIPING/SLURRY SEAL)		
GROUP 1.....	$ 33.76	15.04
GROUP 2.....	$ 35.06	15.04
GROUP 3.....	$ 37.07	15.04
GROUP 4.....	$ 38.81	15.04

LABORERS - STRIPING CLASSIFICATIONS

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

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

GROUP 3: Traffic delineating device applicator: Layout and application of pavement markers, delineating signs, rumble and traffic bars, adhesives, guide markers, other traffic delineating devices including traffic control. This category includes all traffic related surface preparation (sandblasting, waterblasting, grinding) as part of the application process. Traffic protective delineating system installer: removes, relocates, installs, permanently affixed roadside and parking delineation barricades, fencing, cable anchor, guard rail, reference signs, monument markers; operation of all related machinery and equipment; power broom sweeper

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

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LABO1414-003 08/05/2015

	Rates	Fringes
LABORER		
PLASTER CLEAN-UP LABORER	$ 30.16	17.11
PLASTER TENDER	$ 32.71	17.11

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

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

PAIN0036-001 07/01/2015

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

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

PAIN0036-010 10/01/2014

	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 07/01/2015

	Rates	Fringes
SOFT FLOOR LAYER	$ 26.77	13.00

PLAS0200-005 08/06/2015

	Rates	Fringes
PLASTERER	$ 38.44	13.77

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

PLAS0500-001 07/01/2015

	Rates	Fringes

CEMENT MASON/CONCRETE FINISHER

GROUP 1	$ 26.47	17.32
GROUP 2	$ 28.12	17.32
GROUP 3	$ 30.75	17.27

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 07/01/2015

	Rates	Fringes
PLUMBER, PIPEFITTER, STEAMFITTER		
Camp Pendleton	$ 50.46	20.71
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	$ 45.96	20.71
Work ONLY on new additions and remodeling of commercial buildings, bars, restaurants, and stores not to exceed 5,000 sq. ft. of floor space	$ 44.51	19.73
Work ONLY on strip malls, light commercial, tenant improvement and remodel work	$ 35.16	18.06

PLUM0016-011 07/01/2015

	Rates	Fringes
PLUMBER/PIPEFITTER		
Residential	$ 37.17	16.63

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

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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.

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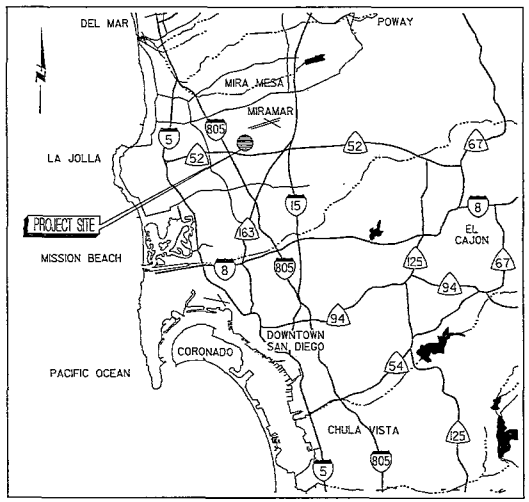
END OF GENERAL DECISION

PUBLIC WORKS DEPARTMENT

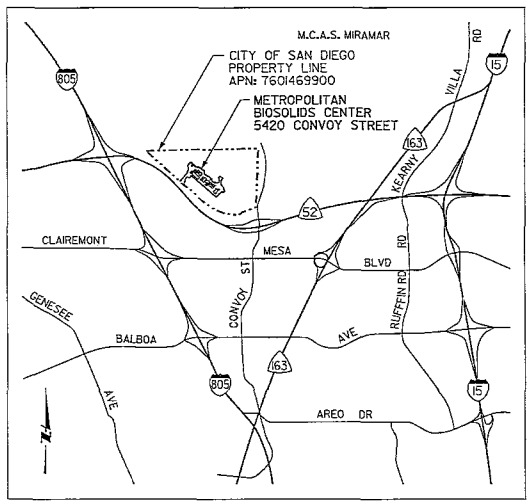
City of San Diego



VICINITY MAP

METROPOLITAN BIOSOLIDS CENTER ODOR CONTROL FACILITIES UPGRADES

MAY 2015



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 REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

VICTOR Y. OCCIANO, JR. — DATE 05/08/2015

OC-CS-1

METROPOLITAN BIOSOLIDS CENTER
ODOR CONTROL FACILITIES UPGRADES

COVER SHEET

CONSTRUCTION CHANGE / ADDENDUM			
CHANGE	DATE	AFFECTED OR ADDED SHEET NUMBERS	APPROVAL NO.
C	9/8/15	116	

WARNING
0 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT

CONSTRUCTION SITE STORM WATER PRIORITY (INSPECTION FREQUENCY): HIGH ___ MEDIUM ___ LOW X

SPEC. NO. K-16-6313-DBB-3

CONSULTANT

Brown AND Caldwell
9665 Chesapeake Drive, Suite 201
San Diego, CA 92123
Tel: 858-514-8822
Fax: 858-514-8833

CITY OF SAN DIEGO, CALIFORNIA
PUBLIC WORKS DEPARTMENT
SHEET 001 OF 238 SHEETS

APPROVED FOR CITY ENGINEER: IRAJ ASGHARZADEH (PRINT NAME) — DATE 05/08/2015 — RCE 036089

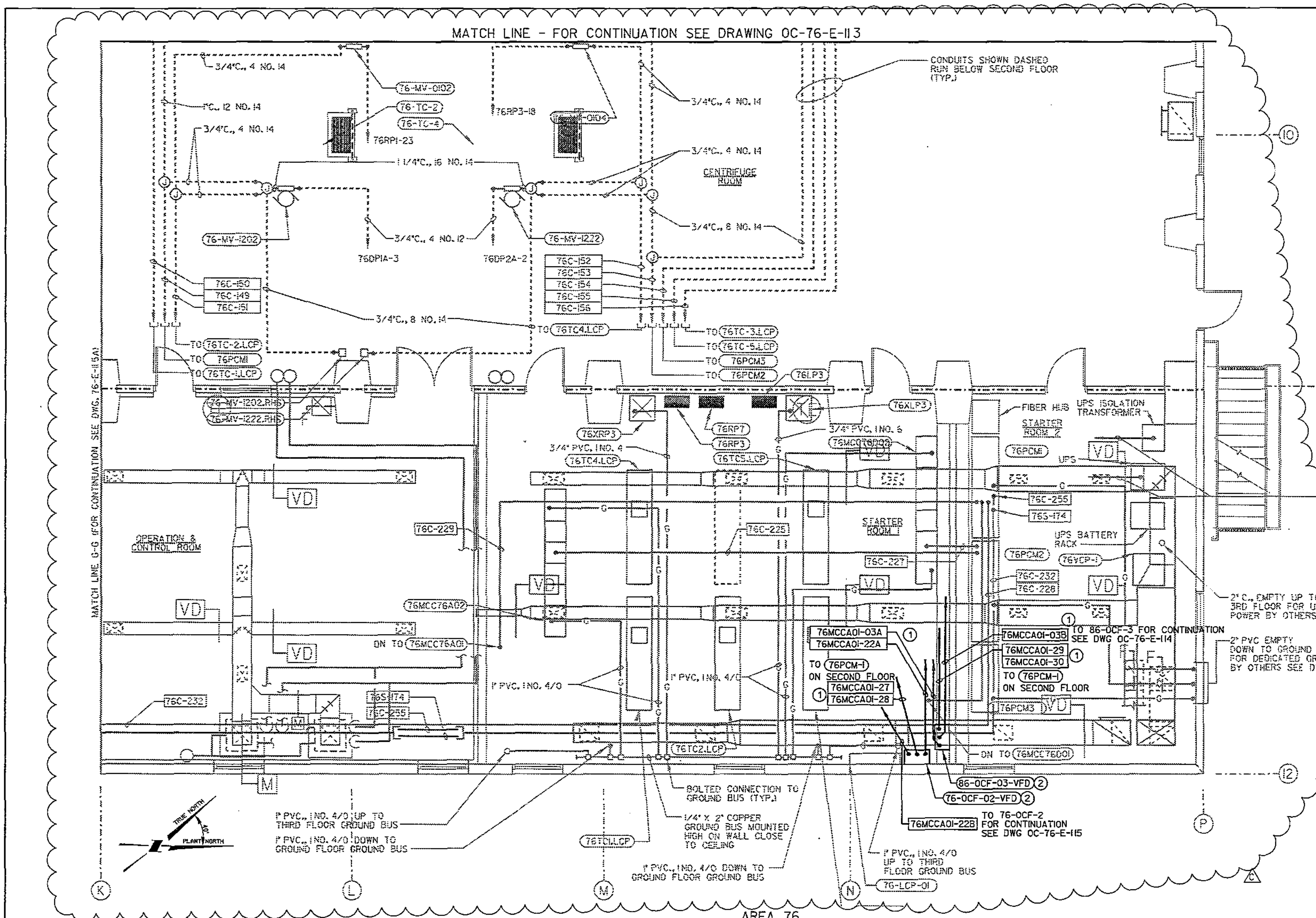
DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	BC			
ADDENDUM C	BC		9/8/15	

CONTRACTOR INSPECTOR — DATE STARTED — DATE COMPLETED — 05/08/2015

WATER WBS	N/A
SEWER WBS	S00323
DESIGNED BY	IDALMIRO MANUEL DA ROSA, PROJECT MANAGER
SPECIFIED BY	JORGE I. ARRIVA, PROJECT ENGINEER
	246-1719 CCDIST COORDINATE
	1886444-6280407 CCSTAS COORDINATES
	37241-001-D

P:\Projects\San Diego, City of (CA)\142695 – MBC Odor Control Upgrade\CADD\2-SHEETS\G-GENERAL\37241-OC-CS1 BID SET.dgn
04-SEP-2015 17:02 therencia September 9, 2015 MBC - Odor Control Facility Upgrades

ADDENDUM C



AREA 76
SECOND FLOOR POWER ENLARGED PLAN 6A
SCALE: 1/4" = 1'-0"

NOTES:

1. FOR LEGEND AND GENERAL NOTES SEE DRAWINGS R-71, R-72 AND R-73.
2. ALL CONDUITS PASSING THROUGH OR CROSSING CENTRIFUGE ISOLATION SLABS SHALL BE PROVIDED WITH EXPANSION / DEFLECTION FITTINGS.

GENERAL NOTES:

G1. SOME INFORMATION, INCLUDING EQUIPMENT AND INSTRUMENT IDENTIFICATION NUMBERS AND NOTES, MAY HAVE BEEN OMITTED FROM THIS SHEET FOR CLARITY. PLEASE REFER TO THE RESPECTIVE AS-BUILT DRAWING FOR MORE INFORMATION.

G2. ALL REFERENCED DRAWINGS ARE EXISTING UNLESS INDICATED WITH THE PREFIX "OC".

G3. ALL NEW WORK IS DENOTED IN BOLD.

G4. REFER TO DIV 11 AND 16 SPECIFICATIONS FOR ALL WORK REQUIREMENTS.

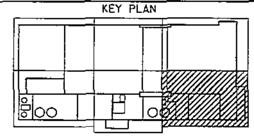
G5. REFER TO DWGS OC-76-E-401 AND OC-76-E-402 FOR HAZARDOUS AREA CLASSIFICATIONS.

G6. EXISTING INFORMATION AND MODIFICATIONS SHOWN ON THESE DRAWINGS ARE BASED ON RECORD DRAWINGS PROVIDED BY THE CITY. IN SOME CASES, THIS INFORMATION MAY VARY FROM ACTUAL FIELD CONDITIONS. CONTRACTOR SHALL FIELD-VERIFY ALL INFORMATION PERTAINING TO THIS WORK AND MAKE ADJUSTMENTS AS NECESSARY TO MEET THE INTENT OF THE DESIGN.

KEY NOTES:

1. ROUTE NEW WIRING IN THE NEW CONDUIT AS SHOWN, IN ACCORDANCE WITH NEC.
2. GROUND NEW VFD PANELS USING #4 BCW ROUTED IN 1" DIA CONDUIT TO EXISTING GROUND BUS.

KEY PLAN



SEE RECORD DRAWING 27329-0481-D FOR ADDITIONAL INFORMATION

OC-76-E-116A

METROPOLITAN BIOSOLIDS CENTER
ODOR CONTROL FACILITIES UPGRADES
AREA 76
ELECTRICAL
SECOND FLOOR POWER ENLARGED PLAN 6A

CITY OF SAN DIEGO, CALIFORNIA
PUBLIC WORKS DEPARTMENT
SHEET 86 OF 238 SHEETS

WATER WBS N/A
SEWER WBS S00323

FOR CITY ENGINEER: IRAJ ASGHARZADEH — DATE 05/08/2015 — C36089

DALMIRO MANUEL DA ROSA — PROJECT MANAGER
JORGE LARRIVA — PROJECT ENGINEER

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	BC			
ADDENDUM C	BC		9/8/15	

246-1719 — CCS27 COORDINATE
1886444-6280407 — CCS83 COORDINATE
37241-116-D

CONTRACTOR — DATE STARTED
INSPECTOR — DATE COMPLETED

CONSULTANT

Brown AND Caldwell

9665 Chesapeake Drive, Suite 201
San Diego, CA 92123
Tel: 858-514-8822
Fax: 858-514-8833

SHEET RE-PRINTED WITH PROPOSED AND EXISTING BACKGROUNDS VISIBLE. SHEET DISCIPLINE REVISED TO "ELECTRICAL"

ADDENDUM C

(2)

DIR ✓
License ✓
MC

City of San Diego

CONTRACTOR'S NAME: _____
ADDRESS: _____
TELEPHONE NO.: _____ **FAX NO.:** _____
CITY CONTACT: Lisa Nguyen - Contract Specialist, Email: LTNguyen@sandiego.gov
Phone No. (619) 533-3435, Fax No. (619) 533-3633
I.DaRosa /RWBustamante/LaD

CONTRACT DOCUMENTS

FOR

MBC - ODOR CONTROL FACILITY UPGRADES

VOLUME 2 OF 2

BID NO.: K-16-6313-DBB-3
SAP NO. (WBS/IO/CC): S-00323
CLIENT DEPARTMENT: 2011
COUNCIL DISTRICT: 6
PROJECT TYPE: BO

THIS CONTRACT IS SUBJECT TO THE FOLLOWING:

- FEDERAL EQUAL OPPORTUNITY CONTRACTING REQUIREMENTS.
- 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.

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 _____

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 _____

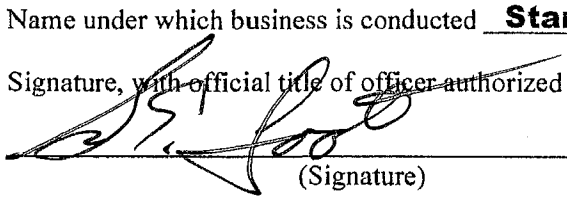
(6) Telephone No. _____ Facsimile No. _____

(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, Suite 102**

(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 12-31-2015

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): [redacted]

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 September 22, 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.

Seal

GSN1 J. ANTHONY COMM. # 2066524 NOTARY PUBLIC·CALIFORNIA SAN DIEGO COUNTY My Comm. Exp. May 2, 2018 GSN1

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 Proposal MBC Odor # of Pages:_____

Notes

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 - Odor Control Facility Upgrades, Bid Number K-16-6313-DBB-3, San Diego, California

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 22nd day of September, 20 15

Stanek Constructors, Inc. (SEAL)
(Principal)

By: _____ (Signature)
George Stanek, Vice President

Berkley Insurance Company (SEAL)
(Surety)

By: _____ (Signature)
Kristen L. McCormick, Attorney-In-Fact
CA License #0E46980

(SEAL AND NOTARIAL ACKNOWLEDGEMENT OF SURETY)

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 September 22, 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.

Seal

GSN1 J. ANTHONY COMM. # 2066524 NOTARY PUBLIC • CALIFORNIA SAN DIEGO COUNTY My Comm. Exp. May 2, 2018 GSN1

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 MBC Odor # of Pages: _____

Notes

STATE OF COLORADO
COUNTY OF DENVER } SS

On September 22, 2015 before me Michele K. Delimont

PERSONALLY APPEARED Kristen L. McCormick

personally known to me (or 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.

WITNESS my hand and official seal.

Signature Michele K Delimont
Michele K. Delimont

My Commission Expires: February 25, 2018

MICHELE K DELIMONT
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20144009025
MY COMMISSION EXPIRES FEBRUARY 25, 2018

This area for Official Notarial Seal

OPTIONAL

Though the data below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent reattachment of this form.

CAPACITY CLAIMED BY SIGNER

- ☐ INDIVIDUAL
- ☐ CORPORATE OFFICER

TITLE(S)

- ☐ PARTNER(S)
- ☐ LIMITED
- ☐ GENERAL
- ☒ ATTORNEY-IN- FACT
- ☐ TRUSTEE(S)
- ☐ GUARDIAN/CONSERVATOR
- ☐ OTHER

SIGNER IS REPRESENTING:
NAME OF PERSON(S) OR ENTITY(IES)
Berkley Insurance Company

DESCRIPTION OF ATTACHED DOCUMENT

TITLE OF TYPE OF DOCUMENT

NUMBER OF PAGES

DATE OF DOCUMENT

SIGNER(S) OTHER THAN NAMED ABOVE

ALL PURPOSE ACKNOWLEDGEMENT

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 _____ By _____
Ira S. Lederman — Senior Vice President & Secretary
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

_____
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 22ND day of SEPTEMBER, 2015.

(Seal)

_____
Andrew M. Tuma

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 **San Diego**)

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: _____

George E. Foote

Title: **Vice President**

Subscribed and sworn to before me this _____ day of _____, 20___

_____

Notary Public

(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 September 22, 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.

Seal

GSN1 J. ANTHONY COMM. # 2066524 NOTARY PUBLIC•CALIFORNIA SAN DIEGO COUNTY My Comm. Exp. May 2, 2018 GSN1

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 MBC Odor # of Pages: _____

Notes

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:

Date of Claim	Location	Description of Claim	Litigation (Y/N)	Status	Resolution/Remedial Action Taken

Contractor Name: **Stanek Constructors, Inc.**

Certified By **George E. Foote** Title **Vice President**

Name

Signature

Date **9-22-2015**

USE ADDITIONAL FORMS AS NECESSARY

EQUAL BENEFITS ORDINANCE CERTIFICATION OF COMPLIANCE

For additional information, contact:
CITY OF SAN DIEGO
EQUAL BENEFITS PROGRAM
202 C Street, MS 9A, San Diego, CA 92101
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 Odor Control Facility Upgrades**	Start Date:
Contract Number (if no number, state location): **K-16-6313-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		**9-22-15**
Name/Title of Signatory	Signature	Date

FOR OFFICIAL CITY USE ONLY

Receipt Date: EBO Analyst: ☐ Approved ☐ Not Approved – Reason:

(Rev 02/15/2011)

LOBBY PROHIBITION, CERTIFICATION AND DISCLOSURE

In acknowledgment that funds received under this agreement have been provided pursuant to a Federal grant, recipient hereby recognizes the prohibitions against lobbying the Federal government with any of these funds. Recipient agrees that it shall comply with the laws set forth at 31 U.S.C. § 1352 (1989) and 24 C.F.R. part 87, to wit:

A. Conditions on use of funds

Recipient shall not expend any funds received pursuant to this agreement to pay any person to influence an officer or employee of Federal agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with any of the following Covered Federal actions:

(1) The awarding of any federal contract
(2) The making of any Federal grant
(3) The making of any Federal Loan
(4) The entering into of any cooperative agreement
(5) The extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

For purposes of defining the terms of this part of the agreement, the definitions set forth in 24 C.F.R. § 87.105 are hereby adopted and incorporated herein by reference.

B. Certification and Disclosure

Each recipient at every tier under this agreement shall file a certification regarding lobbying, and a Disclosure Form-LLL, where required by 24 C.F.R. § 87.110. The certification form and Disclosure Form-LLL are attached to this agreement.

C. Certifications must be filed:

(1) By any person upon each submission that initiates agency consideration for an award of a Federal contract, grant, or cooperative agreement exceeding $100,000, or a Federal loan or loan guarantee exceeding $150,000.
(2) Upon receipt by any person of a Federal contract, grant, or cooperative agreement exceeding $100,000, or upon receipt of a Federal loan or loan guarantee exceeding $150,000.
(3) By any person who requests or receives from a person referred to in subsections 1 and 2 of this paragraph:
   a. A subcontract exceeding $100,000 at any tier under a Federal contract;
   b. A subgrant, contract or subcontract exceeding $100,000 at any tier under a Federal grant;
   c. A contract or subcontract exceeding $100,000 at any tier under a Federal loan exceeding $150,000;
   d. A contract or subcontract exceeding $100,000 at any tier under a Federal cooperative agreement.

D. Disclosure Forms-LLL must be filed in every instance when a person applies for, requests, or receives Federal appropriations exceeding $100,000 pursuant to a contract, subcontract, grant, subgrant, loan, or cooperative agreement when such person has paid or expects to pay any sum, in cash or in kind, to influence or attempt to influence any officer or employee of an agency, a member of Congress, an officer or employee of Congress, or an employee of a member of Congress. Further, Disclosure Form-LLL must be filed by recipients at any tier at the end of each calendar quarter in which there occurs any event that requires disclosure or materially affects information submitted in prior disclosures. Such events include:

(1) 1. An increase of $25,000 in the amount paid or expected to be paid for influencing or attempting to influence a covered Federal action;
(2) 2. A change in the person(s) influencing or attempting to influence a covered action;
(3) 3. A change in the officer(s), employee(s), or member(s) contacted to influence a covered action.

All disclosure Forms-LLL, but not certifications, shall be forwarded from tier to tier until received by the principal recipient, which in turn will file them with the appropriate Federal agency.

INSTRUCTIONS FOR COMPLETION OF SF-LLL, DISCLOSURE OF LOBBYING ACTIVITIES

This disclosure form shall be completed by the reporting entity, whether subawardee or prime Federal recipient, at the initiation or receipt of a covered Federal action, or a material change to a previous filing, pursuant to title 31 U.S.C. section 1352. The filing of a form is required for each payment or agreement to make payment to any lobbying entity for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a covered Federal action. Use the SF-LLLA Continuation Sheet for additional information if the space on the form is inadequate. Complete all items that apply for both the initial filing and material change report. Refer to the implementing guidance published by the Office of Management and Budget for additional information.

1. Identify the type of covered Federal action for which lobbying activity is and/or has been secured to influence the outcome of a covered Federal action.
2. Identify the status of the covered Federal action.
3. Identify the appropriate classification of this report. If this is a follow up report caused by a material change to the information previously reported, enter the year and quarter in which the change occurred. Enter the date of the last previously submitted report by this reporting entity for this covered Federal action.
4. Enter the full name, address, city, State and zip code of the reporting entity. Include Congressional District, if known. Check the appropriate classification of the reporting entity that designates if it is, or expects to be, a prime or subaward recipient. Identify the tier of the subawardee, e.g., the first subawardee of the prime is the 1st tier. Subawards include but are not limited to subcontracts, subgrants and contract awards under grants.
5. If the organization filing there port in item 4 checks "Subawardee," then enter the full name, address, city, State and zip code of the prime Federal recipient. Include Congressional District, if known.
6. Enter the name of the Federal agency making the award or loan commitment. Include at least one organizational level below agency name, if known. For example, Department of Transportation, United States Coast Guard.
7. Enter the Federal program name or description for the covered Federal action (item1). If known, enter the full Catalog of Federal Domestic Assistance (CFDA) number for grants, cooperative agreements, loans, and loan commitments.
8. Enter the most appropriate Federal identifying number available for the Federal action identified in item 1 (e.g., Request for Proposal (RFP) number; Invitation for Bid (IFB) number; grant announcement number; the contract, grant, or loan award number; the application/proposal control number assigned by the Federal agency). Include prefixes, e.g., "RFP-DE-90-001."
9. For a covered Federal action where there has been an award or loan commitment by the Federal agency, enter the Federal amount of the award/loan commitment for the prime entity identified in item 4 or 5.
10. (a) Enter the full name, address, city, State and zip code of the lobbying entity engaged by the reporting entity identified in item 4 to influence the covered Federal action.

    (b) Enter the full names of the individual(s) performing services, and include full address if different from 10 (a). Enter Last Name, First Name, and Middle Initial (MI).
11. Enter the amount of compensation paid or reasonably expected to be paid by the reporting entity (item4) to the lobbying entity (item10). Indicate whether the payment has been made (actual) or will be made (planned). Check all boxes that apply. If this is a material change report, enter the cumulative amount of payment made or planned to be made.
12. Check the appropriate box(es). Check all boxes that apply. If payment is made through an in-kind contribution, specify the nature and value of the in-kind payment.
13. Check the appropriate box(es). Check all boxes that apply. If other, specify nature.
14. Provide a specific and detailed description of the services that the lobbyist has performed, or will be expected to perform, and the date(s) of any services rendered. Include all preparatory and related activity, not just time spent in actual contact with Federal officials. Identify the Federal official(s) or employee(s) contacted or the officer(s), employee(s), or Member(s) of Congress that were contacted.
15. Check whether or not a SF-LLLA Continuation Sheet(s) is attached.
16. The certifying official shall sign and date the form, print his/her name, title, and telephone number.

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.

DISCLOSURE OF LOBBYING ACTIVITIES Approved by OMB

Complete this form to disclose lobbying activities pursuant to 31 U.S.C. 1352 0348-0046

(See reverse for public burden disclosure)

1. Type of Federal Action:	2. Status of Federal Action:	3. Report Type:
☐ a. Contract **N/A** a. Grant b. Cooperative agreement c. Loan d. Loan guarantee e. Loan insurance	☐ a. bid/offer/application b. initial award c. post-award **N/A**	☐ a. initial finding **N/A** b. material change **For Material Change Only** year_____ quarter _____ date of last report_____

4. Name and Address of Reporting Entity:	5. If Reporting Entity in No. 4 is a Subawardee, Enter Name and Address of Prime:
☐ Prime ☐ Subawardee Tier _____, *if known:* Congressional District, *if known:*	 Congressional District, *if known:*
6. Federal Department/Agency:	**7. Federal Program Name/Description:** CFDA Number, *if applicable:* _____
8. Federal Action Number, if known:	**9. Award Amount,** if known: $
10. a. Name and Address of Lobbying Entity (if individual, last name, first name, M)	**b. Individuals Performing Services** (including address if different from No. 10a) (last name, first name, MI):

(attach Continuation Sheet(s) SF-LLL4, *if necessary*)

11. Amount of Payment (check all that apply)	13. Type of Payment (check all that apply)
$_____ ☐ **actual** ☐ **planned**	☐ a. retainer ☐ b. one-time lee ☐ c. commission ☐ d. contingent fee ☐ e. deferral ☐ f. other: specify:_____
12. Form of Payment (check all that apply) ☐ a, cash ☐ b. in-kind: specify: nature _____ Value_____	

14. Brief Description of Services Performed or to be Performed and Date(s) of Service, Including officer(s), employee(s), or Member(s), contacted, for Payment indicated in item 11:

N/A

(attach Continuation Sheet(s) SF-LLLA, *if necessary*)

15. Continuation Sheet(s) SF-LLLA attached: ☐ Yes ☐ No

16. Information requested through this for misauthorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when this transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be reported to the Congress semi-annually and will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less that $10,000 and not more than $100,000 for each such failure.

Signature: _____

Print Name: **George E. Foote**

Title: **Vice President**

Telephone No.: **760-871-0102** Date: **9-22-15**

Federal Use Only:

Authorized for Local Reproduction Standard Form LLL (Rev. 7-07)

DISCLOSURE OF LOBBYING ACTIVITIES Approved by
CONTINUATION SHEET OMB0348-0046

Reporting Entity: _____ Page _____of_____

Authorized for Local Reproduction
Standard Form - LLL-A

PROPOSAL (BID)

The Bidder agrees to the construction of **MBC - Odor Control Facility Upgrades**, 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 No.	Quantity	Unit	NAICS	Payment Reference	Description	Unit Price	Extension
BASE BID							
1	1	LS	237110	2-4.1	Bonds (Payment and Performance)		$ 30,000
2	1	AL	236220	7-5.3	Building Permits Type - I		$67,000.00
3	1	LS	237110	9-3.4.1	Mobilization		$ 100,000
4	1	AL		9-3.5	Field Orders Type II		$350,000,00
5	1	LS	221320	9-3.8	Area 60 Structural Work		$ 800,000
6	1	LS	221320	9-3.8	All Other Work Associated with Area 60		$ 950,000
7	1	LS	221320	9-3.8	All Work Associated with Area 76		$ 800,000
8	1	LS	221320	9-3.8	All Work Associated with Area 86		~~$ 1,200,000~~ GEF $1,500,000
9	1	LS	221320	9-3.8	Area 94 Structural Work		$ 200,000
10	1	LS	221320	9-3.8	All Other Work Associated with Area 94		$ 300,000
						ESTIMATED TOTAL BASE BID:	~~$ 4,817,000~~ GEF $ 5,097,000 MC

TOTAL BID PRICE FOR BID (Items 1 through 10 inclusive) amount written in words:

GEF
Four Million Eight hondred Seventeen Thousand dollars
Five million ninetyseven 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 **Lorena R. Mayor, Assistant Corporate 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: **George E. Foote**

Title: **Vice President**

Business Address: **2434 Auto Park Way, Suite 102, Escondido, CA 92029**

Place of Business: **Escondido, CA**

Place of Residence: **Escondido, CA**

Signature:

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**.

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 SDVOSB①	WHERE CERTIFIED ②	CHECK IF JOINT VENTURE PARTNERSHIP
Name: Southern Contracting Co. Address: 559 Twin Oak Valley Rd City: San Marcos State: CA Zip: 92079 Phone: 760 744 0760 Email: DStokes@Southerncontracting.com	constructor	222252	Electrical	$952,000	No		✓
Name: MC Painting Address: 2525 Ramona Dr. City: Vista State: CA Zip: 92084 Phone: 760-599-8000 Email: Brad@MC-painting.com	constructor	695478	Painting	$62,370	SBE/ WBE	WBENC	✓

① As appropriate, Bidder shall identify Subcontractor as one of the following and shall include a valid proof of certification (except for OBE, SLBE and ELBE):

Certified Minority Business Enterprise	MBE	Certified Woman Business Enterprise	WBE
Certified Disadvantaged Business Enterprise	DBE	Certified Disabled Veteran Business Enterprise	DVBE
Other Business Enterprise	OBE	Certified Emerging Local Business Enterprise	ELBE
Certified Small Local Business Enterprise	SLBE	Small Disadvantaged Business	SDB
Woman-Owned Small Business	WoSB	HUBZone Business	HUBZone
Service-Disabled Veteran Owned Small Business	SDVOSB		

② As appropriate, Bidder shall indicate if Subcontractor is certified by:

City of San Diego	CITY	State of California Department of Transportation	CALTRANS
California Public Utilities Commission	CPUC	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.

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 SDVOSB①	WHERE CERTIFIED ②	CHECK IF JOINT VENTURE PARTNERSHIP
Name: Allied Steel Address: 1027 Palmyrita Ave City: Riverside State: CA Zip: 92507 Phone: 951 241 7000 Email: Pchapman@AlliedSteelCo.com	constructor	164718 C51	Misc Metals Structural Steel	1,415,200	NO	✓	
Name: Address: City: State: Zip: Phone: Email:							

① As appropriate, Bidder shall identify Subcontractor as one of the following and shall include a valid proof of certification (except for OBE, SLBE and ELBE):

Certified Minority Business Enterprise	MBE	Certified Woman Business Enterprise	WBE
Certified Disadvantaged Business Enterprise	DBE	Certified Disabled Veteran Business Enterprise	DVBE
Other Business Enterprise	OBE	Certified Emerging Local Business Enterprise	ELBE
Certified Small Local Business Enterprise	SLBE	Small Disadvantaged Business	SDB
Woman-Owned Small Business	WoSB	HUBZone Business	HUBZone
Service-Disabled Veteran Owned Small Business	SDVOSB		

② As appropriate, Bidder shall indicate if Subcontractor is certified by:

City of San Diego	CITY	State of California Department of Transportation	CALTRANS
California Public Utilities Commission	CPUC	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.

0.4766

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 SDVOSB①	WHERE CERTIFIED②
Name:_____ Address:_____ City:_____ State:_____ Zip:_____ Phone:_____ Email:_____						
Name:_____ 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.

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

EPA United States Environmental Protection Agency

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		Project Name
M.C. Painting		MBC-Odor Control Facility Upgrades
Bid / Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact
K-16-6313-DBB-3		Brad Sabol
Address		
2525 Ramona Dr. Vista, Ca. 92084		
Telephone No.		Email Address
760-599-8000 ext. 114		Brad@mc-painting.com
Prime Contractor Name		Issuing/Funding Entity:
Stanek Constructors, Inc.		

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
Bid Item #5	Area 60 structural Painting	$ 16,775.00
6	Area 60 all other painting	$ 15,320.00
7	Area 76 painting	$ 6,795.00
8	Area 86 painting	$ 16,430.00
9	Area 94 Structural Painting	$ 2,750.00
10	Area 94 all other painting	$ 4,300.00

DBE Certified By:	Meets/exceeds EPA certification standards?
X Other: SBE, WBE	___ 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 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 6100-3 (DBE Subcontractor Performance Form)

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

EPA United States Environmental Protection Agency

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	9-22-2015

Subcontractor Signature	Print Name
	Brad Sabol
Title	**Date**
Estimator / Project Manager	9/22/15

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)

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

United States Environmental Protection Agency

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		Project Name
Stanek Constructors, Inc.		**MBC-Odor Control Facility Upgrades**
Bid / Proposal No.	Assistance Agreement ID No. (if known)	Point of Contact
K-16-6313-DBB-3		
Address		
2434 Auto Park Way, Ste. 102, Escondido, CA 92029		
Telephone No.		Email Address
760-871-0102		**gfoote@stanekconstructors.com**
Issuing/Funding Entity:		

I have identified potential DBE Certified subcontractors	X YES	___ 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?
MC Painting	2525 Ramona Dr		SBE / WBE
	Vista, CA 92084		
	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 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.

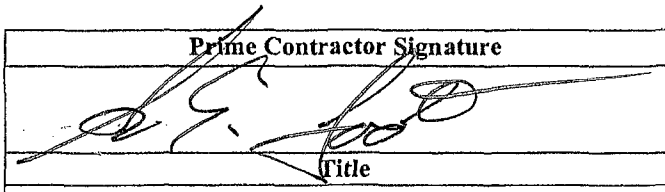
EPA FORM 6100-4 (DBE Subcontractor Utilization Form)

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

United States Environmental Protection Agency

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	**Date**
Vice President	9-22-15

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 6100-4 (DBE Subcontractor Utilization Form)

STATE WATER RESOURCES CONTROL BOARD – DIVISION OF FINANCIAL ASSISTANCE
DISADVANTAGED BUSINESS ENTERPRISE (DBE) UTILIZATION
CLEAN WATER STATE REVOLVING FUND (CWSRF)
FORM UR-334

1. Grant/Finance Agreement Number:	2. Semi-Annual Reporting Period 04/10/__ through 09/30/__ 10/1/__ through 03/30/__	3. Purchase Period of Financing Agreement:
4. Total Payments Paid to Prime Contractor or Sub-Contractors During Current Reporting Period: $		
5. Recipients Name and Address:	6. Recipient's Contact Person and Phone Number:	

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

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

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

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

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

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

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

Stanek Constructors, Inc.

651 Corporate Circle ♦ Suite 108 ♦ Golden, Colorado 80401
Telephone (303) 980-8233 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