City of San Diego

CONTRACTOR'S NAME: Blue Pacific Engineering & Construction

ADDRESS: 3750 Convoy Street, Suite 306, San Diego, CA 92111

TELEPHONE NO.: 858-956-1456

CITY CONTACT: Brittany Friedenreich, Senior Contract Specialist, Email: BFriedenreic@sandiego.gov

Phone No. (619) 533-3104

A. Van / A. Jaro / K. Stewart

BIDDING DOCUMENTS





FOR

PQPS OXYGENATION SYSTEM

BID NO.:	K-23-2080-DBB-3	
SAP NO. (WBS/IO/CC):	B-21001	
CLIENT DEPARTMENT:		
COUNCIL DISTRICT:		
PROJECT TYPE:	ВР	

THIS CONTRACT WILL BE SUBJECT TO THE FOLLOWING:

- PROJECT LABOR AGREEMENT (PLA)
- > THE CITY'S SUBCONTRACTING PARTICIPATION REQUIREMENTS FOR SLBE PROGRAM
- ➤ PREVAILING WAGE RATES: STATE ☐ FEDERAL ☐
- ➤ APPRENTICESHIP

BID DUE DATE:

2:00 PM SEPTEMBER 2, 2022

CITY OF SAN DIEGO'S ELECTRONIC BIDDING SITE, PLANETBIDS

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

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

6/15/22

Seal:

PROFESS IONAL

V. OCCIANO

No. C63566

Exp. 09/30/2022

CIVIL

OF CALLFORN

PROFESS IONAL

CIVIL

2) For City Engineer

6-15-22 se

C68286

COVIL OF CALIFORNIA

TABLE OF CONTENTS

SE	CTIC	ON F	PAGE
1.	RE	QUIRED DOCUMENTS SCHEDULE	4
2.	NC	OTICE INVITING BIDS	5
3.	INS	STRUCTIONS TO BIDDERS	.8
4.	PFI	RFORMANCE AND PAYMENT BONDS	19
5.		TACHMENTS:	
٥.		SCOPE OF WORK	22
	В.	RESERVED	
	С.	EQUAL OPPORTUNITY CONTRACTING PROGRAM	
	D.	PREVAILING WAGE	
	F.	SUPPLEMENTARY SPECIAL PROVISIONS	
		TECHNICALS	
		1. Appendix A - Notice of Exemption	
		2. Appendix B - Fire Hydrant Meter Program	
		3. Appendix C - Materials Typically Accepted by Certificate of Compliance	
		4. Appendix D - Sample City Invoice with Cash Flow Forecast	
		5. Appendix E - Location Map74	42
		6. Appendix F - Hazardous Waste Label/Forms	44
		7. Appendix G - Sample of Public Notice	50
		8. Appendix H - Advanced Metering Infrastructure (AMI) Device Protection	52
		9. Appendix I - LCP Tracker Third Party User Agreement and Forms	59
	F.	PROJECT LABOR AGREEMENT	79
	G.	CONTRACT AGREEMENT82	49
6.	CEI	RTIFICATIONS AND FORMS85	52

REQUIRED DOCUMENTS SCHEDULE DURING BIDDING AND AWARDING

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.

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	DOCUMENT TO BE SUBMITTED	WHEN DUE	FROM
1.	Bid Bond (PDF via PlanetBids)	At Time of Bid	ALL BIDDERS
2.	Contractors Certification of Pending Actions	At Time of Bid	ALL BIDDERS
3.	Mandatory Disclosure of Business Interests	At Time of Bid	ALL BIDDERS
4.	Debarment and Suspension Certification for Prime Contractors	At Time of Bid	ALL BIDDERS
5.	Debarment and Suspension Certification for Subcontractors, Suppliers & Mfgrs	At Time of Bid	ALL BIDDERS
6.	Bid Bond (Original)	By 5PM 3 working days after bid opening	ALL BIDDERS
7.	SLBE Good Faith Effort Documentation	By 5 PM 3 working days after bid opening	ALL BIDDERS
8.	Form AA60 – List of Work Made Available	By 5 PM 3 working days after bid opening with Good Faith Effort (GFE) documentation	ALL BIDDERS
9.	If the Contractor is a Joint Venture: • Joint Venture Agreement • Joint Venture License	Within 10 working days of receipt by bidder of contract forms	AWARDED BIDDER
10.	Listing of "Other Than First Tier" Subcontractors	Within 10 working days of receipt by bidder of contract forms	AWARDED BIDDER
11.	PLA Forms, See Attachment F	Within 10 working days of NOI	AWARDED BIDDER

NOTICE INVITING BIDS

- **1. SUMMARY OF WORK:** This is the City of San Diego's (City) solicitation process to acquire Construction services for **PQPS Oxygenation System**. For additional information refer to Attachment A.
- **2. FULL AND OPEN COMPETITION:** This solicitation is subject to full and open competition and may be bid by Contractors on the City's approved Prequalified Contractors List. For information regarding the Contractors Prequalified list visit the City's web site: http://www.sandiego.gov.
- **3. ESTIMATED CONSTRUCTION COST:** The City's estimated construction cost for this project is \$2,675,000.
- 4. BID DUE DATE AND TIME ARE: Semptmber 2, 2022 at 2:00 PM.
- 5. PREVAILING WAGE RATES APPLY TO THIS CONTRACT: Refer to Attachment D.
- **6. LICENSE REQUIREMENT**: To be eligible for award of this contract, Prime contractor must possess the following licensing classification: **A**
 - 6.1 Specialty License Requirements: All plumbing or pipefitting work that falls within the classification of a C-36 License shall be performed under a contract or subcontract with a contractor or a subcontractor with a C-36 License. All electrical work that falls within the classification of a C-10 License shall be performed under a contract or subcontract with a contractor or a subcontractor with a C-10 License.
- **PROJECT LABOR AGREEMENT.** As a condition of final contract award, the Awarded Bidder must sign and execute a Letter of Assent to the Project Labor Agreement that the City has negotiated which is listed as Attachment A to the Project Labor Agreement. A copy of the Project Labor Agreement (PLA) is attached as Attachment F of this Contract Document. See also Attachment E SSP, Section 5-3.6, "Project Labor Agreement".
- **8. SUBCONTRACTING PARTICIPATION PERCENTAGES**: Subcontracting participation percentages apply to this contract.
 - **8.1.** The City has incorporated **mandatory** SLBE-ELBE subcontractor participation percentages to enhance competition and maximize subcontracting opportunities. For the purpose of achieving the mandatory subcontractor participation percentages, a recommended breakdown of the SLBE and ELBE subcontractor participation percentages based upon certified SLBE and ELBE firms has also been provided to achieve the mandatory subcontractor participation percentages:

SLBE participation
 ELBE participation
 Total mandatory participation
 9.0%

- **8.2.** The Bid may be declared non-responsive if the Bidder fails to meet the following requirements:
 - **8.2.1.** Attend the Pre-Bid Site Visit as described herein.
 - **8.2.2.** Include SLBE-ELBE certified subcontractors at the overall mandatory participation percentage identified in this document; OR
 - **8.2.3.** Submit Good Faith Effort (GFE) documentation, saved in searchable Portable Document Format (PDF), demonstrating the Bidder made a good faith effort to conduct outreach to and include SLBE-ELBE Subcontractors as required in this solicitation by 5 PM 3 Working Days after the Bid opening if the overall mandatory participation percentage is not met.

All submittals in searchable PDF shall be submitted electronically within the prescribed time identified in the contract documents via PlanetBids by invitation to the point of contact named in the bid provided by the Contract Specialist to all bidders.

9. PRE-BID SITE VISIT: All those wishing to submit a bid **MUST** 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 Purchasing & Contracting Department, Public Works Division at (619) 533-3450 at least 5 Working Days prior to the meeting to ensure availability. Failure to attend the **Mandatory** Pre-Bid Site Visit may result in the Design-Builder's Bid being deemed non-responsive. The Pre-Bid Site Visit is scheduled as follows:

Date : August 16, 2022 Time : 1:00 - 2:00 PM

Location: 10150 Cara Way, San Diego, CA, 92123

10. AWARD PROCESS:

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

11. SUBMISSION OF QUESTIONS:

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

BFriedenreic@sandiego.gov

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

INSTRUCTIONS TO BIDDERS

1. PREQUALIFICATION OF CONTRACTORS:

- **1.1.** Contractors submitting a Bid must be pre-qualified for the total amount proposed, including all alternate items, prior to the date of submittal. Bids from contractors who have not been pre-qualified as applicable and Bids that exceed the maximum dollar amount at which contractors are pre-qualified may be deemed **non-responsive** and ineligible for award.
- **1.2.** The completed application must be submitted online no later than 2 weeks prior to the bid opening.
- **1.3. Joint Venture Bidders Cumulative Maximum Bidding Capacity:** For projects with an engineer's estimate of \$30,000,000 or greater, Joint Ventures submitting bids may be deemed responsive and eligible for award if the cumulative maximum bidding capacity of the individual Joint Venture entities is equal to or greater than the total amount proposed.
 - **1.3.1.** Each of the entities of the Joint Venture must have been previously prequalified at a minimum of \$15,000,000.
 - **1.3.2.** Bids submitted with a total amount proposed of less than \$30,000,000 are not eligible for Cumulative Maximum Bidding Capacity prequalification. To be eligible for award in this scenario, the Joint Venture itself or at least one of the Joint Venture entities must have been prequalified for the total amount proposed.
 - **1.3.3.** Bids submitted by Joint Ventures with a total amount proposed of \$30,000,000 or greater on a project with an engineer's estimate of less than \$30,000,000 are not eligible for Cumulative Maximum Bidding Capacity prequalification.
 - **1.3.4.** The Joint Venture designated as the Apparent Low Bidder shall provide evidence of its corporate existence and furnish good and approved bonds in the name of the Joint Venture within 14 Calendar Days of receipt by the Bidder of a form of contract for execution.
- **1.4.** Complete information and links to the on-line prequalification application are available at:
 - http://www.sandiego.gov/cip/bidopps/prequalification
- **1.5.** Due to the City's responsibility to protect the confidentiality of the contractors' information, City staff will not be able to provide information regarding contractors' prequalification status over the telephone. Contractors may access real-time information about their prequalification status via their vendor profile on PlanetBids™.

- 2. **ELECTRONIC FORMAT RECEIPT AND OPENING OF BIDS:** Bids will be received in electronic format (eBids) EXCLUSIVELY at the City of San Diego's electronic bidding (eBidding) site, at: http://www.sandiego.gov/cip/bidopps/index.shtml and are due by the date, and time shown on the cover of this solicitation.
 - **2.1. BIDDERS MUST BE PRE-REGISTERED** with the City's bidding system and possess a system-assigned Digital ID in order to submit and electronic bid.
 - 2.2. The City's bidding system will automatically track information submitted to the site including IP addresses, browsers being used and the URLs from which information was submitted. In addition, the City's bidding system will keep a history of every login instance including the time of login, and other information about the user's computer configuration such as the operating system, browser type, version, and more. Because of these security features, Contractors who disable their browsers' cookies will not be able to log in and use the City's bidding system.
 - 2.3. The City's electronic bidding system is responsible for bid tabulations. Upon the bidder's or proposer's entry of their bid, the system will ensure that all required fields are entered. The system will not accept a bid for which any required information is missing. This includes all necessary pricing, subcontractor listing(s) and any other essential documentation and supporting materials and forms requested or contained in these solicitation documents.
 - 2.4. BIDS REMAIN SEALED UNTIL BID DEADLINE. eBids are transmitted into the City's bidding system via hypertext transfer protocol secure (https) mechanism using SSL 128-256 bit security certificates issued from Verisign/Thawte which encrypts data being transferred from client to server. Bids submitted prior to the "Bid Due Date and Time" are not available for review by anyone other than the submitter who has until the "Bid Due Date and Time" to change, rescind or retrieve its proposal should it desire to do so.
 - **2.5. BIDS MUST BE SUBMITTED BY BID DUE DATE AND TIME**. Once the bid deadline is reached, no further submissions are accepted into the system. Once the Bid Due Date and Time has lapsed, bidders, proposers, the general public, and City staff are able to immediately see the results on line. City staff may then begin reviewing the submissions for responsiveness, EOCP compliance and other issues. The City may require any Bidder to furnish statement of experience, financial responsibility, technical ability, equipment, and references.
 - **2.6. RECAPITULATION OF THE WORK**. Bids shall not contain any recapitulation of the Work. Conditional Bids may be rejected as being non-responsive. Alternative proposals will not be considered unless called for.

- **2.7. BIDS MAY BE WITHDRAWN** by the Bidder only up to the bid due date and time.
 - 2.7.1. Important Note: Submission of the electronic bid into the system may not be instantaneous. Due to the speed and capabilities of the user's internet service provider (ISP), bandwidth, computer hardware and other variables, it may take time for the bidder's submission to upload and be received by the City's eBidding system. It is the bidder's sole responsibility to ensure their bids are received on time by the City's eBidding system. The City of San Diego is not responsible for bids that do not arrive by the required date and time.
- **2.8. ACCESSIBILITY AND AMERICANS WITH DISABILITIES ACT (ADA) COMPLIANCE:** To request a copy of this solicitation in an alternative format, contact the Purchasing & Contracting Department, Public Works Division Contract Specialist listed on the cover of this solicitation at least five (5) working days prior to the Bid/Proposal due date to ensure availability.

3. ELECTRONIC BID SUBMISSIONS CARRY FULL FORCE AND EFFECT:

- **3.1.** The bidder, by submitting its electronic bid, acknowledges that doing so carries the same force and full legal effect as a paper submission with a longhand (wet) signature.
- **3.2.** By submitting an electronic bid, the bidder certifies that the bidder has thoroughly examined and understands the entire Contract Documents (which consist of the plans and specifications, drawings, forms, affidavits and the solicitation documents), and that by submitting the eBid as its bid proposal, the bidder acknowledges, agrees to and is bound by the entire Contract Documents, including any addenda issued thereto, and incorporated by reference in the Contract Documents.
- **3.3.** The Bidder, by submitting its electronic bid, agrees to and certifies under penalty of perjury under the laws of the State of California, that the certification, forms and affidavits submitted as part of this bid are true and correct.
- 3.4. The Bidder agrees to the construction of the project as described in Attachment "A-Scope of Work" for the City of San Diego, in accordance with the requirements set forth herein for the electronically submitted prices. The Bidder guarantees the Contract Price for a period of 120 days from the date of Bid opening. The duration of the Contract Price guarantee shall be extended by the number of days required for the City to obtain all items necessary to fulfill all conditions precedent.
- **4. BIDS ARE PUBLIC RECORDS:** Upon receipt by the City, Bids shall become public records subject to public disclosure. It is the responsibility of the respondent to clearly identify any confidential, proprietary, trade secret or otherwise legally privileged information contained within the Bid. General references to sections of the California Public Records Act (PRA) will not suffice. If the Contractor does not provide applicable case law that clearly establishes that the requested information is exempt from the disclosure requirements of the PRA, the City

shall be free to release the information when required in accordance with the PRA, pursuant to any other applicable law, or by order of any court or government agency, and the Contractor will hold the City harmless for release of this information.

5. CONTRACTOR REGISTRATION AND ELECTRONIC REPORTING SYSTEM:

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

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

- **5.2.** The City may not award the contract until registration of all subcontractors and suppliers is complete. In the event this requirement is not met within the time frame specified in the Notice of Intent to Award letter, the City reserves the right to rescind the Notice of Award / Intent to Award and to make the award to the next responsive and responsible bidder / proposer.
- **JOINT VENTURE CONTRACTORS:** Provide a copy of the Joint Venture agreement and the Joint Venture license to the City within 14 Calendar Days after receiving the Contract forms.

7. INSURANCE REQUIREMENTS:

- **7.1.** 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.
- **7.2.** Refer to sections 5-4, "INSURANCE" of the Supplementary Special Provisions (SSP) for the insurance requirements which must be met.
- **8. REFERENCE STANDARDS:** Except as otherwise noted or specified, the Work shall be completed in accordance with the following standards:

Title		Document Number	
Standard Specifications for Public Works Construction ("The GREENBOOK") http://www.greenbookspecs.org/	2021	ECPI010122-01	
City of San Diego Standard Specifications for Public Works Construction ("The WHITEBOOK")* https://www.sandiego.gov/ecp/edocref/greenbook		ECPI010122-02	
City of San Diego Standard Drawings* https://www.sandiego.gov/ecp/edocref/standarddraw	2021	ECPI010122-03	
Citywide Computer Aided Design and Drafting (CADD) Standards https://www.sandiego.gov/ecp/edocref/drawings	2018	PWPI010119-04	
California Department of Transportation (CALTRANS) Standard Specifications https://dot.ca.gov/programs/design/ccs-standard-plans-and-standard-specifications	2018	PWPI030119-05	

Title		n Document Number
CALTRANS Standard Plans https://dot.ca.gov/programs/design/ccs-standard-plans-and-standard-specifications		PWPI030119-06
California Manual on Uniform Traffic Control Devices Revision 6 (CA MUTCD Rev 6) https://dot.ca.gov/programs/safety-programs/camutcd/camutcd-files		PWPI060121-10
NOTE: *Available online under Engineering Documents and References at: https://www.sandiego.gov/ecp/edocref/		
*Electronic updates to the Standard Drawings may also be found in the link above		

- 9. CITY'S RESPONSES AND ADDENDA: The City, at its discretion, may respond to any or all questions submitted in writing via the City's eBidding web site in the <u>form of an addendum</u>. No other responses to questions, oral or written shall be of any force or effect with respect to this solicitation. The changes to the Contract Documents through addenda are made effective as though originally issued with the Bid. The Bidders shall acknowledge the receipt of Addenda at the time of bid submission.
- 10. 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.
- 11. **CONTRACT PRICING:** This solicitation is for a Lump Sum contract with Unit Price provisions as set forth herein. The Bidder agrees to perform construction services for the City of San Diego in accordance with these contract documents for the prices listed below. The Bidder further agrees to guarantee the Contract Price for a period of 120 days from the date of Bid opening. The duration of the Contract Price guarantee may be extended, by mutual consent of the parties, by the number of days required for the City to obtain all items necessary to fulfill all contractual conditions.

12. SUBCONTRACTOR INFORMATION:

12.1. LISTING OF SUBCONTRACTORS. In accordance with the requirements provided in the "Subletting and Subcontracting Fair Practices Act" of the California Public Contract Code, the Bidder shall provide the NAME and ADDRESS of each Subcontractor who will perform work, labor, render services or who specially fabricates and installs a portion [type] of the work or improvement, in an amount in excess of 0.5% of the Contractor's total Bid. The Bidder shall also state within the description, whether the subcontractor is a CONSTRUCTOR, CONSULTANT or SUPPLIER. The Bidder shall state the DIR REGISTRATION NUMBER for all subcontractors and shall further state within the description, the PORTION of the work which will be performed by each subcontractor under this Contract. The Contractor shall list only one Subcontractor for each portion of the Work. The DOLLAR VALUE of the total Bid to be performed shall be stated for all subcontractors listed. Failure to comply with this requirement

may result in the Bid being rejected as **non-responsive** and ineligible for award. The Bidder's attention is directed to the Special Provisions – Section 3-2, "Self-Performance", which stipulates the percent of the Work to be performed with the Bidders' own forces. The Bidder shall list all SLBE, ELBE, DBE, DVBE, MBE, WBE, OBE, SDB, WoSB, HUBZone, and SDVOSB Subcontractors for which Bidders are seeking recognition towards achieving any mandatory, voluntary (or both) subcontracting participation goals.

Additionally, pursuant to California Senate Bill 96 and in accordance with the requirements of Labor Code sections 1771.1 and 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 California Department of Industrial Relations (DIR). **The Bidder shall provide the name, address, license number, DIR registration number of any Subcontractor – regardless of tier** - who will perform work, labor, render services or specially fabricate and install a portion [type] of the work or improvement pursuant to the contract.

- 12.2. LISTING OF SUPPLIERS. Any Bidder seeking the recognition of Suppliers of equipment, materials, or supplies obtained from third party Suppliers towards achieving any mandatory or voluntary (or both) subcontracting participation goals shall provide, at a minimum, the NAME, LOCATION (CITY), DIR REGISTRATION NUMBER and the DOLLAR VALUE of each supplier. The Bidder will be credited up to 60% of the amount to be paid to the Suppliers for materials and supplies unless vendor manufactures or substantially alters materials and supplies, in which case, 100% will be credited. The Bidder is to indicate within the description whether the listed firm is a supplier or manufacturer. If no indication is provided, the listed firm will be credited at 60% of the listed dollar value for purposes of calculating the Subcontractor Participation Percentage.
- **12.3. LISTING OF SUBCONTRACTORS OR SUPPLIERS FOR ALTERNATES.** For subcontractors or suppliers to be used on additive or deductive alternate items, in addition to the above requirements, bidder shall further note "ALTERNATE" and alternate item number within the description.
- **13. SUBMITTAL OF "OR EQUAL" ITEMS:** See Section 4-6, "Trade Names" in The WHITEBOOK and as amended in the SSP.

14. AWARD:

- **14.1.** The Award of this contract is contingent upon the Contractor's compliance with all conditions precedent to Award.
- **14.2.** 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.

- **14.3.** This contract will be deemed executed and effective only upon the signing of the Contract by the Mayor or his designee and approval as to form the City Attorney's Office.
- **15. SUBCONTRACT LIMITATIONS**: The Bidder's attention is directed to Standard Specifications for Public Works Construction, Section 3-2, "SELF-PERFORMANCE" 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.
- **16. 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 Purchasing & Contracting Department, Public Works Division.
- 17. ONLY ONE BID PER CONTRACTOR SHALL BE ACCCEPTED: No person, firm, or corporation shall be allowed to make, file, or be interested in more than one (1) Bid for the same work unless alternate Bids are called for. A person, firm or corporation who has submitted a subproposal 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.
- 18. SAN DIEGO BUSINESS TAX CERTIFICATE: The Contractor and Subcontractors, not already having a City of San Diego Business Tax Certificate for the work contemplated shall secure the appropriate certificate from the City Treasurer, Civic Center Plaza, First floor and submit to the Contract Specialist upon request or as specified in the Contract Documents. Tax Identification numbers for both the Bidder and the listed Subcontractors must be submitted on the City provided forms within these documents.
- 19. BIDDER'S GUARANTEE OF GOOD FAITH (BID SECURITY) FOR DESIGN-BID-BUILD CONTRACTS:
 - **19.1.** For bids \$250,000 and above, bidders shall submit Bid Security at bid time. Bid Security shall be in one of the following forms: a cashier's check, or a properly certified check upon some responsible bank; or an approved corporate surety bond payable to the City of San Diego for an amount of not less than 10% of the total bid amount.
 - **19.2.** 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.
 - **19.3.** 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.

- **19.4.** At the time of bid submission, bidders must upload and submit an electronic PDF copy of the aforementioned bid security. Whether in the form of a cashier's check, a properly certified check or an approved corporate surety bond payable to the City of San Diego, the bid security must be uploaded to the City's eBidding system. By 5PM, 3 working days after the bid opening date, all bidders must provide the City with the original bid security.
- **19.5.** Failure to submit the electronic version of the bid security at the time of bid submission AND failure to provide the original by 5PM, 3 working days after the bid opening date shall cause the bid to be rejected and deemed **non-responsive**.

Due to circumstances related to Covid-19, until further notice, all original bid bond submittals must be received by 5 PM, 3 working days after bid opening.

Upon circumstances returning to normal business as usual, the original bid bond shall once again be due by 5 PM the day after bid opening.

Original Bid Bond shall be submitted to:
Purchasing & Contracting Department, Public Works Division
1200 3rd Ave., Suite 200, MS 56P
San Diego, California, 92101
To the Attention of the Contract Specialist on the Front Page of this solicitation.

20. AWARD OF CONTRACT OR REJECTION OF BIDS:

- **20.1.** This contract may be awarded to the lowest responsible and reliable Bidder.
- **20.2.** Bidders shall complete ALL eBid forms as required by this solicitation. Incomplete eBids will not be accepted.
- **20.3.** The City reserves the right to reject any or all Bids, to waive any informality or technicality in Bids received, and to waive any requirements of these specifications as to bidding procedure.
- **20.4.** Bidders will not be released on account of their errors of judgment. Bidders may be released only upon receipt by the City within 3 Working Days of the bid opening, written notice from the Bidder which shows proof of honest, credible, clerical error of a material nature, free from fraud or fraudulent intent; and of evidence that reasonable care was observed in the preparation of the Bid.
- **20.5.** A bidder who is not selected for contract award may protest the award of a contract to another bidder by submitting a written protest in accordance with the San Diego Municipal Code.

- **20.6.** The City of San Diego will not discriminate in the award of contracts with regard to race, religion creed, color, national origin, ancestry, physical handicap, marital status, sex or age.
- **20.7.** Each Bid package properly signed as required by these specifications shall constitute a firm offer which may be accepted by the City within the time specified herein.
- **20.8.** The City reserves the right to evaluate all Bids and determine the lowest Bidder on the basis of the base bid and any proposed alternates or options as detailed herein.

21. BID RESULTS:

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

22. THE CONTRACT:

- **22.1.** 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.
- **22.2.** 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.
- **22.3.** 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.

- 22.4. 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.
- 22.5. The award of the Contract is contingent upon the satisfactory completion of the above-mentioned items and becomes effective upon the signing of the Contract by the Mayor or designee and approval as to form by the City Attorney's Office. If the Apparent Low Bidder does not execute the Contract or submit required documents and information, the City may award the Contract to the next lowest responsible and reliable Bidder who shall fulfill every condition precedent to award. A corporation designated as the Apparent Low Bidder shall furnish evidence of its corporate existence and evidence that the officer signing the Contract and bond for the corporation is duly authorized to do so.
- 23. **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 3-9, "TECHNICAL STUDIES AND SUBSURFACE DATA", 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.
- **24. CITY STANDARD PROVISIONS:** This contract is subject to the following standard provisions. See The WHITEBOOK for details.
 - **24.1.** The City of San Diego Resolution No. R-277952 adopted on May 20, 1991 for a Drug-Free Workplace.
 - **24.2.** The City of San Diego Resolution No. R-282153 adopted on June 14, 1993 related to the Americans with Disabilities Act.
 - **24.3.** The City of San Diego Municipal Code §22.3004 for Contractor Standards.
 - **24.4.** The City of San Diego's Labor Compliance Program and the State of California Labor Code §§1771.5(b) and 1776.
 - **24.5.** 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.

- **24.6.** The City's Equal Benefits Ordinance (EBO), Chapter 2, Article 2, Division 43 of The San Diego Municipal Code (SDMC).
- **24.7.** The City's Information Security Policy (ISP) as defined in the City's Administrative Regulation 90.63.

25. PRE-AWARD ACTIVITIES:

- **25.1.** The contractor selected by the City to execute a contract for this Work shall submit the required documentation as specified herein and in the Notice of Intent to Award. Failure to provide the information as specified may result in the Bid being rejected as **non-responsive.**
- **25.2.** The decision that bid is non-responsive for failure to provide the information required within the time specified shall be at the sole discretion of the City.

PERFORMANCE BOND, LABOR AND MATERIALMEN'S BOND

FAITHFUL PERFORMANCE BOND AND LABOR AND MATERIALMEN'S BOND:

Blue Pacific Engineering & Construction	,	a	corporation,	as	principa	al.	and
NATIONWIDE MUTUAL INSURANCE COMPANY	,	а	corporation	aut	horized	ŧo	do
business in the State of California, as Surety, hereby obligate the	em	sel	ves, their succe	esso	rs and as	sig	ns,
jointly and severally, to The City of San Diego a municipal corpo	ora	tio	n in the sum o	f <u>FC</u>	UR MIL	<u>LIO</u>	N
THREE HUNDRED NINETY ONE THOUSAND SEVEN HUNDRED	D S	IXI	Y SEVEN DOL	LAR	S (\$4,39°	1,76	<u>57)</u> ,
for the faithful performance of the annexed contract, and	in	the	sum of <u>FOUR</u>	MIL	LION TE	IRE	E
HUNDRED NINETY ONE THOUSAND SEVEN HUNDRED SIXTY	SE	VE	N DOLLARS (4,39	91,767), f	or	the
benefit of laborers and materialmen designated below.							

Conditions:

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

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

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

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

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

The Surety expressly agrees that the City of San Diego may reject any contractor or subcontractor which may be proposed by Surety in fulfillment of its obligations in the event of default by the Principal.

The Surety shall not utilize the Principal in completing the improvements and work specified in the Agreement in the event the City terminates the Principal for default.

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

THE CITY OF SAN DIEGO	APPROVED AS TO FORM
	Mara W. Elliott, City Attorney
By: Stypher Camara	By: Elglich Com
Print Name: <u>Stephen Samara</u> Principal Contract Specialist Purchasing & Contracting Dept.	Print Name: <u>Slizabeth</u> Cawn Deputy City Attorney
Date: 12/20/2022	Date: 12/20/2022
BLUE PACIFIC ENGINEERING CONSTRUCTION, INC. CONTRACTOR	NATIONWIDE MUTUAL INSURANCE COMPANY SURETY
By: Mul (lit	By: Attorney-In-Fact
Print Name: SHAHRAM ELIHU, PRESIDENT	Print Name: TRACY LYNN RODRIGUEZ, ATTORNEY-IN-FAC
Date: OCTOBER 25, 2022	Date: _OCTOBER 25, 2022
	500 NORTH BRAND BOULEVARD, SUITE 2000 GLENDALE, CA 91203
	Local Address of Surety
	715/530-3481
	Local Phone Number of Surety PREMIUM IS FOR CONTRACT TERM, AND IS SUBJECT TO ADJUSTMENT BASED ON FINAL CONTRACT PRICE
	Premium
	7901107894
	Rond Number

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

☐ Individual

Signer is Representing:

□ Trustee

□ Other:

CIVIL CODE § 1189

THE BURNESS OF THE PROPERTY OF 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 SAN DIEGO County of ____ 10/25/2022 SANDRA FIGUEROA, NOTARY PUBLIC ___ before me, ___ Here Insert Name and Title of the Officer TRACY LYNN RODRIGUEZ personally appeared ___ Name(s) of Signer(s) who proved to me on the basis of satisfactory evidence to be the person(e) whose name(e) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(les), 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 SANDRA FIGUEROA laws of the State of California that the foregoing COMM. # 2334108 paragraph is true and correct. OTARY PUBLIC-CALIFORNIAZ

AY COMMISSION SAN DIEGO COUNTY WITNESS my hand and official seal. MY COMMISSION EXPIRES SEPTEMBER 22, 2024 Place Notary Seal and/or Stamp Above - OPTIONAL Completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document. Description of Attached Document Title or Type of Document: ___ Document Date:_ ____Number of Pages:____ Signer(s) Other Than Named Above: _ Capacity(ies) Claimed by Signer(s) Signer's Name: TRACY LYNN RODRIGUEZ Signer's Name: _ ☐ Corporate Officer - Title(s): _ ☐ Corporate Officer - Title(s): ___ ☐ Partner - ☐ Limited ☐ General ☐ Partner — ☐ Limited ☐ General

respective and Notary Association

□ Individual

Signer is Representing:

□ Trustee

☐ Other:

□ Attorney in Fact

□ Guardian of Conservator

M Attorney in Fact

☐ Guardian of Conservator

Power of Attorney

KNOW ALL MEN BY THESE PRESENTS THAT:

Nationwide Mutual Insurance Company, an Ohio corporation

hereinafter referred to severally as the "Company" and collectively as "the Companies" does hereby make, constitute and appoint:
HELEN MALONEY; JOHN G MALONEY; MARK D IATAROLA; SANDRA FIGUEROA; TRACY LYNN RODRIGUEZ;

each in their individual capacity, its true and lawful attorney-in-fact, with full power and authority to sign, seal, and execute on its behalf any and all bonds and undertakings, and other obligatory instruments of similar nature, in penalties not exceeding the sum of

UNLIMITED

and to bind the Company thereby, as fully and to the same extent as if such instruments were signed by the duly authorized officers of the Company; and all acts of said Altorney pursuant to the authority given are hereby ratified and confirmed.

This power of altorney is made and executed pursuant to and by authority of the following resolution duly adopted by the board of directors of the Company:

"RESOLVED, that the president, or any vice president be, and each hereby is, authorized and empowered to appoint attorneys-in-fact of the Company, and to authorize them to execute and deliver on behalf of the Company any and all bonds, forms, applications, memorandums, undertakings, recognizances, transfers, contracts of indemnity, policies, contracts guaranteeing the fidelity of persons holding positions of public or private trust, and other writings obligatory in nature that the business of the Company may require; and to modify or revoke, with or without cause, any such appointment or authority; provided, however, that the authority granted hereby shall in no way limit the authority of other duly authorized agents to sign and countersign any of said documents on behalf of the Company."

"RESOLVED FURTHER, that such attorneys-in-fact shall have full power and authority to execute and deliver any and all such documents and to bind the Company subject to the terms and limitations of the power of attorney issued to them, and to affix the seal of the Company thereto; provided, however, that said seal shall not be necessary for the validity of any such documents."

This power of attorney is signed and sealed under and by the following bylaws duly adopted by the board of directors of the Company.

Execution of Instruments. Any vice president, any assistant secretary or any assistant treasurer shall have the power and authority to sign or attest all approved documents, instruments, contracts, or other papers in connection with the operation of the business of the company in addition to the chairman of the board, the chief executive officer, president, treasurer or secretary; provided, however, the signature of any of them may be printed, engraved, or stamped on any approved document, contract, instrument, or other papers of the Company.

IN WITNESS WHEREOF, the Company has caused this instrument to be sealed and duly attested by the signature of its officer the 20th day of August, 2021.

Antonio C. Albanese, Vice President of Nationwide Mutual Insurance Company

ACKNOWLEDGMENT.



STATE OF NEW YORK COUNTY OF NEW YORK: ss

On this 20th day of August, 2021, before me came the above-named officer for the Company aforesaid, to me personally known to be the officer described in and who executed the preceding instrument, and he acknowledged the execution of the same, and being by me duly sworn, deposes and says, that he is the officer of the Company aforesaid, that the seal affixed hereto is the corporate seal of said Company, and the said corporate seal and his signature were duly affixed and subscribed to said instrument by the authority and direction of said Company.

Stephenie Rubino McArthur Notary Public, State of New York No. 02MC6270117 Qualified in New York County Commission Expires October 19, 2024 Scylvanie Britismo Mollite

Notary Public
My Commission Expires

CERTIFICATE

I, Laura B. Guy, Assistant Secretary of the Company, do hereby certify that the foregoing is a full, true and correct copy of the original power of attorney issued by the Company; that the resolution included therein is a true and correct transcript from the minutes of the meetings of the boards of directors and the same has not been revoked or amended in any manner; that said Antonio C. Albanese was on the date of the execution of the foregoing power of attorney the duly elected officer of the Company, and the corporate seat and his signature as officer were duly affixed and subscribed to the said instrument by the authority of said board of directors; and the foregoing power of attorney is still in full force and effect.

IN WITNESS WHEREOF, I have hereunto subscribed my name as Assistant Secretary, and affixed the corporate seal of said Company this 25TH day of OCTOBER, 2022

**Aurua B. Guy

Assistant Secretary

ATTACHMENTS

ATTACHMENT A

SCOPE OF WORK

SCOPE OF WORK

- 1. SCOPE OF WORK: The Penasquitos Pump Station (PQPS) is among the larger wastewater pump stations in the City's collection system. It is located at 10150 Cara Way, just east of Interstate 15 at Mercy Road. Septic Wastewater from the PQPS has been linked to the poor performance of the processes at the North City Water Reclamation Plant (NCWRP). The addition of high-purity oxygen can effectively prevent septicity by increasing the dissolved oxygen concentration in the wastewater and maintaining an aerobic environment during conveyance of wastewater from the PQPS to the NCWRP.
 - **1.1.** The Work shall be performed in accordance with:
 - **1.1.1.** The Notice Inviting Bids and Plans numbered **40933-01-D** through **40933-51-D**, inclusive.
- **2. LOCATION OF WORK:** The location of the Work is as follows:

Appendix E - Location Map.

3. **CONTRACT TIME:** The Contract Time for completion of the Work, shall be **219 Working Days**.

ATTACHMENT B

RESERVED

ATTACHMENT C

EQUAL OPPORTUNITY CONTRACTING PROGRAM

EQUAL OPPORTUNITY CONTRACTING PROGRAM (EOCP)

SECTION A - GENERAL REQUIREMENTS

A. INTRODUCTION.

- 1. This document sets forth the following specifications:
 - a) The City's general EOCP requirements for all Construction Contracts.
 - b) Special Provisions for Contracts subject to SLBE and ELBE requirements only.
- 2. Additional requirements may apply for state or federally funded projects.
- 3. These requirements shall be included as Contract provisions for all Subcontracts.
- 4. The City specified forms, instructions, and guides are available for download from the EOCP's web site at: http://www.sandiego.gov/eoc/forms/index.shtml

B. GENERAL.

- 1. The City of San Diego promotes equal employment and subcontracting opportunities.
- 2. The City is committed to ensuring that taxpayer dollars spent on public Contracts are not paid to businesses that practice discrimination in employment or subcontracting.
- 3. The City encourages all companies seeking to do business with the City to share this commitment.

C. DEFINITIONS.

- 1. For the purpose of these requirements: Terms "Bid" and "Proposal", "Bidder" and "Proposer", "Subcontractor" and "Subconsultant", "Contractor" and "Consultant", "Contractor" and "Prime Contractor", "Consultant" and "Professional Service Provider", "Suppliers" and "Vendors", "Suppliers" and "Dealers", and "Suppliers" and "Manufacturers" may have been used interchangeably.
- 2. The following definitions apply:
 - a) **Emerging Business Enterprise (EBE)** A for-profit business that is independently owned and operated; that is not a subsidiary or franchise of another business and whose gross annual receipts do not exceed the amount set by the City Manager and that meets all other criteria set forth in regulations implementing Municipal Code Chapter 2, Article 2, Division 36. The City Manager shall review the threshold amount for EBEs on an annual basis and adjust as necessary to reflect changes in the marketplace.
 - b) **Emerging Local Business Enterprise (ELBE)** A Local Business Enterprise that is also an Emerging Business Enterprise.

- c) **Minority Business Enterprise (MBE)** A certified business that is at least fifty-one percent (51%) owned by one or more minority individuals, or, in the case of a publicly owned business at least fifty-one percent (51%) 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 minorities owners. Minorities include the groups with the following ethnic origins: African, Asian Pacific, Asian Subcontinent, Hispanic, Native Alaskan, Native American, and Native Hawaiian.
- d) **Women Business Enterprise (WBE)** A certified business that is at least fifty-one percent (51%) owned by a woman or women, or, in the case of a publicly owned business at least fifty-one percent (51%) of the stock is owned by one or more women; and (2) whose daily business operations are managed and directed by one or more women owners.
- e) **Disadvantaged Business Enterprise (DBE)** a certified business that is at least fifty-one percent (51%) owned by socially and economically disadvantaged individuals, or, in the case of a publicly owned business at least fifty-one percent (51%) of the stock is owned by one or more socially and economically disadvantaged individuals; and (2) whose daily business operations are managed and directed by one or more socially and economically disadvantaged owners.
- f) **Disabled Veteran Business Enterprise (DVBE)** A certified business that is at least fifty-one percent (51%) owned by one or more disabled veterans; and (2) business operations must be managed and controlled by one or more disabled veterans. Disabled Veteran is a veteran of the U.S. military, naval, or air service; the veteran must have a service-connected disability of at least 10% or more; and the veteran must reside in California.
- g) Other Business Enterprise (OBE) Any business which does not otherwise qualify as a Minority, Woman, Disadvantaged, or Disabled Veteran Business Enterprise.
- h) **Small Business Enterprise (SBE)** A for-profit business that is independently owned and operated; that is not a subsidiary or franchise of another business and whose gross annual receipts do not exceed the amount set by the City Manager and that meets all other criteria set forth in regulations implementing Municipal Code Chapter 2, Article 2, Division 36. The City Manager shall review the threshold amount for SBEs on an annual basis and adjust as necessary to reflect changes in the marketplace. A business certified as a Micro Business (MB) or a Disabled Veteran Business Enterprise (DVBE) by the State of California and that has provided proof of such certification to the City Manager shall be deemed to be an SBE.

i) **Small Local Business Enterprise (SLBE)** - A Local Business Enterprise that is also a Small Business Enterprise.

D. CITY'S EQUAL OPPORTUNITY COMMITMENT.

1. Nondiscrimination in Contracting Ordinance.

a) You, your Subcontractors, and Suppliers shall comply with the requirements of the City's Nondiscrimination in Contracting Ordinance, San Diego Municipal Code §§22.3501 through 22.3517.

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

You shall include the foregoing clause in all Contracts between you and your Subcontractors and Suppliers.

- b) **Disclosure of Discrimination Complaints.** As part of its Bid or Proposal, you shall provide to the City a list of all instances within the past 10 years where a complaint was filed or pending against you in a legal or administrative proceeding alleging that you discriminated against your employees, Subcontractors, vendors, or suppliers, and a description of the status or resolution of that complaint, including any remedial action taken.
- c) Upon the City's request, You agree to provide to the City, within 60 Calendar Days, a truthful and complete list of the names of all Subcontractors and Suppliers that you have used in the past 5 years on any of your Contracts that were undertaken within the San Diego County, including the total dollar amount paid by you for each Subcontract or supply Contract.
- d) You further agree 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. You understand and agree that violation of this clause shall be considered a material breach of the Contract and may result in remedies being ordered against you up to and including contract termination, debarment, and other sanctions for the violation of the provisions of the Nondiscrimination in Contracting Ordinance. You further understand and agree 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. You, your Subcontractors, and Suppliers shall comply with the City's Equal Employment Opportunity Outreach Program, San Diego Municipal Code §§22.2701 through 22.2707.

You shall not discriminate against any employee or applicant for employment on any basis prohibited by law. You shall provide equal opportunity in all employment practices. You shall ensure that your Subcontractors comply with this program. Nothing in this section shall be interpreted to hold you liable for any discriminatory practices of your Subcontractors.

You shall include the foregoing clause in all Contracts between you and your 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 to the City for approval as specified in the Notice of Intent to Award letter.
- 3. The selected Bidder shall submit an Equal Employment Opportunity Plan if a Work Force Report is submitted and if the City determines that there are under-representations when compared to County Labor Force Availability data.
- 4. If the selected Bidder submits an Equal Employment Opportunity Plan, it shall include the following assurances:
 - a) You shall maintain a working environment free of discrimination, harassment, intimidation, and coercion at all Sites and in all facilities at which your employees are assigned to Work.
 - b) You shall review your EEO Policy annually with all on-Site supervisors involved in employment decisions.
 - c) You shall disseminate and review your EEO Policy with all employees at least once a year, post the policy statement and EEO posters on all company bulletin boards and job sites, and document every dissemination, review, and posting with a written record to identify the time, place, employees present, subject matter, and disposition of meetings.
 - d) You shall review, at least annually, all supervisors' adherence to and performance under the EEO Policy and maintain written documentation of these reviews.
 - e) You shall discuss your EEO Policy Statement with Subcontractors with whom you anticipate doing business, including the EEO Policy Statement in your Subcontracts, and provide such documentation to the City upon request.

- f) You shall document and maintain a record of all Bid solicitations and outreach efforts to and from Subcontractors, contractor associations, and other business associations.
- g) You shall disseminate your EEO Policy externally through various media, including the media of people of color and women, in advertisements to recruit. Maintain files documenting these efforts and provide copies of these advertisements to the City upon request.
- h) You shall disseminate your EEO Policy to union and community organizations.
- You shall provide immediate written notification to the City when any union referral process has impeded your efforts to maintain your EEO Policy.
- j) You shall maintain a current list of recruitment sources, including those outreaching to people of color and women, and provide written notification of employment opportunities to these recruitment sources with a record of the organizations' responses.
- k) You shall maintain 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.
- l) You shall encourage all present employees, including people of color and women employees, to recruit others.
- m) You shall maintain all employment selection process information with records of all tests and other selection criteria.
- n) You shall develop and maintain documentation for on-the-job training opportunities, participate in training programs, or both for all of your employees, including people of color and women, and establish apprenticeship, trainee, and upgrade programs relevant to your employment needs.
- o) You shall conduct, at least annually, an inventory and evaluation of all employees for promotional opportunities and encourage all employees to seek and prepare appropriately for such opportunities.
- p) You shall ensure that 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.

F. SUBCONTRACTING.

1. The City encourages all eligible business enterprises to participate in City contracts as a Contractor, Subcontractor, and joint venture partner with you, your Subcontractors, or your Suppliers. You are encouraged to take positive

- steps to diversify and expand your Subcontractor solicitation base and to offer subcontracting opportunities to all eligible business firms including SLBEs, ELBEs, MBEs, WBEs, DBEs, DVBEs, and OBEs.
- 2. For Subcontractor participation level requirements, see the Contract Documents where applicable.
- 3. For the purposes of achieving the mandatory Subcontractor participation percentages, City percentage calculations will not account for the following:
 - a) "Field Orders" and "City Contingency" Bid items.
 - b) Alternate Bid items.
 - c) Allowance Bid items designated as "EOC Type II".
- 4. Allowance Bid items designated as "EOC Type I" will be considered as part of the Base Bid and will be included in the percentage calculation.
- 5. Each joint venture partner shall be responsible for a clearly defined Scope of Work. In addition, an agreement shall be submitted and signed by all parties identifying the extent to which each joint venture partner shares in ownership, control, management, risk, and profits of the joint venture.

G. LISTS OF SUBCONTRACTORS AND SUPPLIERS.

- 1. You shall comply with the Subletting and Subcontracting Fair Practices Act, Public Contract Code §§4100 through 4113, inclusive.
- 2. You shall list all Subcontractors who will receive more than 0.5% of the total Bid amount or \$10,000, whichever is greater on the form provided in the Contract Documents (Subcontractors list).
- 3. The Subcontractors list shall include the Subcontractor's name, telephone number including area code, physical address, Scope of Work, the dollar amount of the proposed Subcontract, the California contractor license number, the Public Works contractor registration number issued pursuant to Section 1725.5 of the Labor Code, and the Subcontractor's certification status with the name of the certifying agency.
- 4. The listed Subcontractor shall be appropriately licensed pursuant to Contractor License Laws.
- 5. For Design-Build Contracts, refer to the RFQ and RFP for each Project or Task Order.

H. SUBCONTRACTOR AND SUPPLIER SUBSTITUTIONS.

- 1. Listed Subcontractors and Suppliers shall not be substituted without the Express authorization of the City or its duly authorized agent.
- 2. Request for Subcontractor or Supplier substitution shall be made in writing to Purchasing & Contracting Department, Public Works Division, Attention Contract Specialist, 1200 3rd Ave., Suite 200, MS 56, San Diego, CA 92101 with a copy to the Engineer.

- 3. The request shall include a thorough explanation of the reason(s) for the substitution, including dollar amounts and a letter from each substituted Subcontractor or Supplier stating that they (the Subcontractors or Suppliers) release all interest in working on the Project and written confirmation from the new Subcontractor or Supplier stating that they agree to work on the Project along with the dollar value of the Work to be performed.
- 4. Written approval of the substitution request shall be received by you or from the City or its authorized officer prior to any unlisted Subcontractor or Supplier performing Work on the Project.
- 5. Substitution of Subcontractors and Suppliers without authorization shall subject you to those penalties set forth in Public Contract Code §4110.
- 6. Requests for Supplier substitution shall be made in writing at least 10 Days prior to the provision of materials, supplies, or services by the proposed Supplier and shall include proof of written notice to the originally listed Supplier of the proposed substitution.
- 7. A Contractor whose Bid is accepted shall not:
 - a) Substitute a person as Subcontractor or Supplier in place of the Subcontractor or Supplier listed in the original bid, except that the City, or it's duly authorized officer, may consent to the substitution of another person as a Subcontractor or Supplier in any of the following situations:
 - i. When the Subcontractor or Supplier listed in the Bid, after having a reasonable opportunity to do so, fails or refuses to execute a written Contract for the scope of work specified in the subcontractor's bid and at the price specified in the subcontractor's bid, when that written contract, based upon the general terms, conditions, plans, and specifications for the project involved or the terms of the subcontractor's written bid, is presented to the subcontractor by the prime contractor.
 - ii. When the listed Subcontractor or Supplier becomes insolvent or the subject of an order for relief in bankruptcy.
 - iii. When the listed Subcontractor or Supplier fails or refuses to perform his or her subcontract.
 - iv. When the listed Subcontractor fails or refuses to meet bond requirements as set forth in Public Contract Code §4108.
 - v. When you demonstrate to the City or it's duly authorized officer, subject to the provisions set forth in Public Contract Code §4107.5, that the name of the Subcontractor was listed as the result of an inadvertent clerical error.
 - vi. When the listed Subcontractor is not licensed pursuant to Contractor License Law.

- vii. When the City, or it's duly authorized officer, determines that the Work performed by the listed Subcontractor or that the materials or supplies provided by the listed Supplier are substantially unsatisfactory and not in substantial accordance with the Plans and specifications or that the Subcontractor or Supplier is substantially delaying or disrupting the progress of the Work.
- viii. When the listed Subcontractor is ineligible to work on a public works project pursuant to §§1777.1 or 1777.7 of the Labor Code.
- ix. When the City or its duly authorized agent determines that the listed Subcontractor is not a responsible contractor.
- b) Permit a Contract to be voluntarily assigned or transferred or allow it to be performed by anyone other than the original Subcontractor, Supplier listed in the original Bid without the consent of the City, or it's duly authorized officer.
- c) Other than in the performance of "Change Orders" causing changes or deviations from the Contract, sublet or subcontract any portion of the Work, or contract for materials or supplies in excess of 0.5% of your total bid or \$10,000, whichever is greater, as to which his or her original Bid did not designate a Subcontractor or Supplier.
- 8. Following receipt of notice from you of the proposed substitution of a Subcontractor or Supplier, the listed Subcontractor or Supplier who has been so notified shall have 5 Working Days within which to submit written objections to the substitution to the Contract Specialist with a copy to the Engineer. Failure to file these written objections shall constitute the listed Subcontractor or Supplier's consent to the substitution. If written objections are filed, the City shall give notice in writing of at least 5 Working Days to the listed Subcontractor or Supplier of a hearing by the City on your request for substitution.

I. PROMPT PAYMENT.

- 1. You or your Subcontractors shall pay to any subcontractor, not later than 7 Calendar Days of receipt of each progress payment, unless otherwise agreed to in writing, the respective amounts allowed you on account of the Work performed by the Subcontractors, to the extent of each Subcontractor's interest therein. In cases of Subcontractor performance deficiencies, you shall make written notice of any withholding to the Subcontractor with a copy to the Contracts Specialist. Upon correction of the deficiency, you shall pay the Subcontractor the amount previously withheld within 14 Calendar Days after payment by the City.
- 2. Any violation of California Business and Professions Code, §7108.5 concerning prompt payment to Subcontractors shall subject the violating Contractor or

Subcontractor to the penalties, sanctions, and other remedies of that section. This requirement shall not be construed to limit or impair any contractual, administrative, or judicial remedies otherwise available to you or your Subcontractor in the event of a dispute involving late payment or nonpayment by the Prime Contractor, deficient subcontract performance, or noncompliance by a Subcontractor.

J. PROMPT PAYMENT OF FUNDS WITHHELD TO SUBCONTRACTORS.

- 1. The City will hold retention from you and will make prompt and regular incremental acceptances of portions, as determined by the Engineer, of the Work and pay retention to you based on these acceptances.
- 2. You or your Subcontractors shall return all monies withheld in retention from a Subcontractor within 30 Calendar Days after receiving payment for Work satisfactorily completed and accepted including incremental acceptances of portions of the Work by the City.
- 3. Federal law (49CFR26.29) requires that any delay or postponement of payment over 30 Calendar Days may take place only for good cause and with the City's prior written approval. Any violation of this provision by you or your Subcontractor shall subject you or your Subcontractor to the penalties, sanctions, and other remedies specified in §7108.5 of the Business and Professions Code.
- 4. These requirements shall not be construed to limit or impair any contractual, administrative, or judicial remedies otherwise available to you or your Subcontractor in the event of a dispute involving late payment or nonpayment by you, deficient subcontract performance, or noncompliance by a Subcontractor.

K. CERTIFICATION.

- 1. The City accepts certifications of DBE, DVBE, MBE, SMBE, SWBE, or WBE by any of the following certifying agencies:
 - a) Current certification by the State of California Department of Transportation (CALTRANS) as DBE, SMBE, or SWBE.
 - b) Current MBE, WBE, or DVBE certification from the California Public Utilities Commission.
 - c) DVBE certification is received from the State of California's Department of General Services, Office of Small and Minority Business.
 - d) Current certification by the City of Los Angles as DBE, WBE, or MBE.
 - e) Subcontractors' valid proof of certification status (copies of MBE, WBE, DBE, or DVBE certifications) shall be submitted as required.

L. CONTRACT RECORDS AND REPORTS.

1. You shall maintain records of all subcontracts and invoices from your Subcontractors and Suppliers for work on this project. Records shall show name, telephone number including area code, and business address of each

- Subcontractor, Supplier, and joint venture partner, and the total amount actually paid to each firm. Project relevant records, regardless of tier, may be periodically reviewed by the City.
- 2. You shall retain all records, books, papers, and documents pertinent to the Contract for a period of not less than 5 years after Notice of Completion and allow access to said records by the City's authorized representatives.
- 3. You shall submit the following reports using the City's web-based contract compliance software, LCP Tracker Online Payroll Reporting:
 - a. **Monthly Payment.** You and your Subcontractors and Suppliers shall submit Monthly Payment Reporting by the 5th day of the subsequent month. Incomplete and/or delinquent reporting may cause payment delays, non-payment of invoices, or both.
 - You shall submit a signed and executed LCP Tracker Software Contract 3rd Party User Agreement prior to the PLA Pre-job conference as defined in Article 16 of the PLA. See Appendix I – LCP Tracker Third Party User Agreement.
- 4. The records maintained under item 1, described above, shall be consolidated into a Final Summary Report, certified as correct by an authorized representative of the Contractor. The Final Summary Report shall include all subcontracting activities and be sent to the EOCP Program Manager prior to Acceptance. Failure to comply may result in assessment of liquidated damages or withholding of retention. The City will review and verify 100% of subcontract participation reported in the Final Summary Report prior to approval and release of final retention to you. In the event your Subcontractors are owed money for completed Work, the City may authorize payment to subcontractor via a joint check from the withheld retention.

EQUAL OPPORTUNITY CONTRACTING PROGRAM (EOCP)

SECTION B - SLBE-ELBE SUBCONTRACTING REQUIREMENTS

THESE SPECIAL PROVISIONS SUPPLEMENT THE POLICIES AND REQUIREMENTS ESTABLISHED BY THE CITY OF SAN DIEGO EQUAL OPPORTUNITY CONTRACTING PROGRAM SPECIFIED IN THE CITY'S GENERAL EOCP REQUIREMENTS.

A. GENERAL.

- 1. It is the City's policy to encourage greater availability, capacity development, and contract participation by SLBE and ELBE firms in City contracts. This policy is, in part, intended to further the City's compelling interest to stimulate economic development through the support and empowerment of the local community, ensure that it is neither an active nor passive participant in marketplace discrimination, and promote equal opportunity for all segments of the contracting community.
- 2. The City is committed to maximizing subcontracting opportunities for all qualified and available firms.
- 3. This policy applies to City-funded construction contracts. Bidders shall be fully informed of this policy as set forth in these specifications. Mandatory or voluntary subcontracting percentages, Bid Discounts, and restricted competitions are specified in the Contract Documents.
- 4. You shall make subcontracting opportunities available to a broad base of qualified Subcontractors and shall achieve the minimum SLBE-ELBE Subcontractor participation identified for your project.
- 5. Failure to subcontract the specified minimum (mandatory) percentages of the Bid to qualified available SLBE-ELBE Subcontractors will cause a Bid to be rejected as non-responsive unless the Bidder has demonstrated compliance with the affirmative steps as specified in the City's document titled "Small Local Business (SLBE) Program, INSTRUCTIONS FOR BIDDERS COMPLETING THE GOOD FAITH EFFORT SUBMITTAL" and has submitted documentation showing that all required positive efforts were made prior to the Bid submittal due date. The required Good Faith Effort (GFE) documentation shall be submitted to the Contract Specialist. The instructions for completing the good faith effort submittal can be found on the City's website:
 - https://www.sandiego.gov/sites/default/files/legacy/eoc/pdf/slbegfeinst.pdf
- 6. The current list of certified SLBE-ELBE firms and information for completing the GFE submittal can be found on the City's EOC Department website:
 - http://www.sandiego.gov/eoc/programs/slbe.shtml
- 7. These requirements may be waived, at the City's sole discretion, on projects deemed inappropriate for subcontracting participation.

B. DEFINITIONS.

- 1. The following definitions shall be used in conjunction with these specifications:
 - a) **Bid Discount** Additional inducements or enhancements in the bidding process that are designed to increase the chances for the selection of SLBE firms in competition with other firms.
 - b) **Commercially Useful Function** An SLBE-ELBE performs a commercially useful function when it is responsible for the execution of the Work and is carrying out its responsibilities by actually performing, managing, and supervising the Work involved. To perform a commercially useful function, the SLBE-ELBE shall also be responsible, with respect to materials and supplies used on the Contract, for negotiating price, determining quantity and quality, ordering the material, and installing (where applicable) and paying for the material itself.

To determine whether an SLBE-ELBE is performing a commercially useful function, an evaluation will be performed of the amount of Work subcontracted, normal industry practices, whether the amount the SLBE-ELBE firm is to be paid under the contract is commensurate with the Work it is actually performing and the SLBE-ELBE credit claimed for its performance of the Work, and other relevant factors. Specifically, an SLBE-ELBE does not perform a commercially useful function if its role is limited to that of an extra participant in a transaction, contract, or project through which funds are passed in order to obtain the appearance of meaningful and useful SLBE-ELBE participation, when in similar transactions in which SLBE-ELBE firms do not participate, there is no such role performed.

- c) Good Faith Efforts (GFE) Documentation of the Bidder's intent to comply with SLBE Program goals and procedures included in the City's SLBE Program, Instructions for Completing Good Faith Effort Submittal available from the City's EOCP website or the Contract Specialist.
- d) Independently Owned, Managed, and Operated Ownership of a SLBE-ELBE firm shall be direct, independent, and by individuals only. Business firms that are owned by other businesses or by the principals or owners of other businesses that cannot themselves qualify under the SLBE-ELBE eligibility requirements shall not be eligible to participate in the Program. Moreover, the day-to-day management of the SLBE-ELBE firm shall be direct and independent of the influence of any other businesses that cannot themselves qualify under the SLBE-ELBE eligibility requirements.
- e) **Joint Venture** An association of two or more persons or business entities that is formed for the single purpose of carrying out a single defined business enterprise for which purpose they combine their

- capital, efforts, skills, knowledge, or property. Joint ventures shall be established by written agreement to qualify for this program.
- f) Local Business Enterprise ("LBE") A firm having a Principal Place of Business and a Significant Employment Presence in San Diego County, California that has been in operation for 12 consecutive months and a valid business tax certificate. This definition is subsumed within the definition of Small Local Business Enterprise.
- g) **Minor Construction Program** A program developed for bidding exclusively among SLBE-ELBE Construction firms.
- h) **Principal Place of Business** A location wherein a firm maintains a physical office and through which it obtains no less than 50% of its overall customers or sales dollars.
- i) **Protégé** A firm that has been approved and is an active participant in the City's Mentor-Protégé Program and that has signed the required program participation agreement and has been assigned a mentor.
- j) **Significant Employee Presence** No less than 25% of a firm's total number of employees are domiciled in San Diego County.

C. SUBCONTRACTOR PARTICIPATION.

- 1. For the purpose of satisfying subcontracting participation requirements, only 1st tier SLBE-ELBE Subcontractors will be recognized as participants in the Contract according to the following criteria:
 - a) For credit to be allowed toward a respective participation level, all listed SLBE-ELBE firms shall have been certified by the Bid due date.
 - b) The Subcontractor shall perform a commercially useful function for credit to be allowed toward subcontractor participation levels. The Subcontractor shall be required by you to be responsible for the execution of a distinct element of the Work and shall carry out its responsibility by actually performing and supervising its own workforce.
 - c) If the Bidder is seeking the recognition of materials, supplies, or both towards achieving any mandatory subcontracting participation level, the Bidder shall indicate on Form AA40 Named Equipment/Material Supplier List with the Bid the following:
 - i. If the materials or supplies are obtained from a SLBE-ELBE manufacturer, the Bidder will receive 100% of the cost of the materials or supplies toward SLBE participation. For the purposes of counting SLBE-ELBE participation, a manufacturer is a firm that operates or maintains a factory or establishment that produces, on the premises, the materials, supplies, articles, or equipment required under the Contract and of the general character described by the specifications.

- ii. If the materials or supplies are obtained from a SLBE-ELBE supplier, the Bidder will receive 60% of the cost of the materials or supplies toward SLBE participation. For the purposes of counting SLBE-ELBE participation a Supplier is a firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials, supplies, articles or equipment of the general character described by the specifications and required under the Contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business. To be a supplier, the firm shall be an established, regular business that engages, as its principal business and under its own name, in the purchase and sale or lease of the products in question. A person may be a supplier in such bulk items as petroleum products, steel, cement, gravel, stone, or asphalt without owning, operating, or maintaining a place of business if the person both owns and operates distribution equipment for the products. Any supplementing of the suppliers' own distribution equipment shall be by a long-term lease agreement and shall not be on an ad hoc or contract-by-contract basis.
- iii. If the materials or supplies are obtained from a SLBE-ELBE, which is neither a manufacturer nor a supplier, the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, fees or transportation charges for the delivery of materials or supplies required on a job site will be counted toward SLBE-ELBE participation, provided the fees are reasonable and not excessive as compared with fees customarily allowed for similar services. No portion of the cost of the materials and supplies themselves will be counted toward SLBE-ELBE participation.
- d) If the Bidder is seeking the recognition of SLBE-ELBE Trucking towards achieving any mandatory subcontracting participation level, the Bidder shall indicate it on Form AA35 List of Subcontractors with the Bid. The following factors will be evaluated in determining the credit to be allowed toward the respective participation level:
 - The SLBE-ELBE shall be responsible for the management and supervision of the entire trucking operation for which it is getting credit on a particular Contract and there shall not be a contrived arrangement for the purpose of counting SLBE-ELBE participation.
 - ii. The SLBE-ELBE shall itself own and operate at least 1 fully licensed, insured, and operational truck used on the Contract.

- iii. The SLBE-ELBE receives credit for the total value of the transportation services it provides on the Contract using trucks it owns, insures, and operates using drivers it employs.
- iv. The SLBE-ELBE may lease trucks from another SLBE-ELBE firm including an owner-operator who is certified as a SLBE-ELBE. The SLBE-ELBE who leases trucks from another SLBE-ELBE receives credit for the total value of the transportation services the lessee SLBE-ELBE provides on the contract.
- v. The SLBE-ELBE may also lease trucks from a non-SLBE-ELBE firm, including an owner-operator. The SLBE-ELBE who leases trucks from a non-SLBE-ELBE is entitled to credit for the total value of transportation services provided by non-SLBE-ELBE lessees not to exceed the value of transportation services provided by SLBE-ELBE owned trucks on the contract. Additional participation by non-SLBE-ELBE lessees receive credit only for the fee or commission it receives as a result of the lease arrangement.
- vi. A lease shall indicate that the SLBE-ELBE has exclusive use of and control over the truck. This does not preclude the leased truck from working for others during the term of the lease with the consent of the SLBE-ELBE so long as the lease gives the SLBE-ELBE absolute priority for use of the leased truck.

D. SLBE-ELBE SUBCONTRACTOR PARTICIPATION PERCENTAGES.

- 1. Contracts valued at \$1,000,000 and above will be considered Major Public Works Contracts and will include a mandatory Subcontractor participation requirement for SLBE-ELBE firms.
 - a) The Bidder shall achieve the mandatory Subcontractor participation requirement or demonstrate GFE.
 - b) The Bidders shall indicate the participation on Forms AA35 List of Subcontractors and AA40 Named Equipment/Material Supplier List as applicable regardless of the dollar value.
 - c) An SLBE-ELBE Bidder may count its own participation toward achieving the mandatory goal as long as the SLBE-ELBE Bidder performs 51% of the Contract Price.
- 2. Contracts Valued over \$500,000 and under \$1,000,000 will also be considered Major Public Works Contracts and will include the mandatory subcontractor participation requirements described above and the following:
 - a) 5% bid discount for SLBE-ELBE firms.
 - b) Non-certified Contractor will receive 5% bid discount if they achieve the specified mandatory Subcontracting participations.

- c) Bid discounts shall not apply if the award will result in a total contract cost of \$50,000 in excess of the apparent lowest Bid.
- d) In the event of a tie bid between a SLBE-ELBE Bidder and a non-SLBE-ELBE Bidder, the SLBE-ELBE Bidder will be awarded the Contract.
- e) In the event of a tie bid between a discounted Bid and a nondiscounted Bid, the discounted Bid will be awarded the Contract.
- 3. Contracts valued over \$250,000 up to \$500,000 will be considered Minor Public Works Contracts and will be awarded through a competitive Bid process open only to City certified SLBE-ELBE firms. If there are no bidders or no responsible bidders, the Contract will be made available to all Bidders and will be subject to requirements listed in items 1 and 2 for Major Public Works Contracts above.
- 4. Contracts valued at \$250,000 and below will also be considered Minor Public Works Contracts and will be awarded through a competitive bid process open only to City certified ELBEs unless there are less than 2 firms available at which it will be awarded through a competitive process open only to the City certified SLBE-ELBE firms. If there are no bidders or no responsible bidders, the Contract will be made available to all Bidders and subject to requirements listed in items 1 and 2 for Major Public Works Contracts above.

E. JOINT VENTURES.

- 1. The City may allow for Joint Venture bid discounts on some Contracts. Contracts that allow for Joint Venture bid discounts will be designated in Bid documents. A firm that is bidding or competing for City Contracts may partner with a certified SLBE or ELBE to compete for Contracts as a Joint Venture.
- 2. A Joint Venture shall be between two entities with the same discipline or license as required by the City. Joint ventures will receive bid discounts depending on the SLBE or ELBE percentage of participation. To be eligible for a discount, a Joint Venture Agreement shall be approved by the City at the time of Bid submittal. The maximum allowable discount shall be 5%. The parties shall agree to enter in the relationship for the life of the projects.
- 3. Joint Venture shall submit a Joint Venture Management Plan, a Joint Venture Agreement, or both at least 2 weeks prior to the Bid due date. Copies of the Joint Venture applications are available upon request to the Contract Specialist. Each agreement or management plan shall include the following:
 - a) Detailed explanation of the financial contribution for each partner.
 - b) List of personnel and equipment used by each partner.
 - c) Detailed breakdown of the responsibilities of each partner.
 - d) Explanation of how the profits and losses will be distributed.
 - e) Description of the bonding capacity of each partner.
 - f) Management or incentive fees available for any one of the partners (if any).

- 4. Each Joint Venture partner shall perform a Commercially Useful Function. An SLBE or ELBE that relies on the resources and personnel of a non-SLBE or ELBE firm will not be deemed to perform a Commercially Useful Function.
- 5. Each Joint Venture partner shall possess licenses appropriate for the discipline for which a proposal is being submitted. If a Joint Venture is bidding on a single trade project, at the time of bid submittal, each Joint Venture partner shall possess the requisite specialty license for that trade bid.
- 6. The SLBE or ELBE partner shall clearly define the portion of the Work to be performed. This Work shall be of the similar type of Work the SLBE or ELBE partner performs in the normal course of its business. The Joint Venture Participation Form shall specify the Bid items to be performed by each individual Joint Venture partner. Lump sum Joint Venture participation shall not be acceptable.
- 7. Responsibilities of the SLBE or ELBE Joint Venture Partner:
 - a) The SLBE or ELBE partner shall share in the control, management responsibilities, risks and profits of the Joint Venture in proportion with the level of participation in the project.
 - b) The SLBE or ELBE partner shall perform Work that is commensurate with its experience.
 - c) The SLBE or ELBE partner shall use its own employees and equipment to perform its portion of the Work.
 - d) The Joint Venture as a whole shall perform Bid items that equal or exceed 50% of the Contract Price, excluding the cost of manufactured items, in order to be eligible for a Joint Venture discount.

F. MAINTAINING PARTICIPATION LEVELS.

- Credit and preference points are earned based on the level of participation proposed prior to the award of the Contract. Once the Project begins you shall achieve and maintain the SLBE-ELBE participation levels for which credit and preference points were earned. You shall maintain the SLBE-ELBE percentages indicated at the Award of Contract and throughout the Contract Time.
- 2. If the City modifies the original Scope of Work, you shall make reasonable efforts to maintain the SLBE-ELBE participation for which creditor preference points were earned. If participation levels will be reduced, approval shall be received from the City prior to making changes.
- 3. You shall notify and obtain written approval from the City in advance of any reduction in subcontract scope, termination, or substitution for a designated SLBE-ELBE Subcontractor. Failure to do so shall constitute a material breach of the Contract.
- 4. If you fail to maintain the SLBE-ELBE participation listed at the time the Contract is awarded and have not received prior approval from the City, the

City may declare you in default and will be considered grounds for debarment under Chapter 2, Article 2, Division 8, of the San Diego Municipal Code.

G. SUBCONTRACTING EFFORTS REVIEW AND EVALUATION.

- Documentation of your subcontracting efforts will be reviewed by EOCP to verify that you made subcontracting opportunities available to a broad base of qualified Subcontractors, negotiated in good faith with interested Subcontractors, and did not reject any bid for unlawful discriminatory reasons. The EOCP review is based on the federal "Six Good Faith Efforts" model.
- 2. The GFEs are required methods to ensure that all ELBE and SLBE firms have had the opportunity to compete for the City's Public Works procurements. The Six Good Faith Efforts, also known as affirmative steps, attract and utilize ELBE and SLBE firms:
 - a) Ensure ELBE firms are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities.
 - b) Make information of forthcoming opportunities available to SLBE-ELBE firms and arrange time for Contracts and establish delivery schedules, where requirements permit, in a way that encourages and facilitates participation by SLBE-ELBE firms in the competitive process. This includes posting solicitations for Bids or proposals to SLBE-ELBE firms for a minimum of 10 Working Days before the Bid or Proposal due date.
 - c) Consider in the contracting process whether firms competing for large Contracts could subcontract with SLBE-ELBE firms.
 - d) Encourage contracting with a consortium of ELBE-SLBE firms when a Contract is too large for one of these firms to handle individually.
 - e) Use the services and assistance of the City's EOC Office and the SLBE-ELBE Directory.
 - f) If you award subcontracts, require your Subcontractors to take the steps listed above.

H. GOOD FAITH EFFORT DOCUMENTATION.

1. If the specified SLBE-ELBE Subcontractor participation percentages are not met, you shall submit information necessary to establish that adequate GFEs were taken to meet the Contract Subcontractor participation percentages. See the City's document titled "Small Local Business (SLBE) Program, INSTRUCTIONS FOR BIDDERS COMPLETING THE GOOD FAITH EFFORT SUBMITTAL." The instructions for completing the good faith effort submittal can be found on the City's website:

https://www.sandiego.gov/sites/default/files/legacy/eoc/pdf/slbegfeinst.pdf

I. SUBCONTRACTOR SUBSTITUTION.

1. Evidence of fraud or discrimination in the substitution of Subcontractors will result in sanctions including assessment of penalty fines, termination of Contract, or debarment. This section does not replace applicable California Public Contract Code.

J. FALSIFICATION OF SUB-AGREEMENT AND FRAUD.

1. Falsification or misrepresentation of a sub-agreement as to company name, Contract amount or actual Work performed by Subcontractors, or any falsification or fraud on the part your submission of documentation and forms pursuant to this program, will result in sanctions against you including assessment of penalty fines, termination of the Contract, or debarment. Instances of falsification or fraud which are indicative of an attempt by you to avoid subcontracting with certain categories of Subcontractors on the basis of race, gender, gender expression, gender identity, religion, national origin, ethnicity, sexual orientation, age, or disability shall be referred to the Equal Opportunity Contracting Program's Investigative Unit for possible violations of Article 2, Division 35 of the City Administrative Code, §§22.3501 et seq. (Nondiscrimination in Contracting).

K. RESOURCES.

1. The current list of certified SLBE-ELBE firms and information for completing the GFE submittal can be found on the City's EOC Department website:

http://www.sandiego.gov/eoc/programs/slbe.shtml

ATTACHMENT D

PREVAILING WAGE

PREVAILING WAGE

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

- 1.3. Payroll Records. Contractor and its subcontractors shall comply with California Labor Code section 1776, which generally requires keeping accurate payroll records, verifying and certifying payroll records, and making them available for inspection. Contractor shall require its subcontractors to also comply with section 1776. Contractor and its subcontractors shall submit weekly certified payroll records online via the City's web-based Labor Compliance Program. Contractor is responsible for ensuring its subcontractors submit certified payroll records to the City.
 - **1.3.1.** Contractor and their subcontractors shall also furnish records specified in Labor Code section 1776 directly to the Labor Commissioner in the manner required by Labor Code section 1771.4.
- **1.4. Apprentices.** Contractor and its subcontractors shall comply with California Labor Code sections 1777.5, 1777.6 and 1777.7 concerning the employment and wages of apprentices. Contractor is held responsible for the compliance of their subcontractors with sections 1777.5, 1777.6 and 1777.7.
- 1.5. Working Hours. Contractor and their subcontractors shall comply with California Labor Code sections 1810 through 1815, including but not limited to: (i) restrict working hours on public works contracts to eight hours a day and forty hours a week, unless all hours worked in excess of 8 hours per day are compensated at not less than 1½ times the basic rate of pay; and (ii) specify penalties to be imposed on contractors 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.
- **1.6. Required Provisions for Subcontracts.** Contractor shall include at a minimum a copy of the following provisions in any contract they enter into with a subcontractor: California Labor Code sections 1771, 1771.1, 1775, 1776, 1777.5, 1810, 1813, 1815, 1860 and 1861.
- 1.7. Labor Code Section 1861 Certification. Contractor in accordance with California Labor Code section 3700 is required to secure the payment of compensation of its employees and by signing this Contract, Contractor certifies that "I am aware of the provisions of Section 3700 of the California Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this Contract."
- **1.8. Labor Compliance Program**. The City has its own Labor Compliance Program authorized in August 2011 by the DIR. The City will withhold contract payments when payroll records are delinquent or deemed inadequate by the City or other governmental entity, or it has been established after an investigation by the City or other governmental entity that underpayment(s) have occurred. For questions or assistance, please contact the City of San Diego's Prevailing Wage Unit at 858-627-3200.

- 1.9. Contractor and Subcontractor Registration Requirements. This project is subject to compliance monitoring and enforcement by the DIR. A contractor or subcontractor shall not be qualified to bid on, be listed in a bid or proposal, subject to the requirements of section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, unless currently registered and qualified to perform public work pursuant to Labor Code section 1725.5 It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by Section 7029.1 of the Business and Professions code or by Section 10164 or 20103.5 of the Public Contract Code, provided the contractor is registered to perform public work pursuant to Section 1725.5 at the time the contract is awarded.
 - **1.9.1.** A Contractor's inadvertent error in listing a subcontractor who is not registered pursuant to Labor Code section 1725.5 in response to a solicitation shall not be grounds for filing a bid protest or grounds for considering the bid non-responsive provided that any of the following apply: (1) the subcontractor is registered prior to bid opening; (2) within twenty-four hours after the bid opening, the subcontractor is registered and has paid the penalty registration fee specified in Labor Code section 1725.5; or (3) the subcontractor is replaced by another registered subcontractor pursuant to Public Contract Code section 4107.
 - **1.9.2.** 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 for themselves and all listed subcontractors to the City at the time of bid or proposal due date or upon request.
- **1.10. Stop Order.** For Contractor or its subcontractors engaging in the performance of any public work contract without having been registered in violation of Labor Code sections 1725.5 or 1771.1, the Labor Commissioner shall issue and serve a stop order prohibiting the use of the unregistered contractors or unregistered subcontractor(s) on ALL public works until the unregistered contractor or unregistered subcontractor(s) is registered. Failure to observe a stop order is a misdemeanor.
- 1.11. List of all Subcontractors. The Contractor shall provide the list of subcontractors (regardless of tier), along with their DIR registration numbers, utilized on this Contract prior to any work being performed; and the Contractor shall provide a complete list of all subcontractors with each invoice. Additionally, Contractor shall provide the City with a complete list of all subcontractors (regardless of tier) utilized on this contract within ten working days of the completion of the contract, along with their DIR registration numbers. The City shall withhold final payment to Construction Management Professional until at least thirty (30) days after this information is provided to the City.
- **1.12. Exemptions for Small Projects.** There are limited exemptions for installation, alteration, demolition, or repair work done on projects of \$25,000 or less. The Contractor shall still comply with Labor Code sections 1720 et. seq. The only recognized exemptions are listed below:
 - **1.12.1.** Registration. The Contractor will not be required to register with the DIR for small projects. (Labor Code section 1771.1).

- **1.12.2.** Certified Payroll Records. The records required in Labor Code section 1776 shall be required to be kept and submitted to the City of San Diego, but will not be required to be submitted online with the DIR directly. The Contractor will need to keep those records for at least three years following the completion of the Contract. (Labor Code section 1771.4).
- **1.12.3.** List of all Subcontractors. The Contractor shall not be required to hire only registered subcontractors and is exempt from submitting the list of all subcontractors that is required in section 1.11 above. (Labor code section 1773.3).

ATTACHMENT E

SUPPLEMENTARY SPECIAL PROVISIONS

SUPPLEMENTARY SPECIAL PROVISIONS

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

- 1. The **2021 Edition** of the Standard Specifications for Public Works Construction (The "GREENBOOK").
- 2. The **2021 Edition** of the City of San Diego Standard Specifications for Public Works Construction (The "WHITEBOOK"), including the following:
 - a) General Provisions (A) for all Construction Contracts.

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

1-2 TERMS AND DEFINITIONS. To the "WHITEBOOK", item 55, "Normal Working Hours", ADD the following:

The **Normal Working Hours** are **6:30 AM** to **3:30 PM**.

SECTION 2 - SCOPE OF THE WORK

- **2-2 PERMITS, FEES, AND NOTICES.** To the "WHITEBOOK", ADD the following:
 - 2. The City will obtain, at no cost to you, the following permits:
 - a) DSD Building Permit
 - b) SDFD TA Permit

The Contractor shall Schedule all Authority Having Jurisdictions (AHJ) inspections required to fulfill project permit requirements, including

Building and Fire Department inspections associated with City or County Building Permits,

Fire Protection Permits and Hazardous Materials Permitting

SECTION 3 - CONTROL OF THE WORK

- **SELF-PERFORMANCE.** To the "GREENBOOK", DELETE in its entirety and SUBSTITUTE with the following:
 - 1. You shall perform, with your own organization, Contract Work amounting to at least **40%** of the Base Bid.

SECTION 4 - CONTROL OF MATERIALS

- **4-6 TRADE NAMES.** To the "WHITEBOOK", ADD the following:
 - 11. You shall submit your list of proposed substitutions for an "equal" item **no**later than 5 Working Days after the issuance of the Notice of Intent to
 Award and on the City's Product Submittal Form available at:

https://www.sandiego.gov/ecp/edocref/

SECTION 5 - LEGAL RELATIONS AND RESPONSIBILITIES

- **5-3.3 Payroll Records.** To the "WHITEBOOK", DELETE in its entirety and SUBSTITUTE with the following:
 - 1. Your attention is directed to the City of San Diego Labor Compliance Program, Section IV, pages 4-7, and the State of California Labor Code §§1771.5(b) and 1776 (Stats. 1978, Ch. 1249). These require, in part, that you and your Subcontractors maintain and furnish to the City, at a designated time, a certified copy of each weekly payroll containing a statement of compliance signed under penalty of perjury.
 - 2. You and your Subcontractors shall submit weekly certified payrolls reflecting the wages of all yours and Subcontractors' employees engaged in the Work online via LCP Tracker, the City's web-based labor compliance program.
 - 3. You and your Subcontractors shall submit the following PLA and Labor Compliance required documents online via LCP Tracker, to the City's webbased labor compliance program:
 - a) Letter of Assent (PLA Attachment A);
 - b) Contractor Core Workforce Form (PLA Attachment B-2) [if required];
 - c) Monthly Proof of Fringe Benefit Payments to Union Trust;
 - d) City of San Diego Labor Compliance Authorized Signatory Form;
 - e) City of San Diego List of Trades Craft;
 - f) Labor Compliance Checklist;
 - g) Fringe Benefit Statement;
 - h) DAS 140 Form & Transmittal Confirmation;
 - i) DAS 142 or Workforce Dispatch Request Form (PLA Attachment B-1) & Transmittal Confirmation;
 - j) Certified Payroll Report (Performance Report with Statement of Compliance, Non-Performance Reports, Confirmation Report that CPR was uploaded to the DIR website);
 - k) State & Federal Apprentice Certifications;
 - l) Payroll Confirmations (as requested per CCR 16432);

m) Other Deduction Forms (letter or documentation relating to non-standard deductions).

ADD:

5-3.6 Project Labor Agreement (PLA). The Contractor and all subcontractors agree to be bound by the Project Labor Agreement (which is attached as Attachment F and incorporated by this reference) by submitting a Letter of Assent to the City's Labor Coordinator. The Contractor shall submit its Letter of Assent as a condition of award and all subcontractors shall submit their Letter of Assent Consent before commencing any Work on the Project.

5-4 INSURANCE. To the "GREENBOOK", DELETE in its entirety and SUBSTITUTE with the following:

5-4 INSURANCE.

1. The insurance provisions herein shall not be construed to limit your indemnity and defense duties set forth in the Contract.

5-4.1 Policies and Procedures.

- 1. You shall procure the insurance described below, at your sole cost and expense, to provide coverage against claims for loss including injuries to persons or damage to property, which may arise out of or in connection with the performance of the Work by you, your agents, representatives, officers, employees or Subcontractors.
- 2. Insurance coverage for property damage resulting from your operations is on a replacement cost valuation. The market value will not be accepted.
- 3. You shall maintain this insurance as required by this Contract and at all times thereafter when you are correcting, removing, or replacing Work in accordance with this Contract. Your duties under the Contract, including your indemnity obligations, are not limited to the insurance coverage required by this Contract.
- 4. If you maintain broader coverage or higher limits than the minimums shown below, City requires and shall be entitled to the broader coverage or the higher limits maintained by you. Any available insurance proceeds in excess of the specified minimum limits of insurance and coverage shall be available to City.
- 5. Your payment for insurance shall be included in the Contract Price you bid. You are not entitled to any additional payment from the City to cover your insurance, unless the City specifically agrees to payment in writing. Do not begin any Work under this Contract or allow any Subcontractors to begin work, until you have provided, and the City has approved, all required insurance.

6. Policies of insurance shall provide that the City is entitled to 30 days advance written notice of cancellation or non-renewal of the policy or 10 days advance written notice for cancellation due to non-payment of premium. Maintenance of specified insurance coverage is a material element of the Contract. Your failure to maintain or renew coverage and to provide evidence of renewal during the term of the Contract may be treated by the City as a material breach of the Contract.

5-4.2 Types of Insurance.

5-4.2.1 General Liability Insurance.

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

General Annual Aggregate Limit	Limits of Liability
Other than Products/Completed Operations	\$10,000,000
Products/Completed Operations Aggregate Limit	\$10,000,000
Personal Injury Limit	\$5,000,000
Each Occurrence	\$5.000.000

5-4.2.2 Commercial Automobile Liability Insurance.

- 1. You shall provide a policy or policies of Commercial Automobile Liability Insurance written on the current version of the ISO form CA 00 01 12 90 or later version or equivalent form providing coverage at least as broad in the amount of \$1,000,000 combined single limit per accident, covering bodily injury and property damage for owned, non-owned, and hired automobiles ("Any Auto").
- 2. All costs of defense shall be outside the limits of the policy.

5-4.2.3 Workers' Compensation Insurance and Employers Liability Insurance.

- 1. In accordance with the provisions of California Labor Code section 3700, you shall provide, at your expense, Workers' Compensation Insurance and Employers Liability Insurance to protect you against all claims under applicable state workers' compensation laws. The City, its elected officials, and employees will not be responsible for any claims in law or equity occasioned by your failure to comply with this requirement.
- 2. Statutory Limits shall be provided for Workers' Compensation Insurance as required by the state of California, and Employer's Liability Insurance with limits of no less than \$1,000,000 per accident for bodily injury or disease.
- 3. By signing and returning the Contract, you certify that you are aware of the provisions of California's Workers' Compensation laws, including Labor Code section 3700, which requires every employer to be insured against liability for workers' compensation or to undertake self-insurance, and that you will comply with these provisions before commencing the Work..

5-4.2.4 Contractors Pollution Liability Insurance.

- 1. You shall procure and maintain at your expense or require your Subcontractor, as described below, to procure and maintain Contractors Pollution Liability Insurance applicable to the Work being performed, with a limit no less than \$2,000,000 per claim or occurrence and \$4,000,000 aggregate per policy period of one year.
- 2. All costs of defense shall be outside the limits of the policy.
- 3. You shall obtain written approval from the City for any insurance provided by your Subcontractor instead of you.
- 4. For approval of a substitution of your Subcontractor's insurance, you shall certify that all activities for which the Contractors Pollution Liability Insurance will provide coverage will be performed exclusively by the Subcontractor providing the insurance. The deductible shall not exceed \$25,000 per claim unless the City has provided prior, written approval.
- Occurrence based policies shall be procured before the Work commences. Claims Made policies shall be procured before the Work commences, shall be maintained for the Contract Time, and shall include a 12-month extended Claims Discovery Period applicable to this contract or the existing policy or policies that shall continue to be maintained for 12 months after the completion of the Work without advancing the retroactive date.

5-4.2.6 Contractors Builders Risk Property Insurance.

1. You shall provide at your expense, and maintain until Final Acceptance of the Work, a Special Form Builders Risk Policy or Policies. This insurance shall be in an amount equal to the replacement cost of the completed Work (without deduction for depreciation) including the cost of excavations, grading, and

- filling. The policy or policies limits shall be 100 percent of the value of the Work under this Contract, plus 15 percent to cover administrative costs, design costs, and the costs of inspections and construction management.
- 2. Insured property shall include material or portions of the Work located away from the Site but intended for use at the Site and shall cover material or portions of the Work in transit. The policy or policies shall include as insured property scaffolding, falsework, and temporary buildings located at the Site. The policy or policies shall cover the cost of removing debris, including demolition.
- 3. The policy or policies shall provide that all proceeds shall be payable to the City as Trustee for the insured, and shall name the City, the Contractor, Subcontractors, and Suppliers of all tiers as named insured. The City, as Trustee, will collect, adjust, and receive all monies that become due and payable under the policy or policies, may compromise any and all claims, and will apply the proceeds of this insurance to the repair, reconstruction, or replacement of the Work.
- 4. Any deductible applicable to the insurance shall be identified in the policy or policies documents. The responsibility for paying the part of any loss not covered because of the deductibles shall be apportioned among the parties, except for the City, as follows: if there is more than one claimant for a single occurrence, then each claimant shall pay a pro-rata share of the per occurrence deductible based upon the percentage of their paid claim to the total paid for insured. The City shall be entitled to 100 percent of its loss. You shall pay the City any portion of the loss not covered because of a deductible; at the same time the proceeds of the insurance are paid to the City as Trustee.
- 5. Any insured, other than the City, making claim to which a deductible applies shall be responsible for 100 percent of the loss not insured because of the deductible.

5-4.2.8 Architects and Engineers Professional Insurance (Errors and Omissions Insurance).

- 1. For Contracts with required engineering services, including <u>Design-Build</u> and preparation of engineered Traffic Control Plans (TCP) by you, you shall keep or require all of your employees and Subcontractors, who provide professional engineering services under Contract, to provide to the City proof of Professional Liability coverage with a limit of no less than \$1,000,000 per claim and \$2,000,000 aggregate per policy period of one year.
- 2. You shall ensure the following:
 - a) The policy retroactive date is on or before the date of commencement of the Project.
 - b) The policy will be maintained in force for a period of three years after completion of the Project or termination of the Contract, whichever occurs last. You agree that, for the time period specified above, there

will be no changes or endorsements to the policy that affect the specified coverage.

- 3. If professional engineering services are to be provided solely by the Subcontractor, you shall:
 - a) Certify this to the City in writing, and
 - b) Agree in writing to require the Subcontractor to procure Professional Liability coverage in accordance with the requirements set forth here.
- **S-4.3 Rating Requirements.** Except for the State Compensation Insurance Fund, all insurance required by this Contract shall be carried only by responsible insurance companies with a rating of, or equivalent to, at least "A-, VI" by A.M. Best Company, that are authorized by the California Insurance Commissioner to do business in the state of California, and that have been approved by the City.
- **5-4.3.1 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 of California and is included on the List of Approved Surplus Lines Insurers (LASLI list).

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

- **5-4.4 Evidence of Insurance.** You shall furnish the City with original Certificates of Insurance, including all required amendatory endorsements (or copies of the applicable policy language effecting coverage required by this clause), prior to your commencement of Work under this Contract. In addition, The City reserves the right to require complete, certified copies of all required insurance policies, including endorsements, required by these specifications, at any time.
- 5-4.5 Policy Endorsements.
- 5-4.5.1 Commercial General Liability Insurance.
- **Additional Insured.** To the fullest extent permitted by law and consistent with the limiting provisions set forth at California Civil Code section 2782, California Insurance Code section 11580.04, and any applicable successor statutes limiting indemnification of public agencies that bind the City, the policy or policies shall be endorsed to include as an Additional Insured the City and its respective elected officials, officers, employees, agents, and representatives, with respect to liability arising out of:
 - i. Ongoing operations performed by you or on your behalf,
 - ii. your products,
 - iii. your work, e.g., your completed operations performed by you or on your behalf, or
 - iv. premises owned, leased, controlled, or used by you.

- 5-4.5.1.2 **Primary and Non-Contributory Coverage.** The policy shall be endorsed to provide that the coverage with respect to operations, including the completed operations, if appropriate, of the Named Insured is primary to any insurance or self-insurance of the City and its elected officials, officers, employees, agents and representatives. Further, it shall provide that any insurance maintained by the City and its elected officials, officers, employees, agents and representatives shall be in excess of your insurance and shall not contribute to it.
- **5-4.5.1.3 Project General Aggregate Limit.** The policy or policies shall be endorsed to provide a Designated Construction Project General Aggregate Limit that will apply only to the Work. Only claims payments which arise from the Work shall reduce the Designated Construction Project General Aggregate Limit. The Designated Construction Project General Aggregate Limit shall be in addition to the aggregate limit provided for the products-completed operations hazard.
- 5-4.5.2 Workers' Compensation Insurance and Employers Liability Insurance.
- **5-4.5.2.1 Waiver of Subrogation.** The policy or policies shall be endorsed to provide that the insurer will waive all rights of subrogation against the City and its respective elected officials, officers, employees, agents, and representatives for losses paid under the terms of the policy or policies and which arise from Work performed by the Named Insured for the City.
- 5-4.5.3 Contractors Pollution Liability Insurance Endorsements.
- **5-4.5.3.1 Additional Insured.** To the fullest extent permitted by law and consistent with the limiting provisions set forth at California Civil Code section 2782, California Insurance Code section 11580.04, and any applicable successor statutes limiting indemnification of public agencies that bind the City, the policy or policies shall be endorsed to include as an Additional 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.
- **5-4.5.3.2 Primary and Non-Contributory Coverage.** The policy or policies shall be endorsed to provide that the insurance afforded by the Contractors Pollution Liability Insurance policy or policies is primary to any insurance or self-insurance of the City and its elected officials, officers, employees, agents and representatives with respect to operations including the completed operations of the Named Insured. Any insurance

maintained by the City and its elected officials, officers, employees, agents and representatives shall be in excess of your insurance and shall not contribute to it.

- **Severability of Interest.** For Contractors Pollution Liability Insurance, the policy or policies shall provide that your insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability and shall provide cross-liability coverage.
- 5-4.5.5 Builders Risk Endorsements.
- **5-4.5.5.1 Waiver of Subrogation.** The policy or policies shall be endorsed to provide that the insurer will waive all rights of subrogation against the City, and its respective elected officials, officers, employees, agents, and representatives for losses paid under the terms of the policy or policies and that arise from Work performed by the Named Insured for the City.
- **5-4.5.2 Builders Risk Partial Utilization.** If the City desires to occupy or use a portion or portions of the Work prior to Acceptance,, the City will notify you, and you shall immediately notify your Builder's Risk insurer and obtain an endorsement that the policy or policies shall not be cancelled or lapse on account of any use or occupancy. You shall obtain the endorsement prior to the City's occupation and use.
- 5-4.6 Deductibles and Self-Insured Retentions. You shall disclose deductibles and self-insured retentions to the City at the time the evidence of insurance is provided. The City may require you to purchase coverage with a lower retention or provide proof of ability to pay losses and related investigations, claim administration, and defense expenses within the retention. The policy language shall provide, or be endorsed to provide, that the self-insured retention may be satisfied by either the named insured or City.
- **S-4.7 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.
- **Notice of Changes to Insurance.** You shall notify the City, in writing, 30 days prior to any material change to the policies of insurance provided under this Contract. This written notice is in addition to the requirements of paragraph 8 of Section 5-4.1. Policies of insurance shall provide that the City is entitled to 30 days advance written notice of cancellation or non-renewal of the policy or 10 days advance written notice for cancellation due to non-payment of premium. Maintenance of specified insurance coverage is a material element of the Contract. Your failure to maintain or renew coverage and to provide evidence of renewal during the term of the Contract may be treated by the City as a material breach of the Contract.

5-4.9 Excess Insurance. Policies providing excess coverage shall follow the form of the primary policy or policies, including, all endorsements.

SECTION 6 - PROSECUTION AND PROGRESS OF THE WORK

- **6-1.1 Construction Schedule.** To the "WHITEBOOK", ADD the following:
 - 3. Refer to the Sample City Invoice materials in **Appendix D Sample City Invoice with Cash Flow Forecast** and use the format shown.
- **6-1.5.2 Excusable Non-Compensable Delays.** To the "WHITEBOOK", Item 1, ADD the following:
 - d) Delays caused by State or County Health Department orders in response to COVID-19.

ADD:

6-6.1.1 Environmental Document.

- The City of San Diego has prepared a Notice of Exemption for PQPS
 Oxygenation System (Penasquitos Pump Station Oxygen Addition
 System), Project No. B-21001, as referenced in the Contract Appendix. You
 shall comply with all requirements of the Notice of Exemption as set forth in
 Appendix A.
- 2. Compliance with the City's environmental document shall be included in the Contract Price, unless separate bid items have been provided.

SECTION 7 - MEASUREMENT AND PAYMENT

- **7-3.11** Compensation Adjustments for Price Index Fluctuations. To the "WHITEBOOK", ADD the following:
 - 5. This Contract is not subject to the provisions of The "WHITEBOOK" for Compensation Adjustments for Price Index Fluctuations for paving asphalt.

SECTION 306 - OPEN TRENCH CONDUIT CONSTRUCTION

- **306-7.8.2.1 General.** To the "WHITEBOOK", item 2, DELETE in its entirety and SUBSTITUTE with the following:
 - 2. Pressure testing of pipe and fittings at the lowest elevation shall be performed at 150% of the specified test pressure and no less than 100% of the specified test pressure at the highest elevation.
 - a) Specified test pressure for Class 235 pipe shall be 150 psi and is tested at 225 psi.
 - b) Specified test pressure for Class 305 pipe shall be 200 psi and is tested at 300 psi.

SECTION 1001 - CONSTRUCTION BEST MANAGEMENT PRACTICES (BMPs)

1001-1 GENERAL. To the "WHITEBOOK", ADD the following:

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

TECHNICALS



PENASQUITOS PUMP STATION OXYGENATION SYSTEM ISSUED FOR CONSTRUCTION

SPECIFICATIONS

APRIL 2022

REVISED JULY 2022





451 A STREET, SUITE 1500, SAN DIEGO, CALIFORNIA, 92101 (858) 514-8822

THIS PAGE INTENTIONALLY LEFT BLANK

PURE WATER TASK ORDER 44 PENASQUITOS PUMP STATION OXYGENATION SYSTEM

TECHNICAL SPECIFICATIONS

THIS PAGE LEFT INTENTIONALLY BLANK

PURE WATER TASK ORDER 44 PQPS OXYGENATION SYSTEM LIST OF SPECIFICATIONS

<u>SECTION</u>	<u>TITLE</u>
DIVISION 01	GENERAL REQUIREMENTS
01 11 00	SUMMARY OF WORK
01 29 00	PAYMENT PROCEDURES
01 31 13	PROJECT COORDINATION
01 31 19	PROJECT MEETINGS
01 32 00	CONSTRUCTION PROGRESS DOCUMENTATION
01 33 00	SUBMITTAL PROCEDURES
01 33 22	WEB BASED CONSTRUCTION DOCUMENT MANAGEMENT
01 43 33	MANUFACTURERS' FIELD SERVICES
01 45 16.13	CONTRACTOR QUALITY CONTROL
01 45 33	SPECIAL INSPECTION, OBSERVATION, AND TESTING
01 50 00	TEMPORARY FACILITIES AND CONTROLS
01 61 00	COMMON PRODUCT REQUIREMENTS
01 73 24	DESIGN REQUIREMENTS FOR NON-STRUCTURAL
	COMPONENTS AND NON-BUILDING STRUCTURES
01 74 19	CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
01 77 00	CLOSEOUT PROCEDURES
01 78 23	OPERATION AND MAINTENANCE DATA
01 88 15	ANCHORAGE AND BRACING
01 91 14	TESTING AND STARTUP
01 99 90	REFERENCE FORMS
DIVISION 03	CONCRETE
03 30 00	CAST-IN-PLACE CONCRETE
03 62 13	NON-METALLIC NON-SHRINK GROUT
DIVISION 05	METALS
05 05 14	HOT-DIP GALVANIZING
05 05 19	POST-INSTALLED CONCRETE ANCHORS
05 12 00	STRUCTURAL STEEL
DIVISION 09	FINISHES
09 90 00	PAINTING AND COATING
DIVISION 26	ELECTRICAL
26 05 00	COMMON WORK RESULTS FOR ELECTRICAL
26 05 19	LOW-VOLTAGE ELECTRICAL CONDUCTORS AND CABLES
26 05 33	RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
26 05 74	ARC FLASH ANALYSIS, SHORT CIRCUIT STUDY

APRIL 2022 ATTACHMENT E - TECHNICALS SPECIFICATION TABLE OF CONTENTS

ı

PURE WATER TASK ORDER 44 PQPS OXYGENATION SYSTEM LIST OF SPECIFICATIONS

<u>SECTION</u>	<u>TITLE</u>
	PROTECTIVE DEVICE COORDINATION REPORT
26 08 00	COMMISSIONING OF ELECTRICAL SYSTEMS
26 09 16	ELECTRICAL CONTROLS AND RELAYS
26 24 13	SWITCHBOARDS
26 24 16	PANELBOARDS
26 27 26	WIRING DEVICES
26 29 13	ENCLOSED CONTROLLERS
26 29 23	VARIABLE FREQUENCY MOTOR CONTROLLERS
DIVISION 40	PROCESS INTEGRATION
40 05 01	PIPING SYSTEMS
40 05 02	PIPING SYSTEM SCHEDULES
40 05 02.05	COMPRESSED AIR AND VENT
40 05 02.11	OXYGEN GAS
40 05 02.43	PRESSURIZED WASTEWATER AND DRAINAGE
40 05 02.89	BUILDING MECHANICAL DRAINAGE
40 05 06.16	PIPING CONNECTIONS
40 05 06.23 40 05 06.33	EXPANSION JOINTS AND FLEXIBLE METAL HOSE PIPING APPURTENANCES
40 05 07	HANGERS AND SUPPORTS FOR PROCESS PIPING
40 05 07.13	SEISMIC RESTRAINTS FOR PIPING
40 05 23	STAINLESS STEEL PROCESS PIPE AND TUBING
40 05 24	STEEL PROCESS PIPE
40 05 31	THERMOPLASTIC PROCESS PIPE
40 05 57.13	MANUAL ACTUATORS
40 05 60	VALVES
40 05 62.16	ECCENTRIC PLUG VALVES FOR LIQUID SERVICE
40 05 63.02	BALL VALVE, BRONZE/BRASS, FULL PORT
40 05 65.01 40 05 65.23	CHECK VALVE, BRONZE SWING SWING CHECK VALVES
40 05 78.23	AIR/VACUUM VALVES FOR WASTEWATER SERVICE
40 06 70	SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEM
40 61 13	PROCESS CONTROL SYSTEM GENERAL PROVISIONS
40 61 21	PROCESS CONTROL SYSTEM TESTING
40 61 93	PROCESS CONTROL SYSTEM INPUT/OUTPUT LIST
40 71 00	FLOW MEASUREMENT
40 72 00	LEVEL MEASUREMENT
40 73 00 40 74 00	PRESSURE, STRAIN AND FORCE MEASUREMENT TEMPERATURE MEASUREMENT
40 76 00	PROCESS GAS ANALYTICAL MEASUREMENT

APRIL 2022 ATTACHMENT E - TECHNICALS SPECIFICATION TABLE OF CONTENTS

Ш

PURE WATER TASK ORDER 44 PQPS OXYGENATION SYSTEM LIST OF SPECIFICATIONS

<u>SECTION</u>	<u>TITLE</u>
DIVISION 43	PROCESS GAS AND LIQUID HANDLING, PURIFICATION, AND STORAGE
43 05 13	RIGID EQUIPMENT MOUNTS
43 05 14	MACHINE ALIGNMENT
43 05 21	COMMON MOTOR REQUIREMENTS FOR EQUIPMENT
43 23 03	GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS
43 23 89.13	HORIZONTAL VARIABLE SPEED NON-CLOG CENTRIFUGAL PUMPS
DIVISION 46	WATER AND WASTEWATER EQUIPMENT
46 31 59	OXYGEN CLEANING
46 51 50	OXYGENATION SYSTEM

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE INTENTIONALLY LEFT BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS SPECIFICATION TABLE OF CONTENTS VI

SECTION 01 11 00 SUMMARY OF WORK

PART 1 GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

- A. The completed Work will provide Owner with a system that uses on-site oxygen generation including a proprietary oxygen saturation system for the injection of high purity oxygen into the Penasquitos Pump Station effluent and includes, but is not limited to the work items below, as more fully described in the Drawings (40933-D) and the technical specifications. Contactor shall determine most effective order in performing the listed work.
 - 1. Temporary drain forcemain to facilitate piping connections and empty the pump station wet well for duration of piping work (night work may be required).
 - 2. Construct pump pedestal, provide and install side stream pump and motor in pump room (Level D). Make connections to wet well pump suction piping and connect pump discharge piping to raw sewer header.
 - 3. Construct modifications to existing equipment pad, provide and install oxygenation pressure vessel, appurtenances, and control panel in motor room (Level B). Make all necessary piping and wiring connections.
 - Construct new equipment pads. Provide and install pressure swing absorption unit, oxygen storage tank, oxygen buffer tank, oxygen pressure booster, and related appurtenances in work area (Level A) including connection to the sewer force main.
 - 5. Construct new equipment pads. Provide and install air compressor, noise enclosure, weather canopy, and compressed air storage tank. Make all necessary piping connection (Level A Outside blower building).
 - 6. Provide and install compressed air piping connecting compressed air storage tank to oxygenation system. (Outside through odor control and chemical areas).
 - 7. Perform the following electrical and instrumentation work:
 - a. Provide and install new switchboard and mini-power zone to provide power to new loads as shown on electrical drawings. New switchboard shall connect to existing switchboard within Penasquitos Pump Station electrical room.
 - b. Provide required connections to all power and control/instrumentation loads within project scope from source until final termination.
 - c. At Kika Court vault, Contractor shall install off-gas oxygen sensor and associated piping and coalescing filter, provide RTU, and construct 120V power feeds, for 120V off-gas oxygen sensors and RTU, conduits, wiring, and associated appurtenances based on existing field conditions. Underground buried Conduits shall be PVC coated RGS.
 - 8. Provide and install interconnection of vendor equipment. Provide connection between vendor equipment and existing DCS at the station.

APRIL 2022 SUMMARY OF WORK

ATTACHMENT E - TECHNICALS

01 11 00 - 1

- 9. Conduct all tests described in Attachment E, Section 01 91 14 TESTING AND STARTUP.
- 10. Modify existing van accessible parking stall as shown on the Drawings. Refer to Sheet C-3 (40933-07-D).
- 1.02 OWNER-FURNISHED PRODUCTS (NOT USED)
- 1.03 PRE-SELECTED PRODUCTS
 - A. Refer to Section 01 31 13 PROJECT COORDINATION.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS SUMMARY OF WORK

01 11 00 - 2

SECTION 01 29 00 PAYMENT PROCEDURES

PART 1 GENERAL

1.01 WORK REQUIRED OF THIS SECTION

- A. Payment for the various items of the Bid Schedule, as further specified herein, shall include all compensation to be received by the Contractor for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor and services, operations, and incidentals appurtenant to the items of Work being described here and within the plans, specifications, and Contract Documents, as necessary to complete the various items of the Work all in accordance with the requirements of the Contract Documents, including all appurtenances thereto, and including all costs of permits and cost of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the California Division of Industrial Safety and the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA). No separate payment will be made for any item that is not specifically set forth in the Bid Schedule, and all costs therefore shall be included in the Contract Price.
- B. Work shall include all electrical, mechanical, HVAC, plumbing, instrumentation and control, structural, coatings, and architectural work required to support each Bid Item.

1.02 RELATED SECTIONS

- A. The Work of the following Section applies to Work of this Section. Other Sections of the Work not referenced below shall also apply to the extent required for proper performance of the Work.
 - 1. Bid Schedule.
 - 2. Section 01 32 00, CONSTRUCTION PROGRESS DOCUMENTATION.

1.03 SUBMITTALS

A. Informational Submittals:

- Schedule of Values: Submit based on a roll up of the cost-loaded schedule described in Section 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION.
- 2. Schedule of Estimated Progress Payments: Submit based on current approved Schedule of Values.
- 3. Record Drawing Red-lines: Update and deliver monthly as required by Construction Manager.
- 4. Application for Payment: Submit on Owner's form.
- 5. Final Application for Payment.

APRIL 2022

PAYMENT PROCEDURES

ATTACHMENT E - TECHNICALS

1.04 CASH ALLOWANCES

- A. Cash allowances will be administered in accordance with the Contract requirements.
- B. Submit, with application for payment, invoice showing the date of purchase, labor costs, expenses, and the total price for all allowance items.
- C. Cash allowances shall be paid based on actual work performed up to the amount listed in the Bid Schedule. The Owner shall authorize the use of the cash allowances on an as needed basis.
- D. Cash allowances are further described as:
 - 1. Integration Period.
 - 2. Contingency (Field Orders)
 - 3. Building Permit Fees.
 - 4. SWPPP Fee

1.05 SCHEDULE OF VALUES

- A. Prepare a separate Schedule of Values for each schedule of the Work under the Agreement, using the Cost ID activity code specified in Section 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION.
- B. Upon request of Construction Manager, provide documentation to support the accuracy of the Schedule of Values.
- C. Unit Price Work: Reflect unit price quantity and price breakdown from conformed Bid Form

D. Limitations:

1. The values of the activities listed below are limited as indicated. The limit is the percent of the Contract Price.

ACTIVITY	LIMIT
Mobilization	3.0 Percent maximum
Contractor Quality Control Program	1.0 Percent-minimum
Baseline Schedule Approval	0.5 Percent
O&M Data (Manuals)	1.0 Percent-minimum
Functional Testing	1.5 Percent-minimum
Performance Testing	1.0 Percent-minimum
Project Record Documents	0.5 Percent-minimum
Demobilization	0.25 Percent-minimum

2. Mobilization: Payment for mobilization work shall be distributed equally over the first 2 progress payments up to the bid amount of the Mobilization bid item (per Whitebook 7-3.4.1). Mobilization includes:

APRIL 2022

PAYMENT PROCEDURES

ATTACHMENT E - TECHNICALS

- a. Project manager on site full time.
- b. Construction equipment for activities for first month on site.
- c. Fire protection established.
- d. Construction yard setup with storage and maintenance facilities and utilities setup.
- e. Safety Plan submitted and required notices posted.
- f. Initial Quality Control Plan submitted.
- g. QC Manager on site full time.
- h. Permits acquired.
- 3. Contractor Quality Control Program: Payment for Contractor Quality Control will be prorated based on progress towards project completion.
- 4. Baseline Schedule Approval: Payment will be made on approval of the Baseline schedule as specified in Section 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION.
- 5. O&M Data (Manuals):
 - a. The Contractor and Construction Manager shall meet to determine the total number of O&M Data (Manuals) for the contract. The value of the O&M Data shall be distributed equally across the total number of O&M Data for the contract.
 - b. A Draft, Draft-Final and Final submittal is required for each O&M Data (Manual). The Draft, Draft-Final and Final submittals will be assigned 50%, 25% and 25%, respectively of the calculated value for each Manual. Payment will be made upon acceptance of each submittal.
- 6. Functional Testing: Payment will be prorated based upon completion of the functional testing activities. Refer to Section 01 91 14 TESTING AND STARTUP for details on functional testing activities.
- 7. Performance Testing: Payment will be pro-rated based upon completion of all performance testing activities as described in the Section 01 91 14 TESTING AND STARTUP.
- 8. Project Record Documents: Progress payments for project record (as-built) documentation will be made based on the estimated percent complete of the quantity of documents submitted.
- 9. Demobilization:
 - a. Submittal of warranties.
 - b. Removal of construction equipment.
 - c. Removal of field office, construction yards and related facilities, utilities and project signs.
 - d. Cleanup and disposal of materials, supplies, equipment and debris.
 - e. Restoration of areas, roads and other facilities damaged or altered as a result of the Work.
- E. An unbalanced or front-end loaded schedule will not be acceptable. Acceptable Schedule of Values will be required prior to submittal of first Application for Payment.

APRIL 2022

PAYMENT PROCEDURES

ATTACHMENT E - TECHNICALS

- F. Summation of the complete Schedule of Values representing all the Work shall equal the Contract Price.
- G. Use Schedule of Values Form provided by Owner.
- H. Schedule of Values shall correlate with cost-loaded construction schedule.

1.06 APPLICATION FOR PAYMENT

- A. Transmittal Summary Form: Attach one Summary Form with each detailed Application for Payment for each schedule and include Request for Payment of Materials and Equipment on Hand as applicable. Execute certification by authorized officer of Contractor.
- B. Use detailed Application for Payment Form provided by Owner.
- C. Provide separate form for each schedule as applicable.
- D. Include accepted Schedule of Values for each schedule or portion of lump sum Work and the unit price breakdown for the Work to be paid on a unit priced basis.
- E. Include separate line item for each Change Order and Work Change Directive executed prior to date of submission. Provide further breakdown of such as requested by Construction Manager.

F. Preparation:

- 1. Round values to nearest dollar.
- 2. Submit Application for Payment, including a Transmittal Summary Form and detailed Application for Payment Form(s) for each schedule as applicable, a listing of materials on hand for each schedule as applicable, and such supporting data as may be requested by Construction Manager.
- G. Progress payments do not constitute acceptance of the Work or a waiver of any terms or conditions of the Contract.

1.07 PAYMENT - GENERAL

- A. Payment for all Lump Sum Work shown or specified in Contract Documents is included in the Contract Price. Payment will be based on a percentage complete basis for each line item of the accepted Schedule of Values.
- B. Payment for the various items of the Bid Schedule, as further specified herein, shall include all compensation to be received by the Contractor for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor and services, operations, and incidentals appurtenant to items of Work being described here and within the plans, specifications, and Contract Documents, as necessary to complete the various items of the Work all in accordance with the requirements of the Contract Documents, including all appurtenances thereto, and including all costs of permits and cost of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the California

APRIL 2022

PAYMENT PROCEDURES

ATTACHMENT E - TECHNICALS

Division of Industrial Safety and the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA). No separate payment will be made for any item that is not specifically set forth in the Bid Schedule, and all costs therefore shall be included in the contract price.

C. Payment for Procured Equipment:

- Payment for procured equipment is divided into two types of equipment: Major Equipment as identified in Attachment 1 List of Major Equipment, and all other procured equipment. Major Equipment will be paid according to the following milestones:
 - a. Purchase Order = 5%. An executed purchase order must accompany the payment request.
 - b. Submittal Acceptance = 5%. Approval of the equipment submittal is required prior to payment of this amount.
 - c. Fabrication = 65%. Fabrication, including factory testing, may be paid in part provided adequate documentation is presented and accepted at the monthly Schedule Preview Meeting.
 - d. Delivery = 10%. Proof of onsite delivery (or proper handling of stored materials) must accompany the payment request.
 - e. Pre-Operational Checkouts/Installation Certification = 10%. Proof of Installation Certification by the Manufacturer must accompany the payment request.
 - f. Operational Checkouts/Performance Verification = 5%. Documentation of successful operational checkouts/performance verification must be provided.
 - g. The sum of items listed above shall not exceed the documented quotation amount or invoice amount.
- 2. All other equipment (i.e., non-Major Equipment) will be paid upon submittal and acceptance of the required documents, including:
 - a. Paid invoices and proof of payment for materials on hand.
 - b. Proof of proper storage or stored materials.
 - c. Quantity verification (load tickets, etc.).
 - d. Any required certifications.

1.08 NONPAYMENT FOR REJECTED OR UNUSED PRODUCTS

- A. Payment will not be made for following:
 - 1. Loading, hauling, and disposing of rejected material.
 - Quantities of material wasted or disposed of in manner not called for under Contract Documents.
 - 3. Rejected loads of material, including material rejected after it has been placed by reason of failure of Contractor to conform to provisions of Contract Documents.
 - 4. Material not unloaded from transporting vehicle.
 - 5. Defective Work not accepted by Owner.

APRIL 2022

PAYMENT PROCEDURES

ATTACHMENT E - TECHNICALS

6. Material remaining on hand after completion of Work.

1.09 RETENTION

- A. The Owner shall retain a percentage of each progress payment in accordance with Section 7-3 Partial and Final Payment of Part 1 Special Provisions General of the Contract Documents. The retained amount is available for the protection and payment of the person(s), mechanics, subcontractors, or materialmen who perform labor upon the Contract or Work thereunder, and the persons who supply such person(s), or subcontractors with components and supplies for carrying on such Work.
- B. Pursuant to Section 22300 of the Public Contract Code of the State of California. the Contractor has the option, at its expense, to deposit securities with an Escrow Agent as a substitute for retention earnings required to be withheld by the City. Securities eligible for such substitution are bank or savings and loans certificates of deposit or such securities which are eligible for investment pursuant to Government Code Section 16430. As to any such security or securities so substituted for monies withheld, the Contractor shall be the beneficial owner of same and shall receive any interest thereon. Such security shall, at the request and expense of the Contractor, be deposited with the City or with a State or Federally Chartered bank as the escrow agent who shall pay such monies to the Contractor upon notification by the City that payment can be made. Such notification will be given at the expiration of 35 days from the date of acceptance of the work, or as prescribed by law, provided however, that there will be a continued retention of the necessary securities to cover such amounts as are required by law to be withheld by properly executed and filed notices to stop payment, or as may be authorized by the Contract to be further retained.

1.10 MEASUREMENT AND PAYMENT

A. Bonds

1. Payment is made for this Item per Section 1-7.2.1 of the City Whitebook.

B. Mobilization

1. Payment is made for this Item for mobilization as defined in the Part 1.05 (refer to Whitebook Section 7-3.4.1).

C. Penasquitos Pump Station (PQPS) Oxygenation System

 Payment is made for this item for the construction of the PQPS Oxygenation System. This item shall include a complete and operational system that uses on-site generation, and proprietary oxygen saturation systems for the injections of high purity oxygen into the PQPS effluent and includes all other appurtenant work necessary, in accordance with the special provisions, plans numbered 40933-D, and associated technical specifications. The work for Penasquitos Pump Station (PQPS) Oxygenation System includes all work not identified in the other bid items to provide a complete and workable system including but not limited to the Bid Items for "Excavation and Base at 18 inch Thick Equipment Pad ", "Concrete Equipment Pads – 6 inch Thick", Concrete

APRIL 2022

PAYMENT PROCEDURES

ATTACHMENT E - TECHNICALS

Equipment Pads – 18 inch Thick", "Misc. Concrete Work", "Misc. Structural Steel Work," "Misc. Exterior Improvements", "Misc. Equipment", "Electrical and Instrumentation", "Raw Sewage, Ductile Iron Pipe", "Oxygen Gas Pipe, Black Steel", "Compressed Air Pipe, Black Steel", "Vent Pipe, Black Steel", and "Drain Pipe, PVC".

D. Field Orders (EOC Type II) Allowance:

1. Payment is made for this item per Section 7-3.9 of the City Whitebook.

E. Oxygen Monitoring System

- 1. Payment is made for this item towards the Kika Court Vault work as described in Section 01 11 00 SUMMARY OF WORK Part 1.01-7.c
- 2. Payment under this bid item shall be made as the lump sum price named in the Bid Schedule.

F. Van Accessible Parking Modifications

- Payment is made for this item towards the Modification of existing Van Accessible Parking Stall as described in Section 01 11 00 SUMMARY OF WORK Part 1.01-A.11.
- 2. Payment under this bid item shall be made as the lump sum price named in the Bid Schedule.

G. Building Permit (EOC Type I) Fees Allowance

 Payment is made for this item from the allowance for building permit fees paid by the Contractor to the City in order to obtain and perfect permits associated with the PQPS Oxygenation System Work at site address 10150 Cara Way, San Diego, CA 92129. Payment for this item shall be made as an allowance amount named in the Bid Schedule.

H. Water Pollution Control Plan (WPCP) Development

- Payment is made for this item for the development of the WPCP. This item shall consist of a complete WPCP in compliance with the San Diego Storm Water Standards. Payment under this bid item shall be made as the lump sum price named in the Bid Schedule.
- 2. The Schedule of Values for the WPCP shall be itemized in accordance with Whitebook Section 1001-4.2..

I. WPCP Implementation

- 1. Payment is made for this item for the implementation of the WPCP. This item shall consist of a complete WPCP in compliance with the San Diego Storm Water Standards. Payment under this bid item shall be made as the lump sum price named in the Bid Schedule.
- 2. The Schedule of Values for the WPCP shall be itemized in accordance with Whitebook Section 1001-4.2.

APRIL 2022

PAYMENT PROCEDURES

ATTACHMENT E - TECHNICALS

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS PAYMENT PROCEDURES

SECTION 01 29 00 PAYMENT PROCEDURES ATTACHMENT 1 LIST OF MAJOR EQUIPMENT

Specification Section	Specific Product
46 51 50	Oxygenation System

APRIL 2022 ATTACHMENT E - TECHNICALS **PAYMENT PROCEDURES**

01 29 00.A1 - 1

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS PAYMENT PROCEDURES 01 29 00.A1 - 2

SECTION 01 31 13 PROJECT COORDINATION

PART 1 GENERAL

- 1.01 SUBMITTALS (NOT USED)
- 1.02 RELATED WORK AT SITE
 - A. Power:
 - 1. Work to be performed by Contractor:
 - a. Coordinate Contractor's Work with San Diego Gas & Electric.
 - b. Perform Work in accordance with San Diego Gas & Electric requirements and codes.

1.03 UTILITY NOTIFICATION AND COORDINATION

- A. Coordinate the Work with various utilities within Project limits. Notify applicable utilities prior to commencing Work, if damage occurs, or if conflicts or emergencies arise during the Work.
 - 1. Electricity Company: San Diego Gas & Electric.
 - a. Contact: Cathy Cavaletto
 - b. Telephone: 1-858-636-5786
 - 2. Telephone Company: AT&T
 - a. Contact: Chris Porter
 - b. Telephone: (858)-208-8375
 - 3. Public Utilities Department: City of San Diego
 - a. Contact Person: Anthony Van.
 - b. Telephone: (858) 292-6492
 - 4. Gas Company: San Diego Gas & Electric
 - a. Contact Person: Cathy Cavaletto
 - b. Telephone: 1-858-636-5786
 - 5. Building Department: City of San Diego
 - a. Contact Person: Chris Larson
 - b. Telephone: 619-446-5368
 - 6. Engineering and Capital Projects Department: City of San Diego
 - a. Construction Manager: To be assigned prior to NTP issuance

B. SDG&E Coordination:

 Contractor shall abide by SDG&E Standards, CPUC General Order 95, and OSHA requirements at all times. Work restrictions include (but are not limited to) the following:

APRIL 2022

PROJECT COORDINATION

ATTACHMENT E - TECHNICALS

- a. Boom-type lifting or hoisting equipment, including load, must maintain 20-ft horizontal clearance from medium-voltage (600V-50KV) conductors per SDG&E Standard OH 228.2.
 - 1) To reduce minimum distance to 10-ft, refer to OSHA requirements 1926.1408.
- b. All energized overhead facilities of any voltage classification shall have a minimum clearance of 10-ft measured horizontally and at a radius of 25-ft from an exposed tank, vent, or fill tube containing flammable or explosive mixtures per SDG&E Standard SD 019.
- c. Maintain the most restrictive minimum vehicle clearance of wires above thoroughfares per SDG&E Standard OH 224 or CPUC General Order 95 Rule 37 Table 1.
- d. Identify the work zone per OSHA requirements 1926.1408(A)(1).
- e. Contractor shall review the following to confirm the above list compiles with the latest requirements and any additional that may apply:
 - 1) SDG&E Standards: https://www.sdge.com/project-resources
 - 2) CPUC General Order 95: http://docs.cpuc.ca.gov/publisheddocs/published/g000/m146/k646/146 646565.pdf
 - 3) OSHA: <a href="https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table="standards.gov/pls/oshaweb/owadisp.show_document?p_table="standards.gov/pls/oshaweb/owadisp.show_document?p_table="standards.gov/pls/oshaweb/owadisp.show_document?p_table="standards.gov/pls/oshaweb/owadisp.show_document?p_table="standards.gov/pls/oshaweb/owadisp.show_document?p_table="standards.gov/pls/oshaweb/owadisp.show_document?p_table="standards.gov/pls/oshaweb/owadisp.show_document?p_table="standards.gov/pls/oshaweb/owadisp.show_document?p_table="standards.gov/pls/oshaweb/owadisp.show_document?p_table="standards.gov/pls/oshaweb/owadisp.show_document?p_table="standards.gov/pls/oshaweb/owadisp.show_document?p_table="standards.gov/pls/oshaweb/owadisp.show_document?p_table="standards.gov/pls/oshaweb/owadisp.show_document.gov/pls/oshaweb/

1.04 PROJECT MILESTONES

- A. General: Include the Milestones specified herein as a part of the Progress Schedule required under Section 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION.
- B. All items described in the table included in Section 01 91 14 TESTING AND STARTUP, 1.04 Organization of Startup Phases

1.05 WORK SEQUENCING/CONSTRAINTS

- A. Continuous operation of Owner's facilities is of critical importance. Schedule and conduct activities to enable existing facilities to operate continuously, unless otherwise specified. Work during hours other than normal working hours (e.g. nighttime) may be required to enable continuous operation of the existing facilities. Include the following work sequences in the Progress Schedule:
 - 1. Performance tests of all equipment and subsystems required to support the listed process system Functional Tests.
 - 2. Functional Tests of the following process systems:
 - a. Oxygen Generation System.
 - b. Oxygen Saturation System.
 - c. Sidestream Pump.

APRIL 2022

PROJECT COORDINATION

ATTACHMENT E - TECHNICALS

3. Installation, testing, and acceptance of all pipelines and utilities within the PQPS.

1.06 GENERAL SEQUENCING REQUIREMENTS

- A. Electrical installed before functional testing of any facility requiring electrical.
- B. Drainage functional before facility requiring drainage.
- C. New piping installed and tested up to tie-in point(s) before shutdown(s).

1.07 FACILITY OPERATIONS

- A. When necessary, plan, design, and provide various temporary services, utilities, connections, temporary piping and heating, access, and similar items to minimize interrupting operations of Owner's facility.
- B. Do not close lines, open or close valves, or take other action which would affect the operation of existing systems, except as specifically required by the Contract Documents and after authorization by Owner and Construction Manager. Such authorization will be considered within 48 hours after receipt of Contractor's written request.
- C. Process or Facility Shutdown and Operating Requirements:
 - 1. The following describes operating requirements and facilities which may be shutdown at some time during the Work:
 - a. Temporary draining of the forcemain, emptying of the pump station wetwell to facilitate piping connections, and other interruptions in the facility operation will be considered upon 48 hours written request to Owner and Construction Manager. Describe the Work, anticipated length of time, and areas and equipment affected. Contractor shall not cause a spill of wastewater to ground or surface water at any time during the Work.
 - b. Power outages will be considered upon 48 hours written request to Owner and Construction Manager. Describe the reason, anticipated length of time, and areas affected by the outage. Provide temporary provisions for continuous power supply to critical facility components.
- D. Provide safe, continuous access to equipment for pump station operations personnel.
- E. Maintain safe operation and maintenance access for all operating equipment at all times.
 - 1. For all operating equipment, reserve a minimum of 3 feet unencumbered workspace around equipment.
 - a. Areas reserved for operations and maintenance access for all operating equipment shall be separated from Contractor's working area with temporary orange plastic fencing or similar means.
 - b. Storage of Contractor's equipment or materials in access area is prohibited.

3 - 11

ATTACHMENT E - TECHNICALS

01 31 13 - 3

PROJECT COORDINATION

APRIL 2022

- F. Do not proceed with Work affecting pump station operation without obtaining Owner's and Construction Manager's advance approval of the need for and duration of such Work.
- G. Relocation of Existing Facilities:
 - 1. During construction, it is expected that minor relocations of Work will be necessary.
 - 2. Use only new materials for relocated facility. Match materials of existing facility, unless otherwise shown or specified.
 - 3. Perform relocations to minimize downtime of existing facilities.
 - 4. Install new portions of existing facilities in their relocated position prior to removal of existing facilities, unless otherwise accepted by Construction Manager.
- H. Lock-Out Tag-Out
 - 1. Comply with the Cities LOTO procedures included in 01 31 13 Attachment A.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

- 3.01 CUTTING, FITTING, AND PATCHING
 - A. Cut, fit, adjust, or patch Work and work of others, including excavation and backfill as required, to make Work complete.
 - B. Obtain prior written authorization of Owner before commencing Work to cut or otherwise alter:
 - 1. Structural or reinforcing steel, structural column or beam, elevated slab, trusses, or other structural member.
 - 2. Weather-resistant or moisture-resistant elements.
 - 3. Efficiency, maintenance, or safety of element.
 - 4. Work of others.
 - C. Refinish surfaces to provide an even finish.
 - 1. Refinish continuous surfaces to nearest intersection.
 - 2. Refinish entire assemblies.
 - 3. Finish restored surfaces to such planes, shapes, and textures that no transition between existing work and the Work is evident in finished surfaces.
 - D. Restore existing work, Underground Facilities, and surfaces that are to remain in completed Work including concrete-embedded piping, conduit, and other utilities as specified and as shown on Drawings.

APRIL 2022

PROJECT COORDINATION

ATTACHMENT E - TECHNICALS

- E. Make restorations with new materials and appropriate methods as specified for new Work of similar nature; if not specified, use recommended practice of manufacturer or appropriate trade association.
- F. Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces and fill voids.
- G. Remove specimens of installed Work for testing when requested by Engineer.

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS PROJECT COORDINATION

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS PROJECT COORDINATION

MWWD OUTLYING STATIONS LOCKOUT/TAGOUT SITE SPECIFIC LOTO PROCEDURES

SITE SPECIFIC PROCEDURES

GENERAL INSTRUCTIONS

This procedure establishes the minimum requirements to safely isolate energy sources (mechanical, pneumatic, electrical, hydraulic, physical, or chemical) that will potentially cause injury to MWWD employees. This specific procedure has been prepared to assist authorized personnel in performing lockouts of all energy isolating devices whenever maintenance or servicing is performed on machines or equipment. It shall be used to ensure that the machine or equipment is stopped and isolated from all potentially hazardous energy sources and locked out before any MWWD employees perform any servicing or maintenance. All affected and authorized employees assigned to perform work at Outlying Stations will comply with this procedure. The Outlying Stations Maintenance Section and Central Support Facility are the authorized employees responsible to perform preventative, corrective maintenance and/or repair on various equipment. Contractors may be authorized to perform lockout tagout under the supervision of Operations Section. In addition to the Maintenance, CSF and Contractor lockout, with the sole purpose of providing protection to other affected personnel, Operations will also perform lockout/tagout to secure the equipment and/or system, and to formally release asset to Maintenance, CSF or Contractor (under supervision).

PROCEDURAL STEPS

- 1. The Pump Station Maintenance Coordinator, or Operations Supervisor or Maintenance Supervisor will notify all affected employees such as: Pump Operators, Plant Maintenance, or CSF that servicing or maintenance is required on a machine or equipment and that the machine or equipment must be shut down and locked out to perform the servicing or maintenance.
- 2. Operations employee on duty will complete the appropriate blocks and sign the LOTO Sheet Log Form stating all requisite information including the description of work to be performed, date, equipment name and number, location and Lock ID number.
- 3. Operations employee on duty will follow Standard Operating Procedures to isolate or shutdown the equipment.
- 4. Operations employee on duty will gather all appropriate locking devices and tags applicable to the equipment. Document the lock number and the number of appropriate informational tags in the LOTO sheet.
- 5. Operations employee on duty will isolate all energy sources, with their appropriate locking devices and tags. If the machine or equipment is operating, shut it down by the normal stopping procedure (depress the stop button, open switch, close valve, etc.).
- 6. If applicable, Operations employee on duty will place any local controls in the "LOCAL" position and proceed to place the specified asset in the OOS(white) mode at the DCS.
- 7. Operations employee on duty will return their keys to the Operations Lockout Station and notify Maintenance or CSF employee and all affected personnel of the Operations lockout/tagout completion.
- 8. Maintenance or CSF employee(s), will verify the Operations lockout/tagout on the specified equipment and contact the Operations Supervisor if there are any concerns at any time during the lockout.
- 9. Maintenance or CSF employee(s) will identify the type and location of energy isolating devices applicable to the equipment and make an appropriate entry in the LOTO Log Sheet Form. The maintenance employee shall refer to the Equipment's Specific Standard Operating Procedure to identify the type and magnitude of the energy isolating devices that the equipment utilizes.
- 10. Maintenance or CSF employee(s) will obtain appropriate locking devices and tags deemed necessary to lock and tag out all the energy isolating devices with individual locks.
- 11.Maintenance employee(s) will ensure that all applicable energy sources had been isolated from the energy source(s), by first checking that no personnel are exposed and then verify if the stored or residual energy from the specified equipment or asset had been released by operating the push button or other normal operating control(s) or by testing to make certain the equipment will not operate. Stored or residual energy elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure, etc.) must be dissipated or restrained by methods such as grounding, repositioning, blocking, bleeding down, etc.

Caution: Return operating control(s) to neutral or "off" position after verifying the isolation of the equipment.

- 12. Each affected craft, crew or employee will attach their appropriate locking devices/tags to the applicable isolation devices and shall maintain the key in their possession. The asset or equipment is now locked out.
- 13. Maintenance employee(s) will notify all affected personnel that the equipment or asset has been de-energized, LOTO has been completed and the equipment is now ready for maintenance.
- 14. Maintenance will conduct the preventative or corrective maintenance due on the specified asset or equipment.

When the servicing or maintenance is completed and the asset or equipment is ready to return to normal operating condition, Maintenance employee (e) will perform the following steps:

- Check the asset or equipment and the immediate area around the equipment to ensure that nonessential items have been removed and that the asset or equipment components are operationally intact. Replace all guards and other applicable safety devices.
- Check the affected area to ensure that all employees have been notified and safely positioned or removed from the area.
- Verify that the controls are in OFF or neutral position.
- Maintenance employee(s) will remove their locking devices and tags from the specified asset and make contact with Operator and all affected employees that the servicing or maintenance is completed and the machine or equipment is ready for use.
- Operations on Duty will remove their locks to reenergize or put back the asset or equipment in normal condition. All lockout devices must be returned to the Lockout Station.

Note: The removal of some forms of blocking may require reenergization of the machine before safe removal.

- 15. As appropriate, Operations on duty will adjust the local controls and the DCS to allow the specified asset to be returned to operational service.
- 16. Maintenance and Operations employee on duty will make an appropriate entry in the LOTO Log Sheet and notify all affected employees of their completion of the work done on the specified asset.
- 17. Operations will follow Standard Operating Procedures to reintroduce the specified equipment into the process. Notify affected employees that the servicing or maintenance is completed and the machine or equipment is ready for used.

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 01 31 19 PROJECT MEETINGS

PART 1 GENERAL

1.01 GENERAL

A. The Construction Manager will schedule physical arrangements for meetings throughout progress of the Work, prepare meeting agenda with regular participant input and distribute with written notice of each meeting, preside at meetings, record minutes to include significant proceedings and decisions, and reproduce and distribute copies of minutes within 5 days after each meeting to participants and parties affected by meeting decisions.

1.02 PRECONSTRUCTION CONFERENCE

- A. Contractor shall be prepared to discuss the following subjects, as a minimum:
 - 1. Required schedules.
 - 2. Status of bonds and insurance.
 - 3. Sequencing of critical path work items.
 - 4. Progress payment procedures.
 - 5. Project changes and clarification procedures.
 - 6. Use of Site, access, office and storage areas, security and temporary facilities.
 - 7. Major product delivery and priorities.
 - 8. Contractor's safety plan and representative.

B. Attendees will include:

- 1. Owner's representatives.
- 2. Construction Manager's representatives.
- 3. Contractor's office representative.
- 4. Contractor's resident superintendent.
- 5. Contractor's quality control representative.
- 6. Subcontractors' representatives whom Contractor may desire or Engineer may request to attend.
- 7. Engineer's representatives.
- 8. Others as appropriate.

1.03 PRELIMINARY SCHEDULES REVIEW MEETING

- A. As set forth in General Conditions and Section 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION.
- B. Provide weekly look-ahead schedules for Progress Meetings (show one-week past, current week, and four weeks in advance)

APRIL 2022 PROJECT MEETINGS

ATTACHMENT E - TECHNICALS

1.04 PROGRESS MEETINGS

- A. Construction Manager will schedule regular progress meetings at Site, conducted weekly to review the Work progress, Progress Schedule, Schedule of Submittals, Application for Payment, contract modifications, and other matters needing discussion and resolution
- B. Attendees will include:
 - 1. Owner's representative(s), as appropriate.
 - 2. Construction Manager's representative(s), as appropriate.
 - 3. Contractor, Subcontractors, and Suppliers, as appropriate.
 - 4. Engineer's representative(s).
 - 5. Others as appropriate.

1.05 QUALITY CONTROL MEETINGS

- A. In accordance with Section 01 45 16.13 CONTRACTOR QUALITY CONTROL.
- B. Scheduled by Construction Manager on regular basis and as necessary to review test and inspection reports, and other matters relating to quality control of the Work.
- C. Attendees will include:
 - Contractor.
 - 2. Contractor's designated quality control representative.
 - 3. Subcontractors and Suppliers, as necessary.
 - 4. Construction Manager's representatives.
 - 5. Engineer's representatives, as necessary.

1.06 PROCESS INSTRUMENTATION AND CONTROL SYSTEMS (PICS) COORDINATION MEETINGS

- A. Construction Manager will schedule as needed meetings at Site to review specific requirements of PICS work.
- B. Attendees will include:
 - 1. Contractor.
 - 2. Owner.
 - 3. Construction Manager.
 - 4. PICS Subcontractor/Installer.
 - 5. Distributed Control System Provider.
 - 6. Engineer's representatives as required.

1.07 PREINSTALLATION MEETINGS

A. When required in individual Specification sections, convene at Site prior to commencing the Work of that section.

APRIL 2022 PROJECT MEETINGS

ATTACHMENT E - TECHNICALS

- B. Require attendance of entities directly affecting, or affected by, the Work of that section.
- C. Notify Construction Manager 5 days in advance of meeting date.
- D. Provide suggested agenda to Construction Manager to include reviewing conditions of installation, preparation and installation or application procedures, and coordination with related Work and work of others.

1.08 FACILITY STARTUP MEETINGS

- A. Schedule and attend a minimum of two (2) facility startup meetings. The first of such meetings shall be held prior to submitting Facility Startup Plan, as specified in Section 01 91 14 TESTING AND STARTUP, and shall include preliminary discussions regarding such plan.
- B. Agenda items shall include, but not be limited to, content of Facility Startup Plan, coordination needed between various parties in attendance, and potential problems associated with startup.
- C. Attendees will include:
 - 1. Contractor.
 - 2. Contractor's designated quality control representative.
 - 3. Subcontractors and equipment manufacturer's representatives whom Contractor deems to be directly involved in facility startup.
 - 4. Construction Manager.
 - 5. Engineer's representatives.
 - 6. Owner's operations personnel.
 - 7. Others as required by Contract Documents or as deemed necessary by Contractor or City.

1.09 OTHER MEETINGS

A. In accordance with Contract Documents and as may be required by Owner and Construction Manager.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

APRIL 2022 PROJECT MEETINGS

ATTACHMENT E - TECHNICALS

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS **PROJECT MEETINGS**

SECTION 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

- A. The Work shall be executed with such progress as required to prevent any delay to this contract. Compliance includes, but is not limited to, meeting contract milestone dates, compliance to scheduling submittals, working within any constraints and completion of all contract work within the allotted time.
- B. The Work specified in this section includes the preparation, submittal, and acceptance of a Baseline Construction Schedule., construction progress schedules, schedule updates, recovery schedules, Time Impact Analysis (TIA) and revisions to the construction progress schedule. The construction schedule shall conform to the time provisions specified in the special provisions of the contract documents and the requirements of all other specified work sequence constraints set forth in the contract documents.
- C. The Contractor shall prepare and submit a Construction Schedule in accordance with Section 6-1 of the 2021 GREENBOOK and 2021 WHITEBOOK, and requirements of this section. By preparing and submitting the Construction Schedule and schedule updates, the Contractor represents that it can and intends to safely execute the contracted work and all portions thereof including all activities of subcontractors, equipment vendors, and suppliers including submittals and resubmittals within the specified times and constraints. The Contractor also represents that the bid price covers all costs associated with the execution of the Work in accordance with the construction schedule and contract documents.
- D. This specification includes the cost loaded schedule requirements, consistent with the Section 01 29 00 PAYMENT PROCEDURES, which shall form the basis for the pay application report and all monthly payment requests. These referenced sections shall be correlated and linked when preparing the monthly progress payment. The Schedule of Values shall be generated from the Oracle Primavera P6 current accepted schedule.
- E. The Owner will review the schedule, and any updates or revisions, and any other schedule data for conformance to the Contract. Review and acceptance of the Baseline Construction Schedule and associated documents does not relieve the contractor of responsibility for the feasibility of the schedule, performance of any omitted work and completion of the work and milestones within the contract time.

1.02 DEFINITIONS

A. Activity: A discrete work element of a project that can be identified for planning, scheduling, and controlling the construction project. Activities included in a construction schedule consume time and resources.

CONSTRUCTION PROGRESS DOCUMENTATION

APRIL 2022

ATTACHMENT E - TECHNICALS

- B. Predecessor Activity: An activity that precedes another activity in the network.
- C. Successor Activity: An activity that follows another activity in the network.
- D. Code of Accounts: A unique lettering or numbering system in which letters or numbers are assigned to each unique component of the Work Breakdown Structure (WBS).
- E. Hard Logic: Relationships with mandatory dependencies where the nature of the work itself dictates the order in which the activities should be performed. Construction of the walls before starting painting work is an example of mandatory dependency.
- F. Soft Logic: Also known as Discretionary Dependencies or Preferential Logic. Preferential logic that controls the critical path using constraints and lags will not be allowed.
- G. Hard Constraints: Override logical relationships and thereby prevent activities from being scheduled according to the logic. Hard Constraints include Mandatory Start, Mandatory Finish, Start On and Finish On.
- H. Critical Path Method (CPM): A method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of the Project.
- I. Critical Activities: Activities on the critical path. To avoid project delays, work must start and finish on the planned early start and finish dates.
- J. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the maximum overall project duration or completion. There can only be one critical path for a project duration or a project milestone.
- K. Near Critical Path: The Near Critical Path shall be defined as the "longest path" plus 15 working days total float.

L. Float:

- 1. The measure of leeway in starting and completing an activity. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
- 2. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned project completion date or contract milestone.
- M. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- N. Work Area: An area of construction, a separate facility, or a similar significant construction element.

CONSTRUCTION PROGRESS DOCUMENTATION

APRIL 2022

ATTACHMENT E - TECHNICALS

- O. Contract Milestone: An activity or event that must be completed by a specific date and to which liquidated damages may apply. Contract start and completion dates are considered Contract Milestones.
- P. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.
- Q. Schedule of Values: A realistic statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment. The Schedule of Values should be produced from P6 and match the Cost Loading in the Schedule.
- R. Cost-Loading: The allocation of the Schedule of Values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total contract amount, unless otherwise approved by the City.
- S. Resource Loading: The allocation of manpower necessary for the completion of an activity as scheduled.
- T. Calendar Day: All days in a calendar year including weekends and holidays. Contract duration is measured in calendar days against contract milestones.
- U. Pacing: An intentional slowing of work activities during a delay, or alleged delay, to project completion.
- V. Installed Major Equipment: All major equipment installed as part of the final constructed facility. See Section 01 29 00 PAYMENT PROCEDURES for definition of Major Equipment.
- W. Construction Equipment: All equipment utilized by the contractor to construct the facility but is not a part of the final constructed facility.
- X. Blackout Calendar: An activity calendar that applies the non-work option in Primavera P6 Activity Calendars to create non-working days, weeks, and/or months when work is restricted from occurring. The City requires the use of blackout calendars for restricted activities rather than adjusted logic and durations.

1.03 SCHEDULER QUALIFICATIONS

A. The Contractor shall employ or retain the services of Project Scheduler who shall have verifiable experience in construction work sequencing, productivity, and scheduling as well as preparing and maintaining detailed construction schedules using the most current version of Oracle Primavera P6 software. Within seven (7) calendar days after Notice to Proceed, the Contractor shall submit to the City Representative for review and acceptance, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, the Project Scheduler's resume, including personal references from at least two (2) owner- representatives familiar with the Project Scheduler's work on previous water or wastewater treatment projects. The City

CONSTRUCTION PROGRESS DOCUMENTATION

APRIL 2022

ATTACHMENT E - TECHNICALS

reserves the right to reject the proposed scheduler based on the lack of qualifications as defined in this section.

1.04 SCHEDULING CONFERENCES

- A. Pre-Construction Scheduling Conference:
 - 1. Within ten (10) calendar days after Notice to Proceed, the City Representative shall schedule and conduct a pre-construction scheduling meeting. Per Section 6.1-1 of the 2021 GREENBOOK and 2021 WHITEBOOK, and the Contractor shall submit to the City Representative a written copy of its proposed WBS, and a cost loaded construction schedule at this meeting. The City shall review the WBS and schedule within ten (10) calendar days after submission by the Contractor. The Contractor shall make all modifications to the proposed WBS that are requested by the City. The WBS shall be correlated with the Contractor's Schedule of Values and the cost loaded schedule.

1.05 FLOAT

- A. Float time is not for the exclusive use or benefit of either the City or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and the contract completion date. Contractor's use of float shall be pre-approved by the City prior to use.
- B. No time extensions will be granted nor delay damages paid unless a City-caused delay occurs which impacts the Project's critical path and the Contractor has complied with all related contract requirements. Other delays will be evaluated by the Contractor for concurrency to issues and be included as part of the Contractor's analysis.
- C. Submittal of an early completion schedule shall not provide a basis for the Contractor to claim an excusable delay for any time earlier than the contract completion date.

1.06 LOGIC AND LEVEL OF DETAIL

A. The project schedule shall include activities of sufficient detail to accurately represent and clearly convey the Contractor's feasible plan for the timely completion of the full scope of the work. The Contractor shall be responsible for developing the logic of the Baseline Construction Schedule and for updating the logic each month to accurately reflect the progress of the work to date and the Contractor's current plan for the timely completion of the work. The schedule logic for each activity shall be constructed by determining which activities must be completed before any subsequent activity can start, which activities can occur simultaneously with the predecessor activity, which activities cannot start until another activity is complete, and the impact of all resource limitations on activity sequencing, activity durations, and activity dates. Every activity, except the project start and finish milestones, shall have a minimum of one predecessor and one successor. All paths through the project schedule shall proceed in the direction representing the progression of time; start to finish logic is disallowed. Activity lags

CONSTRUCTION PROGRESS DOCUMENTATION

APRIL 2022

ATTACHMENT E - TECHNICALS

- shall not have a negative value. The use of lags shall be kept to a minimum and shall be subject to acceptance by the City. Redundant ties to preceding activities in a sequential series of activities will not be permitted.
- B. The activity descriptions shall be specific and discrete such that it cannot be confused with any other activity description. For example, "Form Concrete Wall" is too broad; there must be a description of the unique location of the wall. Similarly, activities that are discrete should not be combined.
- C. Finish to start logical relationships shall be predominantly used for schedule activities. The use of logical relationships with negative lags will not be allowed in the Baseline Construction Schedule, in proposed revised schedules, or in the monthly updates.
- D. Milestones. Separately identify each Project milestone, conforming to the scheduling requirements as set forth in the Contract Documents, and assign a "finish no later than" constraint date. For Completion Deadlines, the activity description shall reference the appropriate Contract clause.
- E. No unspecified milestone constraints, other constraints, float suppression techniques, or use of Project activity durations, logic ties, and/or sequences deemed unreasonable by the City, will be used in the Project Schedule..

1.07 SCHEDULE SOFTWARE SETTINGS AND RESTRICTIONS

- A. Contractor shall use the most current version of Oracle Primavera P6 software to produce the contract schedules and reports as specified herein. The schedule files shall be submitted in Primavera's Proprietary Exchange (XER) format until such time as Primavera recommends transferring to their Extensible Markup Language (XML) format. Reports shall be in Adobe Portable Document Format (PDF).
- B. Activity Constraints: Date/time constraint(s), other than those required by the contract, will not be allowed unless accepted by the City. Identify any constraints proposed and provide an explanation of the purpose of the constraint in the Narrative Report. Any finish constraints for City required milestones must use a 'Finish on or Before' type designation and have logic ties. Start on or After and Start on or Before constraints are discouraged. All Start on or After and Start on or Before constraints are subject to approval by the City representative. No hard constraints, which include Start on, Finish on, Mandatory Start, and Mandatory Finish, are allowed. The contractor shall not use any manual date entries that override schedule driven dates based on duration and network logic.
- C. Lags: Lags will not be used when the creation of an activity will perform the same function (e.g., concrete cure time), instead an activity representing the gap between the completion of one activity and the start of another will describe the time gap.

CONSTRUCTION PROGRESS DOCUMENTATION

ATTACHMENT E - TECHNICALS

01 32 00 - 5

APRIL 2022

D. Default Progress Data Disallowed: Actual Start and Actual Finish dates on the CPM schedule shall match the dates provided from Contractor Quality Control Production Reports, Contractor daily reports and other contemporaneous project documentation.

E. Software Settings:

- 1. Schedule calculations and Out-of-Sequence progress (if applicable) shall be handled through Retained Logic, not Progress Override. All activity durations and float values will be shown in days. Activity progress will be shown using Remaining Duration. Default activity type set to "Task Dependent." User preference settings shall be set to hours with the show unit label box checked and zero decimal places. The "Durations Format" shall be set to days with the show durations label box checked, and zero decimal places.
- 2. The critical path shall be calculated by selecting the Longest Path as opposed to Total Float.
- F. Activities unless otherwise approved will be "physical percent complete" type. Duration percent complete will only be used on City-related activities such as submittal reviews.
- G. Duration Type shall be set to Fixed Duration and Units.
- H. The "Automatically Level resources when scheduling" box shall not be checked. All schedule submittals, and schedule related data of any kind, shall not be resource leveled and shall be the basis for rejection if submitted with resource leveling.
- I. The project critical path shall be displayed using both the 'Critical' and 'Longest Path' filters in P6.

1.08 COST LOADING

- A. The activities contained within the schedules shall be cost loaded, and they shall equal the Contract Total Price with Sub-Totals that match the Schedule of Values within the Section 01 29 00 PAYMENT PROCEDURES. Contractor is required to cost load the construction schedule using price per unit. Equipment shall include installed and construction equipment specified as price of equipment that is worth over \$100,000. For example, the labor unit would be \$ per hour; the material unit would be material cost per unit installed. The non-labor resources shall be used exclusively on activities containing equipment. Equipment shall include installed and construction equipment specified as price of equipment. The resource coding and name shall distinguish between installed and construction equipment. An example of price per unit cost loading is shown below:
 - 1. One (1) labor unit = \$1of labor
 - 2. Material unit of \$1 for 1 unit
 - 3. Equipment unit of \$1 for 1 unit

CONSTRUCTION PROGRESS
DOCUMENTATION

- B. Procured items, including installed equipment, should be budgeted as part of separate procurement activities such that the installation activity is not status as started when the procured material is onsite and installation has not begun. O&M and Training activities shall be their own cost-loaded schedule activities. Project record documentation (as-builts) shall also be a separate cost-loaded schedule activity.
- C. Overhead and profit shall be prorated evenly on all cost loaded activities. Alternatively, overhead may be treated as a Level of Effort activity or activities. The Contractor shall not unbalance the activity cost loading, nor shall the Contractor utilize Resource Leveling as a technique for extending activity durations. The approved Schedule of Values, as generated from the Cost Loading becomes the basis for the Payment Application.
- D. Every construction activity that contains labor shall be cost loaded.
- E. Fabricate and Deliver activities shall be cost loaded to cover the material or equipment costs. The Fabrication activities shall utilize a material or equipment resource.
- F. Commissioning activities shall be cost loaded using a labor resource.
- G. The cost loading and progress payments for long lead procurement items will be discussed at the pre-construction scheduling conference.
- H. Once the Schedule of Values is accepted with the Baseline Construction Schedule, requests for changes to the Baseline Schedule of Values will not be approved unless approved in writing by the City Representative.
- I. The Contractor shall submit with the Baseline Construction Schedule the detailed budget documents reflecting the costs used as the basis of the cost loading contained therein.
- J. In Oracle Primavera P6, for actual monthly costs to store correctly, the Contractor must setup the financial period to equal the first and last date of the calendar month, regardless of the actual monthly cutoff date. Financial periods cannot bridge 2 months and must equal the full month. Financial dates table will be provided at the Preliminary Schedule meeting.
- K. Work Restrictions in Section 01 31 13 PROJECT COORDINATION indicating activities that cannot be performed during specific periods of time due to operational or other City requirements shall be accommodated in the Baseline and Progress Schedules using blackout calendars. These Blackout Calendars must be developed incorporating the specific durations when work cannot be performed, according to the terms of each work restriction, and applied to the applicable activities. These Blackout Calendars will prevent work from extending into these restricted periods by shifting it until after the completion of the restriction.

CONSTRUCTION PROGRESS DOCUMENTATION

1.09 RESOURCE LOADING

- A. Schedules shall include resource loading, also known as manpower loading, showing at a minimum, the composite crew, the classification (e.g., foreman, journeyman, etc.) of the individual craftsman comprising the crew, materials or equipment associated with each construction and commissioning activity shown on the schedule, plus any other information required by the City. Manpower shall be expressed as manhours.
- B. Manpower resources shall be listed in the Resource Library of the Primavera Software and the Contractor shall assign manpower resource loading by trade for each work activity of the schedule.
- C. The Contractor warrants that it will allocate resources and costs based upon Early Date curves and Late Date curves as well as all area between these two curves. The Contractor also warrants that the cost of performing the work, based upon both curves, is included within its bid price.
- D. The Contractor shall submit with the Baseline Construction Schedule the detailed budget documents reflecting labor hours used as the basis of the resource loading contained therein. The budget documents used to resource load the Baseline Construction Schedule shall be based upon the escrowed bid documents and reconcile thereto.
- E. Work performed by the prime contractor and all subcontractors with a contract value greater than or equal to two (2) percent of the Prime Contract Value shall use the following resources:
 - 1. Labor
 - 2. Materials
 - 3. Installed Major Equipment (refer to Section 1.02 Definitions)
 - 4. Construction Equipment (refer to Section 1.02 Definitions)
 - 5. Manhours
- F. The Prime Contractor, and each of the subcontractors with a contract value greater than or equal to two (2) percent of the Prime Contract Value, shall create separate Labor, Material and Nonlabor (Equipment) resources for the Prime Contractor and each subcontractor. The resources shall be titled with the name and/or trade of the Prime Contractor and subcontractors and shall match the responsibility activity code assigned to each activity.

1.10 ACTIVITY CALENDARS

A. All calendars shall be given specific project names and defined clearly in Oracle Primavera P6. Calendars for different trades if used, should be specified. All calendars and activity coding within the schedule shall be "Global" rather than "Project" level and shall have a unique prefix of the City contract number.

CONSTRUCTION PROGRESS DOCUMENTATION

APRIL 2022

B. The Contractor shall utilize Blackout Calendars and apply the calendars to activities that may be impacted by the work restrictions stated in Section 01 31 13 PROJECT COORDINATION.

PART 2 PRODUCTS

2.01 BASELINE CONSTRUCTION SCHEDULE

- A. The Baseline Construction Schedule shall be constructed to show sequence and duration of the activities the Contractor proposes to carry out the Work. The schedule shall be resource (manpower) and cost loaded and should indicate any restrictions on the availability of work areas. The Contractor shall utilize the Baseline Construction Schedule in planning, scheduling, coordinating, and performing the work under the Contract (including all activities of Subcontractors, equipment vendors, and Suppliers). The Baseline Construction Schedule is the basis of the Schedule of Values and look-ahead schedules. The plan shall demonstrate all work including Mechanical and Electrical work and Commissioning phases.
- B. Within fourteen (14) calendar days of receiving the City's comments on the schedule delivered in the Pre-Construction Scheduling Conference, the Contractor shall submit the Baseline Construction Schedule to the City, including a written narrative to further explain the plan as set forth in its CPM logic network and schedule. The Contractor shall schedule a workshop prior to submittal of the Baseline Construction Schedule to present the schedule plan. Within seven (7) calendar days from Baseline Construction Schedule submittal, the Contractor shall conduct a Baseline Construction Schedule presentation describing the schedule in detail and the Contractor's means & methods for construction. The City Representative shall accept or reject, in writing, the Contractor's Baseline Construction Schedule within seven (7) calendar days after receipt of all required information. If rejected, the Contractor shall make necessary modification to the Baseline Construction Schedule and resubmit to the City within seven (7) calendar days. The City Representative shall accept or reject, in writing, the revised Baseline Construction Schedule within seven (7) calendar days of resubmittal. Once accepted, the Baseline Construction Schedule shall be used for monitoring and evaluating Contract performance, including, but not limited to progress, progress payments, changes, and delays.
- C. The Baseline Construction Schedule will be the Performance Measurement Baseline (PMB) for the project. This requires that the PMB will be maintained with any structural schedule changes in the Current schedule. This includes expansion and contraction in WBS and/or activities, detailing out summary cost items, and anything else that makes the PMB non-measurable.
- D. There shall be at least one continuous Critical Path in the Baseline Construction Schedule, using the longest path definition that starts at the earliest occurring schedule activity in the network (i.e., NTP1) and ends at the latest occurring schedule activity in the network. No more than 20 percent of the activities may be

CONSTRUCTION PROGRESS DOCUMENTATION

APRIL 2022

ATTACHMENT E - TECHNICALS

critical or near critical. The Near Critical path shall be defined as within 15 working days of the critical path. If 20% of the activities become critical, present a plan to reduce the number of near-Critical Path activities to the client.

- E. The Baseline Construction Schedule shall demonstrate the final level of detail for each activity and shall contain the required relationships completely identified and the durations of each activity correctly depicted. The Baseline Construction Schedule shall be developed as follows:
 - The Baseline Construction Schedule shall contain no contract changes or delays which may have been incurred during the interim schedule development period. These changes will be entered at the first update after the Baseline Construction Schedule has been accepted and a change to the contract time or duration was made via an approved change order.
 - 2. The Baseline Construction Schedule submitted for review and acceptance by the Owner shall contain no status and the data date shall be the contract notice to proceed date.
 - The Baseline Construction Schedule shall clearly indicate the longest critical path of activities from notice to proceed to the contract completion date or contract milestone.
 - 4. The Baseline Construction Schedule will contain all cost information assigned to each of the specific activities at the final level of detail. Every construction activity that contains labor, construction equipment or permanent equipment shall be cost and resource loaded to permit initial generation of a cash flow curve and resource curve.
- F. The Baseline Construction Schedule shall include summary activities and milestones for startup as defined in Part 1.05 of Section 01 91 14 TESTING AND STARTUP. The detailed Startup Schedule will be submitted and updated separately as described in Section 01 91 14 TESTING AND STARTUP, with links to the accepted Baseline Construction Schedule summary activities and milestones for startup. 30 calendar days prior to the start of Pre-Commissioning, the Contractor shall submit detailed Startup Schedule which will link to the accepted Baseline Construction Schedule summary activities and milestones for startup.
- G. The Comments made by the City Representative on the Baseline Construction Schedule, during review, will not relieve the Contractor from compliance with requirements of the Contract Documents. To the extent that there are any conflicts between the accepted schedule and the requirements of the Contract Documents, the Contract Documents shall govern. The Baseline Construction Schedule shall show the sequence and interdependence of activities required for complete performance of the Work, beginning with the date of the Contractor's Notice to Proceed date and concluding with the Contract Completion.
- H. Please refer to the Section 01 31 13 PROJECT COORDINATION for specific requirements regarding Facility Operations. Maintenance of Pump Station Operations (MOPO) Requests must be submitted prior to starting work in any area, and additional specific MOPO Requests must be submitted for each shutdown and

CONSTRUCTION PROGRESS DOCUMENTATION

APRIL 2022

cutover. MOPO Requests shall be submitted a minimum of 14 calendar days prior to the need date. Activities for the MOPO Request Submittal, City Review Period, and MOPO Request Approval shall be included in the Baseline Construction Schedule.

- I. The Baseline Construction Schedule shall reflect the Contractor's true plans for progressing and performing the work. The Contractor shall be responsible for the means, methods, and duration and certifies that the schedule duration and contract period is achievable and Contractor's estimate/bid, and/or budgets, are based upon sequences shown in the schedule.
- J. The Baseline Construction Schedule shall provide the Contractor and the City with a tool to monitor and follow the progress of all phases of the Work. The Baseline Construction Schedule submitted to the City shall comply with all limits imposed by the Scope of Work, with all contractually specified intermediate milestone and completion dates, and with all constraints, restraints or sequences included in the Contract. The Contractor shall obtain subcontractor written concurrence with its Baseline Construction Schedule for all subcontracts with a contract value of 2 percent or greater of the prime contract value.
- K. The Baseline Construction Schedule shall incorporate and include:
 - Appropriate administrative activities and contract specified review periods (including the City and third parties) for all and phases and components of work
 - 2. Required cost, resource and activity codes.
 - 3. Project milestones dates and overall construction activities and project completion dates.
 - 4. Project budget, schedule of values and the cost basis for progress payments.
 - 5. Testing and startup activities.
 - 6. Punch list and final completion activities.
- L. Failure to include in the schedule any element of Work required for performance of Contract shall not excuse Contractor from completing all Work required within applicable time constraints, notwithstanding the City's acceptance of Contractor's Baseline Construction Schedule.
- M. Nothing in these requirements shall be deemed to negate or diminish Contractor's authority and responsibility to plan and schedule Work as required, subject to requirements of Contract Documents.
- N. No construction activity shall be more than 20 working days duration. Exceptions may be approved by the City.
- O. Submittal Review Time: Include in the schedule the review times indicated in the Section 01 33 00 SUBMITTAL PROCEDURES. Coordinate submittal review times in contractor's baseline construction schedule with submittal schedule. The schedule shall include a schedule activity for all submittals required by these

CONSTRUCTION PROGRESS DOCUMENTATION

APRIL 2022

ATTACHMENT E - TECHNICALS

specifications. Rejected submissions will require the contractor to add activities that start a second submission and review process.

2.02 SCHEDULE NAMING REQUIREMENTS

A. To assist the City in consolidating the schedules from all the projects, a standard naming convention has been adopted. The Project name in P6 and the schedule file name should be the same as the following example:

PQPS-OAS Baseline 01 Dec18 DD123118

Where:

PQPS OAS = the code for the project, in this case PQPS Oxygenation

System

Baseline = the type of schedule submittal, which can also be Update,

Recovery or Time Impact Analysis

01 = the submittal number or version

Dec18 = the month and year of the schedule submittal

DD = the Data Date, in this example Dec 31, 2018

The exported P6 data (XER) file shall use the same name as the Schedule ID

2.03 ACTIVITY ID

- A. Every Activity ID in the baseline and updated schedules shall be preceded by a 3 or 4 letter prefix code followed by a dash. All suffix coding to the right of the dash is at the discretion of the Contractor. The prefix code for this project is PQPS.
- B. If for any reason an Activity ID is deleted or removed from the schedule, it may not be reused for another activity. Similarly, once the baseline construction schedule is accepted, activity descriptions may not be changed without the permission of the City Representative.

2.04 SCHEDULE SUBMITTALS

- A. In accordance with the Section 01 33 00 SUBMITTAL PROCEDURES, submit all required schedule submittals in the following format:
 - 1. One (1) electronic copy of the Oracle Primavera P6 XER file including all project layouts.
 - 2. One (1) PDF copy of all reports, bar-charts, time-scaled diagrams, histograms, s- curves and narrative.
 - 3. One (1) hardcopy tabular reports per Section 6-1.1.2 of the 2021 WHITEBOOK.
- B. Variance Report: With each updated schedule submission, provide a computergenerated Log Report listing all changes made between the previous schedule and current updated schedule. Identify the name of the previous schedule and

CONSTRUCTION PROGRESS DOCUMENTATION

APRIL 2022

ATTACHMENT E - TECHNICALS

name of the current schedule being compared showing all changes to the Schedule. This report will as a minimum show changes for: Added & Deleted Activities, Original Durations, Calendars, Descriptions, Constraints (added, deleted or changed), Added/Deleted Resources, Costs, Added/Deleted Relationships, Changed Relationship Lags, a Critical Path Analysis, Float Analysis, Open Ended Activity Analysis. A narrative shall be included in the variance report stating the reason for the changes listed above.

- C. CPM Reports: Concurrent with the CPM schedule, submit in PDF format the reports listed below. The specific format of the required reports will be discussed at the Preconstruction Scheduling Conference.
 - 1. Critical Path Gantt Chart as further described in Section 2.06.L
 - 2. Critical and Near Critical Path Gantt Chart as further described in Section 2.06.L
 - 3. Activity ID Report: List of all activities sorted by activity number.
 - 4. Activity Schedule Bar-chart: Sorted by phase, area, start and finish.
 - 5. Logic Report: List of preceding and succeeding activities for all activities, sorted by phase, area, start and finish.
 - 6. Total Float Report: List of all activities sorted by phase in descending order of total float, then descending finish.
 - 7. Schedule of Values Report generated from the Oracle Primavera P6 schedule grouped by the Cost ID activity code and filtered by "budgeted total cost is not equal to \$0." Sort by Activity ID with the following columns:
 - a. Activity ID
 - b. Activity Name
 - c. Remaining Duration
 - d. Start
 - e. Finish
 - f. Cost Percent Complete
 - q. Physical Percent Complete
 - h. Previous Physical Percent Complete
 - i. Budgeted Total Cost
 - i. Actual Total Cost
 - k. Actual This Period Total Cost
 - I. Previous Applications Total Cost
 - m. Remaining Total Cost
 - n. At Completion Total Cost
 - 8. Project Cash Flow S-Curve: Show the monthly budgeted costs, actual costs and estimate at completion. Include cash curves for early and late start and finish dates.
 - 9. Manpower Histograms: Showing project overall labor hours per month and trade labor hours per month (carpenters, masons, electricians, laborers, foremen, etc.)

CONSTRUCTION PROGRESS DOCUMENTATION

APRIL 2022

ATTACHMENT E - TECHNICALS

10. Material and Equipment Status Report: Showing the status of materials and equipment stored on-site and materials and equipment stored in bonded warehouse(s).

2.05 BASELINE NARRATIVE

- A. The Contractor shall provide a written narrative accompanying the electronic version of the Contractor's Baseline Construction Schedule submission. This narrative shall explain the Contractor's approach for meeting all milestones and project completion dates. It shall also include a clear description of the critical path activities from beginning to end and describe anticipated crew sizes, production rate and anticipated problems of major activities along the critical path.
- B. In the written narrative, the contractor shall include the basis and assumptions used to develop the Contractor's Baseline Construction Schedule. The contractor shall include crew sizes, equipment requirements, and anticipated delivery dates; restraints; critical path activities; activities requiring overtime or additional shifts; activities that contain time contingencies for impacts to be expected from normal rainfall; holidays and other non- work days; potential problem areas; permits; coordination required with the City and third party agencies; and long lead delivery items requiring more than 45 calendar days from order to delivery. The narrative shall also include a description of winterization activities necessary for work to continue through normally inclement weather periods.

2.06 SCHEDULE UPDATE PROCESS AND PAYMENTS

- A. Contractor to update monthly the approved Baseline Construction Schedule to reflect the current status of the Project. The update shall include all information available and status of the Project as of the cut-off date established in the Preliminary Schedule Meeting. All Monthly Progress Schedules shall incorporate all schedule Revisions and changes previously approved by the City.
- B. Each Monthly Progress Schedule shall reflect all as-built activities performed as of the effective data date of the update schedule. The Monthly Progress Schedule shall include the period from the last update to the effective data date and for the remainder of the Project. The current period's activities shall be reported as they actually took place. In the updated schedule, Contractor shall indicate the actual dates that activities were started, completed, or split. Ongoing activities shall have an indication of the percent complete based on the amount of actual work performed, and the estimated remaining duration to complete such activities.
- C. Contractor shall certify that the progress shown on the schedule update accurately represents Work completed through the cutoff date of the Submittal.
- D. If Work was performed out of sequence, implement changes to the schedule so that it correctly reflects the actual sequence of work. In the case of repairing logic for Work performed out of sequence, the Owner may consider the use of negative lags. Any such schedule corrections for out of sequence work shall be considered a Revision, and Contractor shall obtain written approval from the Owner prior to

CONSTRUCTION PROGRESS DOCUMENTATION

APRIL 2022

implementing those revisions to the Monthly Progress Schedule or any other type of schedule.

- E. The physical percentage completion status (and remaining duration) of activities shall be status in the schedule Updates and the Monthly Progress Schedule independently from the status of the dollar amount assigned to the activity for cost (price) and progress payment purposes. For example, the status of an activity can be 50% complete (based on time of performance) and may have a remaining duration of 5 days of the original 10-day duration, but the cost assigned to that activity may have a different completion status, and the earned dollars could be more or less than 50% of the at-completion dollars assigned to that activity. Contractor shall set up the scheduling software to calculate the physical completion status of each activity related to time separately from the status of the value of dollars earned for progress payment purposes.
- F. The earned-to-date dollar amount must reflect the value of the work completed (which may not be directly proportional to the activity remaining duration or physical completion status), and consideration must be given to: 1) materials stored at the site or off site, but not incorporated into the work when payment prerequisites are met by Contractor, 2) reductions for non-compliant work, 3) reductions for failure to provide material testing or required certifications, 4) reductions for other reasons described by the Contract Documents, 5) when the value of the work remaining is naturally disproportionate to the performance time remaining. When the physical percentage complete of an activity is disproportionate to the earned-to-date dollar amount, the reasons for the variance shall be described in a Log field as part of the Monthly Progress Schedule data, and those Log field notations shall be displayed as a column in the APPLICATION FOR PAYMENT DETAIL.
- G. In addition to what is required for a schedule update of work progress, the submission shall include a separate tabular report of all schedule activities that are cost loaded, and shall include the at-completion Total Cost, the proposed earned-this-period Cost amount, and the proposed earned-to-date Cost. The format and group subtotaling of the cost and payment accounting tabular report shall be submitted for review and acceptance by the Owner prior to the first Monthly Progress Schedule submission, and the Owner can request and Contractor shall implement revisions to the formatting and data displayed in the tabular report at any time thereafter to better serve the Owner's cost accounting system. The tabular report shall serve as the line item detail of the earned-to-date dollars assigned to each activity through the schedule's data date, will be referred to as the APPLICATION FOR PAYMENT DETAIL document, and once approved by the Owner, will be an attachment to the Contractor SUMMARY OF TASKS submitted by Contractor as part of the monthly INVOICE AND INVOICE CERTIFICATE package.
- H. Two days prior to the Monthly Progress Schedule data date, submit draft Monthly Progress Schedule for review by the Owner. Review will be done during a meeting to go over the claimed amounts. During the meeting the Owner Representative will respond to Contractor's estimated earned-to-date dollar amounts, and any

CONSTRUCTION PROGRESS DOCUMENTATION

APRIL 2022

variances between Contractor's proposed earned-to-date dollars and the Owner's estimate will be discussed and resolved. A marked up copy of the tabular report of the resolution of any variances will be copied for each party. Those changes to the draft Monthly Progress Schedule earned-to-date dollars will be made to the schedule before the Monthly Progress Schedule is formally submitted. If follow-up is required to further a discussion or to present proof in order to resolve the earned-to-date dollar amount for an activity, it shall occur within two working days after the Meeting, and a resolution shall be reached before formal submission of the Monthly Progress Schedule. If there is a disagreement between Owner's and Contractor's estimated earned-to-date dollar amounts, Contractor shall use the Owner's earned-to-date figure.

- If at any time, Contractor or the Owner discovers an at-completion dollar amount (budget) assigned to an activity that is unreasonable or incorrect, either party can request that an adjustment be made. Such proposed adjustment shall be presented at the next Weekly Progress Meeting and discussed and treated like any other proposed schedule revision. Adjustments to the at-completion dollar amount for any activity will naturally require an equal adjustment to another activity such that the total Contract value does not change. Any proposed Revision to the at-completion dollar amount for any activity must be accepted by the Owner in writing prior to the change being made to the Monthly Progress Schedule. Contractor will maintain and make available to the Owner a record of all approved revisions to at-completion dollar amounts that displays each approved revision, and the adjustments to all activities affected by a revision.
- J. Contractor's monthly payment applications shall not be accepted and processed for payment by the Owner Representative without Baseline Construction Schedule progress updates submitted in the time and manner required by this specification which accurately reflect the allowable costs due under the Contract Documents and are accepted by the Owner. Should the Baseline Construction Schedule progress updates not be accepted due to the Contractor's failure to address all Owner provided comments, payment withholds and deducts will be applied as specified in paragraph 3.03 of this section.
- K. Please see the Section 01 29 00 PAYMENT PROCEDURES for the Schedule of Values approval process and coordination with invoice payment.
- L. The Schedule Update Submittal shall include:
 - 1. A detailed Gantt chart showing all activities organized by WBS. The activity columns shall include Activity ID, Activity Name, Original Duration, Remaining Duration, Duration Percent Complete, Physical Percent Complete, Start, Finish, and Total Float. The critical path shall be clearly shown.
 - 2. A Critical Path Gantt chart showing Longest Path grouped by WBS to level 1 only. The activity columns shall include Activity ID, Activity Name, Remaining Duration, Start, Finish, and Total Float. The critical path and relationship lines (logic) shall be clearly shown and based upon the critical and longest path.
 - 3. A Critical and Near Critical Path Gantt using the "calculate multiple float paths" option in P6 with the "display multiple float paths ending with activity" set to

CONSTRUCTION PROGRESS DOCUMENTATION

APRIL 2022

ATTACHMENT E - TECHNICALS 01 32 00 - 16

each of the contract milestones. Set the number of float paths to thirty (30). Group the report by "Float Path" and filter for float value 15 days from the float value showing on each contract milestone. The activity columns on the tabular data portion of the schedule shall include Activity ID, Activity Name, Remaining Duration, Start, Finish, and Total Float. The critical path and relationship lines (logic) shall be clearly shown.

- 4. A Schedule Variance Report shall be submitted comparing the current schedule submittal with the previously accepted schedule. Display the baseline project bars and milestones in the Gantt Chart. Include the following categories:
 - a. Activity ID
 - b. Activity Name
 - c. Original Duration
 - d. BL Project Duration
 - e. Variance BL Project Duration
 - f. Start
 - g. Finish
 - h. BL Project Start
 - i. BL Project Finish
 - j. Variance BL Project Finish Date
- 5. Schedule of Values Report generated from the Oracle Primavera P6 schedule grouped by the Cost ID activity code and filtered by "budgeted total cost is not equal to \$0." Sort by Activity ID with the following columns:
 - a. Activity ID
 - b. Activity Name
 - c. Remaining Duration
 - d. Start
 - e. Finish
 - f. Cost Percent Complete
 - g. Physical Percent Complete
 - h. Previous Physical Percent Complete
 - i. Budgeted Total Cost
 - i. Actual Total Cost
 - k. Actual This Period Total Cost
 - I. Previous Applications Total Cost
 - m. Remaining Total Cost
 - n. At Completion Total Cost
- 6. A Cashflow curve plotting actual invoicing against Baseline forecast cashflow and the update forecast to project completion. The cashflow shall include Show the monthly budgeted costs, actual costs and estimate at completion. Include cash curves for early and late start and finish dates.
- 7. A manpower histogram plotting actual labor hours against Baseline forecast labor hours over the entire project.

CONSTRUCTION PROGRESS DOCUMENTATION

APRIL 2022

ATTACHMENT E - TECHNICALS

- 8. Material and Equipment Histograms: Showing the status of materials and equipment stored on-site and materials and equipment stored in bonded warehouse(s).
- 9. Construction Equipment Histograms: Show project overall equipment count per month by major equipment category count per month (cranes, excavators, etc.).
- M. All changes to Schedule Updates must be accepted by the Owner Representative. If the Contractor desires to make a change to the current accepted Progress Update Schedule, the Contractor shall request permission from the Owner in writing, stating the reasons for the change as well as the specifics, such as revisions to activities, logic, durations, calendars, etc. Pending changes will be discussed at the Monthly Schedule Review (two days prior to last Friday) where the Owner may authorize their inclusion in the schedule without any determination of merit or responsibility.
- N. Out of sequence logic must be corrected before the Progress Update Schedule is submitted.
- O. Pending Changes shall have a Owner assigned Potential Change (PC) number. The Contractor shall incorporate PC activities into the schedule as Level of Effort (LOE) activities, with a zero-dollar value cost, in the update period in which the Contractor knew, or should have known of the change. The LOE shall be linked to the impacted base contract schedule activities. The change activity shall not be cost loaded until an agreement is reached between the Contractor and Owner as to cost. Should the PC impact the critical path, the Contractor shall submit a Time Impact Analysis (TIA) per the TIA provisions of these specifications. Upon acceptance of a TIA by the Owner Representative, the Contractor shall incorporate the detailed TIA schedule activities into the next Schedule Update retaining the original LOE activity. Upon PCs being incorporated into a Contract Change Order (CCO), the Contractor shall assign an Activity Code for each CCO, with its subset of PC numbers, with the sum cost loading of said PC activities equal to the value of the CCO. The sum of the base contract activities shall total the original contract value. The sum of the change activities shall total CCOs issued to date, plus remaining PCs pending CCO. In the case of deductive change, the base contract activity shall be broken into two activities with the same logic ties consisting of the original activity with the remaining base contract amount and second activity with the amount to be deducted, the sum of the two totaling the originally scheduled value. Add an offsetting deduct (negative cost) as a PC change activity. The deduct amount activity on the base contract section shall have the successor logic removed, with a "deduct" note in parenthesis added to the end of the activity description. The deduct activity shall remain open until the actual deduct activity in the change section is status as complete upon the CCO being issued. Upon the CCO being issued, both activities shall be status with the CCO issue date.
- P. Failure to include in the schedule any element of Work required for performance of Contract shall not excuse Contractor from completing all Work required within applicable time constraints, notwithstanding the Owner's acceptance of Contractor's Construction Schedule.

CONSTRUCTION PROGRESS DOCUMENTATION

APRIL 2022

- Q. Contractor shall address Owner review comments and resubmit within seven (7) Calendar Days from receipt of review comments. Should the Contractor fail to timely incorporate the Owner schedule review comments prior to the due date for the next month's update, the Contractor shall proceed with the update and the outstanding schedule review comments from the prior month will be included in the current schedule update's review comments. The Contractor is responsible for including the Owner schedule review comments into all affected schedules.
- R. Schedule updates forecasting contract milestones 15 or more calendar days late are subject to rejection.

2.07 NARRATIVE PROGRESS REPORTS

- A. A Cost Activity Report shall be prepared and submitted with each progress payment. The cost information shall be updated by activity and summarized for each month. The sum of all monthly costs shall be equal to the contract amount plus approved change orders.
- B. The Narrative Report shall be submitted with the monthly progress update and include:
 - 1. The Contractor's transmittal letter.
 - 2. Schedule report indicating each activity on the CPM Schedule that has been:
 - a. Completed during this reporting period.
 - b. In progress during this reporting period.
 - 3. Scheduled for the next reporting period.
 - 4. Analysis, by critical path. (Note: critical path is longest path as described above.)
 - a. A listing of the current critical path.
 - b. Progress made on critical path activities in current CPM schedule
 - c. Explanations for any lack of Work on critical path activities planned to be performed during the last month.
 - d. Impact on other activities, milestones, and completion dates.
 - 5. Current and anticipated delays:
 - a. Cause of the delay.
 - b. Corrective action and schedule adjustments taken or to be taken to correct the delay.
 - c. Impact of the delay on other activities, milestones, and completion dates.
 - d. Recommendations for recovery of the delays.
 - 6. Any change in construction sequence, logic changes, relationship changes, or duration changes and the rationale associated with each change for Owner review and acceptance.
 - 7. Any corrective actions taken by the Contractor to address delays or potential delays
 - 8. Value of materials and equipment properly stored at the site but not yet incorporated in the Work.

CONSTRUCTION PROGRESS DOCUMENTATION

APRIL 2022

ATTACHMENT E - TECHNICALS

- 9. Identify interface items of work with another contract or with existing facilities or where third-party action or coordination is required.
- 10. Pending issues and status of other items such as:
 - a. Permits.
 - b. Contract modifications.
 - c. Time extension requests.
 - d. Long-lead procurement items.
- 11. Contract complete date status.
- 12. Ahead of schedule and number of days.
- 13. Behind schedule and number of days.
- 14. Summary of project status including cumulative information to date, variance, and forecast at completion.
- 15. Other project or scheduling concerns.

2.08 RECOVERY SCHEDULE

- A. When a periodic update indicates the project completion, or any intermediate contract milestone, is 1 to 15 calendar days behind the current accepted schedule, the Owner reserves the right to request a recovery schedule. If the work falls more than 15 calendar days behind the current accepted schedule, the Contractor is required to submit a Recovery Schedule taking steps necessary to improve progress at no additional cost to the Owner.
- B. Recovery schedules may be submitted independently or included in the next Monthly Progress Update. Indicate changes to working hours per shift, labor per shift, shifts per working day, working days per week, or amount of construction equipment, or any combination of foregoing, sufficiently to achieve the contractual milestones in accordance with the current Contract requirements. If the Contractor chooses to include the recovery schedule with the next Monthly Progress Update, the Owner Representative may reject the Monthly Progress Update or require revisions to be made to the recovery schedule before the Monthly Progress Schedule is accepted. Recovery Schedules shall be prepared by the Contractor regardless of the underlying cause for the delay and responsibility for the time.
- C. The Recovery Schedule shall have the same data date as the submitted Monthly Progress Schedule, and the data prior to the data date shall be the same in both.
- D. Concurrent with the submittal of the Monthly Progress Schedule for review by the Owner, Contractor shall submit the proposed Recovery Schedule. The Submittal shall also include a written, narrative format document detailing proposed changes to the Project Schedule and including reasons for the changes. This narrative document shall include at a minimum, the following:
 - 1. Detailed description of the changes in the means and methods that Contractor intends to implement to recover from schedule delay; such as additional design staff, additional construction crews, additional equipment, extended working hours, additional shifts per day, or other means;

CONSTRUCTION PROGRESS DOCUMENTATION

APRIL 2022

- 2. Detailed description of proposed changes in work activity sequences that will permit previously scheduled sequential work to be performed concurrently, or other scheduling changes, which will result in recovery of the schedule delay;
- 3. Identification of changes to specific activity original durations;
- 4. Identification of changes to activity relationships and/or schedule logic;
- 5. Identification of activities that have been added, deleted, or modified; and/or
- 6. Identification of changes to the Project Schedule's Critical Path.

2.09 TIME IMPACT ANALYSIS (TIA)

- A. When the Contractor asserts it has been or will be delayed, and as a result is requesting a time extension, the Contractor shall notify the Owner Representative of a potential delay and prepare and submit a TIA within fourteen (14) calendar days after the impact is known or should have been known.
- B. The TIA shall be submitted separately and based upon the current accepted schedule with a data date closest to and prior to the date when the Contractor knew, or should have known, of the impact. The current accepted schedule can be the Initial 90 Day Schedule, Baseline Construction Schedule, or Monthly Schedule Update.
- C. If the Contractor is submitting time related costs of any kind and/or is requesting time due to a schedule delay, the submittal of a TIA is required.
- D. The Contractor shall submit to the Owner a written TIA illustrating the influence of each change or delay on any specified intermediate milestone date and the current projected completion date. Each TIA shall include a CPM schedule network (fragnet) indicating all necessary added activities, logic, duration and demonstrating how the Contractor proposes to incorporate the change or delay into the Schedule and any additional supporting evidence that the Owner deems necessary.
- E. The TIA submittal shall include a PDF fragnet comparing the current accepted schedule against the Contractor's claimed delay, showing the impact on the critical path. The fragnet must show all impacts leading up and including the contract milestones.
- F. The TIA shall include a narrative addressing entitlement including a description of the scope of the change as well as addressing compliance with all contract requirements for requesting a time extension. The schedule narrative at a minimum shall address the chronology of events (impact activities), compliance with notice requirements, schedule update used as the basis of analysis (or Baseline Construction Schedule if applicable), critical path, identification of CPM schedule activities impacted, logic ties between impact activities and CPM schedule activities, fragnet, concurrency, and compensability if applicable.

CONSTRUCTION PROGRESS DOCUMENTATION

01 32 00 - 21

PQPS Oxygenation System

K-23-2080-DBB-3

- G. The Contractor shall submit one (1) electronic copy of the Oracle Primavera P6 schedule files in XER format, PDF copies of the fragments, and the narrative. Each TIA should be identified with a discrete ID number and description.
- H. Should the Contractor fail to request time and submit a contract compliant TIA per these specifications, the Contractor will have irrevocably waived its contract right to a time extension and time-related costs and will be responsible for all costs associated with mitigating said delay to complete the work within the contract time.
- I. It is expressly agreed and understood that the Contractor shall not be entitled to any time or compensation for potential delays, or delays, which:
 - 1. Can be avoided by re-sequencing work activities;
 - 2. Applying additional resources;
 - 3. Do not delay the project completion date or a project milestone; or
 - 4. Result from any method used to sequester float.
- J. Pacing is defined as an intentional slowing of work activities during a delay, or alleged delay, to project completion. Absent contemporaneous notice of intent to pace, including the contractor's rational to pace and the Owner's concurrence, pacing of work activities will be construed as a concurrent delay for the purposes of assessing time extensions and delay costs."
- K. The Contractor shall incorporate Owner review comments and resubmit the TIA within 7 calendar days of receiving them.
- L. Upon acceptance of the TIA by the Owner Representative, the Contractor shall incorporate the TIA fragnet into the next monthly progress schedule update.

PART 3 WEATHER

3.01 ANTICIPATED WEATHER DAYS

A. Time Allowance for Inclement Weather: Time allowance for inclement weather: "Inclement weather" is a lost workday, caused by inclement weather conditions, and is defined as a day in which the Contractor's workforce cannot work 50 percent or more of the day thereby resulting in a delay to the critical path. The number of inclement weather days will be reflected in a schedule activity titled "Inclement Weather". Since a majority of the Work will be indoors and access is not expected to be impacted by inclement weather, the Contractor shall allow two (2) working days within the Baseline Construction Schedule for inclement weather, the unused portion shall be considered as Float to be used by either party. The inclement weather activity's successor shall be the Substantial Completion milestone. The predecessor activities shall be the last project activities that occur before Substantial Completion. The Contractor shall notify the Resident Project Representative in writing when a lost workday has occurred due to inclement weather in accordance with the Baseline Construction Schedule update requirements. Any delays beyond the two (2) working days shall not entitle the

CONSTRUCTION PROGRESS DOCUMENTATION

ATTACHMENT E - TECHNICALS

01 32 00 - 22

APRIL 2022

Contractor to any additional compensation. The sole remedy of the Contractor shall be to seek a non-compensable extension of time.

3.02 WEATHER CALENDAR AND ACCOUNTING OF DAYS

- A. The accounting of weather days shall occur once monthly corresponding to the Monthly Schedule Update. The Owner granted non-working days affecting the critical path attributable to weather shall be accounted for in the Weekly Statement of Contract Time, as prepared by the Owner, independent of the weather allowance. Owner granted weather days shall be added to the schedule monthly as a one work day Non-work days in the calendars with an actual date equal to the non-working day as reflected in the Weekly Statement of Contract Time. A monthly reconciliation will occur between the inclement weather allowance and actual weather impact, as reflected in the Weekly Statement of Contract Time. Should the Contractor meet all contract requirements for demonstrating unavoidable delay, the Contractor shall be granted a time extension for weather impact days, beyond the weather allowance days for the same time period, for activities on the critical path.
- B. No contract time adjustment shall be made if actual non-working days attributable to weather affecting the critical path DOES NOT exceed the allowance. Unused weather allowance shall become project float.

3.03 COMPLIANCE AND FAILURE TO SUBMIT TIMELY SCHEDULES

A. Because the Owner places a high value on the importance and use of project scheduling information as a management tool in achieving the completion of Work as planned, the Owner will deduct ten percent (10%) of the monthly Progress Payment, but not more than three percent (3%) of the contract value, for failure by the Contractor to submit accepted Baseline Construction Schedules or the monthly Progress Update Schedules as required by these specifications. These deductions shall apply should the Contractor fail to address within the specified time frame schedule review comments, TIA review comments, recovery schedule requirements, and address any other requirements of these specifications and/or the Owner. These deductions are cumulative and will be made for each and every month that the Contractor fails to provide the required information. The Progress Update Schedules and narratives shall be accurate, reflect actual events on the project, and meet all requirements of these specifications. If the Contractor does not correct the deficiency by providing an acceptable schedule within the specified time frame from receiving the Owner's review comments, the deduction will become permanent via a deductive change order.

PART 4 PART 4 -- PROJECT RECORD SCHEDULE

4.01 FINAL PROGRESS SCHEDULE

A. The last monthly update of the project schedule shall be the project record (asbuilt) schedule. The project record schedule shall accurately show the completion

CONSTRUCTION PROGRESS DOCUMENTATION

APRIL 2022

of all work required by the contract and shall have a data date equivalent to the day after the actual date of the Contract Completion milestone. All project schedule activities shall be status at one hundred percent (100%) complete and have actual start and actual finish dates. The project budgeted cost reflected in the project record schedule shall be the contract price, inclusive of all adjustments due to executed change orders. The project record schedule submittal shall meet all monthly update requirements and include an actual cost statement. The Owner's acceptance of the project record schedule shall be a condition precedent to acceptance of the contract by the City of San Diego Council and to the release of final payment and bonds by the Owner/City.

B. This schedule submission shall be accompanied by a certification, signed by an officer of the company and the Contractor's Project Manager and Project Scheduler, stating "To the best of our knowledge, the enclosed final update of the Construction Progress Schedule accurately reflects the actual start and completion dates and logical relationships of all activities contained herein and represents an accurate depiction of the way in which the project was constructed."

END OF SECTION

CONSTRUCTION PROGRESS DOCUMENTATION

01 32 00 - 24

PQPS Oxygenation System

K-23-2080-DBB-3

SECTION 01 33 00 SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 DEFINITIONS

- A. Action Submittal: Written and graphic information submitted by Contractor that requires Engineer's approval.
- B. Deferred Submittal: Information submitted by Contractor for portions of design that are to be submitted to permitting agency for approval prior to installation of that portion of the Work, along with Engineer's review documentation that submittal has been found to be in general conformance with Project's design.
- C. Informational Submittal: Information submitted by Contractor that requires Engineer's review and determination that submitted information is in accordance with the Conditions of the Contract.

1.02 PROCEDURES

- A. Direct submittals as described in this Section, unless specified otherwise.
 - 1. Via Construction Manager.
- B. Electronic Submittals: Submittals shall, unless specifically accepted, be made in electronic format.
 - Each submittal shall be an electronic file in Adobe Acrobat Portable Document Format (PDF) limited to 100 MB in size. Use the latest version available at time of execution of the Agreement.
 - 2. Electronic files that contain more than 10 pages in PDF format shall contain internal bookmarking from an index page to major sections of the document.
 - 3. PDF files shall be set to open "Bookmarks and Page" view. Magnification shall be set to "fit page".
 - 4. Add general information to each PDF file, including title, subject, author, and keywords.
 - 5. PDF files shall be set up to print legibly at 8.5-inch by 11-inch, 11-inch by 17-inch, or 22-inch by 34-inch. No other paper sizes will be accepted.
 - 6. Submit new electronic files for each resubmittal.
 - 7. Include a copy of the Transmittal of Contractor's Submittal form, located at end of section, with each electronic file.
 - 8. Owner will reject submittal that is not electronically submitted, unless specifically accepted.
 - 9. Provide Construction Manager with authorization to reproduce and distribute each file as many times as necessary for Project documentation. Provide file password if security settings are used.

APRIL 2022

SUBMITTAL PROCEDURES

ATTACHMENT E - TECHNICALS

10. Detailed procedures for handling electronic submittals will be discussed at the preconstruction conference.

C. Transmittal of Submittal:

- 1. Contractor shall:
 - a. Review each submittal and check for compliance with Contract Documents.
 - b. Stamp each submittal with uniform approval stamp before submitting to Construction Manager.
 - Stamp to include Project name, submittal number, Specification number, Contractor's reviewer name, date of Contractor's approval, and statement certifying submittal has been reviewed, checked, and approved for compliance with Contract Documents.
 - 2) Construction Manager will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- 2. Complete, sign, and transmit with each submittal package, one Transmittal of Contractor's Submittal form in format approved by Construction Manager.
- 3. Identify each submittal with the following:
 - a. Numbering and Tracking System:
 - 1) Sequentially number each submittal.
 - 2) Resubmission of submittal shall have original number with sequential alphabetic suffix.
 - b. Specification section and paragraph to which submittal applies.
 - c. Project title and Owner's project number.
 - d. Date of transmittal.
 - e. Names of Contractor, Subcontractor or Supplier, and manufacturer as appropriate.
- 4. Identify and describe each deviation or variation from Contract Documents.
- 5. All submittals shall be in the English language.

D. Format:

- 1. Do not base Shop Drawings on reproductions of Contract Documents.
- 2. Package submittal information by individual specification section. Do not combine different specification sections together in submittal package, unless otherwise directed in specification.
- 3. Present in a clear and thorough manner and in sufficient detail to show kind, size, arrangement, and function of components, materials, and devices, and compliance with Contract Documents.
- 4. Index with labeled tab dividers in orderly manner.
- 5. Submit all text in the English language.
- E. Timeliness: Schedule and submit in accordance Schedule of Submittals, and requirements of individual specification sections.
- F. Processing Time:

APRIL 2022

SUBMITTAL PROCEDURES

ATTACHMENT E - TECHNICALS

- 1. Time for review shall commence on Construction Manager's receipt of submittal.
- 2. Construction Manager will act upon Contractor's submittal and transmit response to Contractor not later than 15 working days after receipt, unless prior notice has been given. Within 5 working days of receipt of the Construction Manager's comments, Contractor shall resolve and discuss with the Construction Manager any outstanding issues as a result of the Construction Manager's comments.
- 3. Allow 15 working days for the review of deferred submittals by the Agency Having Jurisdiction (AHJ) after approval by the Engineer.
- 4. Contractor shall submit resubmittals or final submittals to Construction Manager within 10 working days of the resolution of the submittal issues.
- 5. No adjustment of Contract Times or Price will be allowed as a result of delays in progress of Work caused by rejection and subsequent resubmittals.
- G. Resubmittals: Clearly identify each correction or change made.
- H. Incomplete Submittals:
 - 1. Construction Manager will return entire submittal for Contractor's revision if preliminary review deems it incomplete.
 - 2. When any of the following are missing, submittal will be deemed incomplete:
 - a. Contractor's review stamp; completed and signed.
 - b. Transmittal of Contractor's Submittal; completed and signed.
 - c. Insufficient number of copies.
- I. Submittals not required by Contract Documents:
 - 1. Will not be reviewed and will be returned stamped "Not Subject to Review."
 - 2. Construction Manager will keep one copy and return submittal to Contractor.
- J. Approved Materials List (AML): See Section 3-8.1 "General" and Section 4-3.6 Preapproved Materials in the 2021 WHITEBOOK and 2021 GREENBOOK.
- K. Working Drawings: Submit Working Drawings listed in TABLE 3-8.2 of 2021 WHITEBOOK AND 2021 GREENBOOK.

1.03 ACTION SUBMITTALS

- A. Prepare and submit Action Submittals required by individual specification sections.
- B. Shop Drawings:
 - 1. Copies: Copies will be submitted electronically (via PMWeb). If revisions are required, coordination will be completed electronically.
 - 2. Identify and Indicate:
 - a. Applicable Contract Drawing and Detail number, products, units and assemblies, and system or equipment identification or tag numbers.
 - b. Equipment and Component Title: Identical to title shown on Drawings.

APRIL 2022

SUBMITTAL PROCEDURES

ATTACHMENT E - TECHNICALS

- c. Critical field dimensions and relationships to other critical features of Work. Note dimensions established by field measurement.
- d. Project-specific information drawn accurately to scale.
- 3. Manufacturer's standard schematic drawings and diagrams as follows:
 - a. Modify to delete information that is not applicable to the Work.
 - b. Supplement standard information to provide information specifically applicable to the Work.
- 4. Product Data: Provide as specified in individual specifications.
- 5. Deferred Submittal: See Drawings for list of deferred submittals.
 - a. Contractor-design drawings and product data related to permanent construction.
 - 1) Written and graphic information.
 - 2) Drawings.
 - 3) Cut sheets.
 - 4) Data sheets.
 - 5) Action item submittals requested in individual specification section.
 - b. Prior to installation of indicated structural or nonstructural element, equipment, distribution system, or component or its anchorage, submit required supporting data and drawings for review and acceptance by Engineer. Documentation of review and approval provided on Engineer's comment form, along with completed submittal, shall be filed with permitting agency by Contractor and approved by permitting agency prior to installation.
 - Foreign Manufacturers: When proposed, include names and addresses of at least two companies that maintain technical service representatives close to Project.

C. Samples:

- 1. Copies: Two, unless otherwise specified in individual specifications.
- 2. Preparation: Mount, display, or package Samples in manner specified to facilitate review of quality. Attach label on unexposed side that includes the following:
 - a. Manufacturer name.
 - b. Model number.
 - c. Material.
 - d. Sample source.
- 3. Manufacturer's Color Chart: Units or sections of units showing full range of colors, textures, and patterns available.
- 4. Full-size Samples:
 - a. Size as indicated in individual specification section.
 - b. Prepared from same materials to be used for the Work.
 - c. Cured and finished in manner specified.
 - d. Physically identical with product proposed for use.

APRIL 2022

SUBMITTAL PROCEDURES

ATTACHMENT E - TECHNICALS

- D. Action Submittal Dispositions: Engineer will review, comment, stamp, and distribute as noted:
 - 1. Approved:
 - a. Contractor may incorporate product(s) or implement Work covered by submittal.
 - b. Distribution: Electronic.
 - 1) One copy of closed submittal furnished to the Construction Manager.
 - 2. Approved as Noted:
 - a. Contractor may incorporate product(s) or implement Work covered by submittal, in accordance with Engineer's notations.
 - b. Distribution: Electronic.
 - 3. Partial Approval, Resubmit as Noted:
 - a. Make corrections or obtain missing portions and resubmit.
 - b. Except for portions indicated, Contractor may begin to incorporate product(s) or implement Work covered by submittal, in accordance with Engineer's notations.
 - c. Distribution: Electronic.
 - 4. Revise and Resubmit:
 - a. Contractor may not incorporate product(s) or implement Work covered by submittal.
 - b. Distribution: Electronic.

1.04 INFORMATIONAL SUBMITTALS

A. General:

- 1. Copies: Electronic.
- 2. Refer to Section 3-8.4 of the 2021 GREENBOOK and 2021 WHITEBOOK, and individual specification sections for specific submittal requirements.
- Construction Manager will review each submittal. If submittal meets conditions
 of the Contract, Construction Manager will forward copy to appropriate parties.
 If Construction Manager determines submittal does not meet conditions of the
 Contract and is therefore considered unacceptable, Construction Manager will
 provide review comments to Contractor, and require that submittal be
 corrected and resubmitted.
- B. Equipment Procured Overseas: Within fourteen (14) Calendar Days of Notice to Proceed, submit a list of equipment that will require overseas shipping for project delivery. List shall include the value of shipped items.

C. Certificates:

- 1. General:
 - a. Provide notarized statement that includes signature of entity responsible for preparing certification.
 - b. Signed by officer or other individual authorized to sign documents on behalf of that entity.

APRIL 2022

SUBMITTAL PROCEDURES

ATTACHMENT E - TECHNICALS

- 2. Welding: In accordance with individual specification sections.
- 3. Installer: Prepare written statements on manufacturer's letterhead certifying installer complies with requirements as specified in individual specification section.
- 4. Material Test: Prepared by qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
- 5. Certificates of Successful Testing or Inspection: Submit when testing or inspection is required by Laws and Regulations or governing agency or specified in individual specification sections.
- 6. Manufacturer's Certificate of Compliance: In accordance with Section 01 61 00 COMMON PRODUCT REQUIREMENTS.
- 7. Manufacturer's Certificate of Proper Installation: In accordance with Section 01 43 33 MANUFACTURER'S FIELD SERVICES.
- D. Closeout Submittals: In accordance with Section 01 77 00 CLOSEOUT PROCEDURES.
- E. Contractor-design Data (related to temporary construction):
 - 1. Written and graphic information.
 - 2. List of assumptions.
 - 3. List of performance and design criteria.
 - 4. Summary of loads or load diagram, if applicable.
 - 5. Calculations.
 - 6. List of applicable codes and regulations.
 - 7. Name and version of software.
 - 8. Information requested in individual specification section.
- F. Deferred Submittals: See Drawings for list of deferred submittals.
 - 1. Contractor-design data related to permanent construction:
 - a. List of assumptions.
 - b. List of performance and design criteria.
 - c. Summary of loads or load diagram, if applicable.
 - d. Calculations.
 - e. List of applicable codes and regulations.
 - f. Name and version of design software.
 - g. Factory test results.
 - h. Informational submittals requested in individual specification section.
 - 2. Prior to installation of indicated structural or nonstructural element, equipment, distribution system, or component or its anchorage, submit calculations and test results of Contractor-designed components for review by Engineer. Documentation of review and indication of compliance with general design intent and project criteria provided on Engineer's comment form as meets conditions of the Contract, along with completed submittal, shall be filed with

APRIL 2022

SUBMITTAL PROCEDURES

ATTACHMENT E - TECHNICALS

- permitting agency by Contractor and approved by permitting agency prior to installation.
- G. Manufacturer's Instructions: Written or published information that documents manufacturer's recommendations, guidelines, and procedures in accordance with individual specification section.
- H. Operation and Maintenance Data: As required in Section 01 78 23 OPERATIONS AND MAINTENANCE DATA.

I. Payment:

- 1. Application for Payment: In accordance with Section 01 29 00 PAYMENT PROCEDURES.
- 2. Schedule of Values: In accordance with Section 01 29 00 PAYMENT PROCEDURES.
- 3. Schedule of Estimated Progress Payments: In accordance with Section 01 29 00 PAYMENT PROCEDURES.
- J. Quality Control Documentation: As required in Section 01 45 16.13 CONTRACTOR QUALITY CONTROL.

K. Schedules:

- Schedule of Submittals: Prepare separately or in combination with Progress Schedule as specified in Section 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION.
 - a. Show for each, at a minimum, the following:
 - 1) Specification section number.
 - 2) Identification by numbering and tracking system as specified under Paragraph Transmittal of Submittal.
 - 3) Estimated date of submission to Construction Manager, including reviewing and processing time.
 - b. On a monthly basis, submit updated Schedule of Submittals to Construction Manager if changes have occurred or resubmittals are required.
- 2. Progress Schedules: In accordance with Section 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION.
- L. Special Guarantee: Supplier's written guarantee as required in individual specification sections.

M. Statement of Qualification:

 Evidence of qualification, certification, or registration as required in Contract Documents to verify qualifications of professional land surveyor, engineer, materials testing laboratory, specialty Subcontractor, trade, Specialist, consultant, installer, and other professionals. Submittals Required by Laws, Regulations, and Governing Agencies:

APRIL 2022

SUBMITTAL PROCEDURES

ATTACHMENT E - TECHNICALS

- a. Promptly submit promptly notifications, reports, certifications, payrolls, and otherwise as may be required, directly to the applicable federal, state, or local governing agency or their representative.
- b. Transmit to Construction Manager for Owner's records one copy of correspondence and transmittals (to include enclosures and attachments) between Contractor and governing agency.
- N. Submittals Required by Laws, Regulations, and Governing Agencies:
 - 1. Promptly submit promptly notifications, reports, certifications, payrolls, and otherwise as may be required, directly to the applicable federal, state, or local governing agency or their representative.
 - 2. Transmit to Engineer for Owner's records one copy of correspondence and transmittals (to include enclosures and attachments) between Contractor and governing agency.
- O. Test, Evaluation, and Inspection Reports:
 - 1. General: Shall contain signature of person responsible for test or report.
 - 2. Factory:
 - a. Identification of product and specification section, type of inspection or test with referenced standard or code.
 - b. Date of test, Project title and number, and name and signature of authorized person.
 - c. Test results.
 - d. If test or inspection deems material or equipment not in compliance with Contract Documents, identify corrective action necessary to bring into compliance.
 - e. Provide interpretation of test results, when requested by Construction Manager.
 - f. Other items as identified in individual specification sections.

3. Field:

- a. As a minimum, include the following:
 - 1) Project title and number.
 - 2) Date and time.
 - 3) Record of temperature and weather conditions.
 - 4) Identification of product and specification section.
 - 5) Type and location of test, Sample, or inspection, including referenced standard or code.
 - 6) Date issued, testing laboratory name, address, and telephone number, and name and signature of laboratory inspector.
 - 7) If test or inspection deems material or equipment not in compliance with Contract Documents, identify corrective action necessary to bring into compliance.
 - 8) Provide interpretation of test results, when requested by Construction Manager.
 - 9) Other items as identified in individual specification sections.

APRIL 2022

ATTACHMENT E - TECHNICALS

SUBMITTAL PROCEDURES

- P. Testing and Startup Data: In accordance with Section 01 91 14 TESTING AND STARTUP.
- Q. Training Data: In accordance with Section 01 43 33 MANUFACTURER'S FIELD SERVICES.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS SUBMITTAL PROCEDURES

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS SUBMITTAL PROCEDURES

SECTION 01 33 22 WEB BASED CONSTRUCTION DOCUMENT MANAGEMENT

PART 1 GENERAL

1.01 SUMMARY

- A. The Owner, Construction Manager, Engineer, and Contractor shall utilize PMWeb (PMWeb is a registered trademark of PMWeb, Inc.), for submission of all data and documents (unless specified otherwise herein) throughout the duration of the Contract.
 - 1. PMWeb is a web-based electronic media site.
 - 2. PMWeb is paid for by the Owner.
 - 3. PMWeb will be made available to all Contractor's personnel, subcontractor personnel, suppliers, consultants, Construction Manager, and Engineer.
 - 4. The joint use of this system is to facilitate electronic exchange of information, automation of key processes, and overall management of Construction Phase Documentation.
 - 5. PMWeb shall be the primary official means of project information submission and management.
- B. User Access Limitations: The Construction Manager will initially manage the Contractor's access to PMWeb by allowing access and assigning user profiles to accepted Contractor personnel. User profiles will define levels of access into the system; determine assigned function based authorizations and user privileges. Subcontractors and suppliers will be given access to PMWeb by and through the Contractor. Entry of information exchanged and transferred between the Contractor and its subcontractors and suppliers on PMWeb shall be the responsibility of the Contractor.
- C. Joint Ownership of Data: Data entered in a collaborative mode (entered with the intent to share as determined by permissions and workflows within the PMWeb system) by the Owner, Construction Manager, Engineer, and Contractor will be jointly owned.
- D. Automated System Notification and Audit Log Tracking: Review comments made (or lack thereof) by the Owner on Contractor submitted documentation shall not relieve the Contractor from compliance with requirements of the Contract Documents. The Contractor is responsible for managing, tracking, and documenting the Work to comply with the requirements of the Contract Documents. Owner's acceptance via automated system notifications or audit logs extends only to the face value of the submitted documentation and does not constitute validation of the Contractor's submitted information.

E. Submittals:

1. See Section 01 33 00 SUBMITTAL PROCEDURES.

APRIL 2022

WEB BASED CONSTRUCTION DOCUMENT MANAGEMENT

ATTACHMENT E - TECHNICALS

01 33 22 - 1

2. Preconstruction Submittals List of Contractor's key PMWeb personnel. Include descriptions of key personnel's roles and responsibilities for this Project. Contractor should also identify their organizations administrator on the list.

F. Computer Requirements:

- The Contractor shall use computer hardware and software that meets the requirements of the PMWeb system as required to access and utilize PMWeb. As recommendations are modified by PMWeb, the Contractor will upgrade their system(s) to meet or exceed the recommendations. Upgrading of the Contractor's computer systems will not be justification for a cost or time modification to the Contract.
- 2. The Contractor shall ensure that connectivity to the PMWeb system is accomplished through DSL, cable, T-1 or wireless communications systems. The minimum bandwidth requirements for using the system is 128kb/s. It is recommended a faster connection be used when uploading pictures and files into the system.
- 3. PMWeb currently supports Mozilla's Firefox v3.0-3.5, Apple's Safari v3.0-3.5, and Microsoft's Internet Explorer v7.0 web browsers for accessing the application.

G. Contractor Responsibility:

- 1. The Contractor shall be responsible for the validity of their information placed in PMWeb and for the abilities of their personnel.
- 2. Accepted users shall be knowledgeable in the use of computers, including Internet Browsers, email programs, CAD drawing applications, and Adobe Portable Document Format (PDF) document distribution program.
- 3. The Contractor shall utilize the existing forms in PMWeb to the maximum extent possible. If a form does not exist in PMWeb the Contractor must include a form of their own or provided by the Construction Manager as an attachment to a submittal.
- 4. Adobe PDF documents will be created through electronic conversion rather than optically scanned whenever possible. The Contractor is responsible for the training of their personnel in the use of PMWeb (outside what is provided by the Owner), and the other programs indicated above as needed.
- H. Connectivity Problems: Provide a list of Contractor's key PMWeb personnel for the Construction Manager's acceptance. Contractor is responsible for adding and removing users from the system. The Construction Manager reserves the right to perform a security check on all potential users. The Contractor will be allowed to add additional personnel and subcontractors to PMWeb after clearance by security check.

I. Training:

- 1. The Owner has arranged and paid for training to be provided to the Contractor.
- 2. Training consists of web-based seminars in conjunction with a conference call.

APRIL 2022

WEB BASED CONSTRUCTION DOCUMENT MANAGEMENT

3. Contractor shall arrange and pay for the facilities and hardware/software required to facilitate their own training.

PART 2 PRODUCTS

2.01 DESCRIPTION

A. PMWeb project management application (no or-equal).

PART 3 EXECUTION

3.01 PMWEB UTILIZATION

A. PMWeb shall be utilized in connection with all document and information management required by these Contract Documents.

3.02 SUBMITTALS

A. Shop Drawings:

- 1. Shop Drawing and design data documents shall be submitted PDF attachments to the PMWeb submittal work flow process and form. Examples of Shop Drawings include, but are not limited to:
 - a. Standard manufacturer installation drawings.
 - b. Drawings prepared to illustrate portions of the work designed or developed by the Contractor.
 - c. Steel fabrication, piece, and erection drawings.
- B. See Section 01 33 00 SUBMITTAL PROCEDURES.

3.03 PRODUCT DATA

- A. Product catalog data and manufacturer's instructions shall be submitted as PDF attachments to the PMWeb submittal work flow process and form. Examples of product data include, but are not limited to:
 - 1. Manufacturer's printed literature.
 - 2. Preprinted product specification data and installation instructions.

3.04 ADMINISTRATIVE OR INFORMATIONAL SUBMITTALS

- A. All correspondence and preconstruction submittals shall be submitted using PMWeb. Examples of administrative submittals include, but are not limited to:
 - 1. Permits.
 - 2. Requests for substitutions (RFS).
 - 3. List of contact personnel.
 - 4. Requests for Information (RFI).
- B. Network Analysis Schedules and associated reports and updates. Each schedule submittal specified in these Contract Documents shall be submitted

APRIL 2022

WEB BASED CONSTRUCTION DOCUMENT MANAGEMENT

ATTACHMENT E - TECHNICALS

01 33 22 - 3

as a native backed-up file (.PRX or .STX) of the scheduling program being used. The schedule shall also be posted as a PDF file in the format specified in these Contract Documents.

- C. Plans for safety, demolition, environmental protection, and similar activities.
- D. Quality Control Plan(s), Testing Plan and Log, Quality Control Reports, Production Reports, Quality Control Specialist Reports, Preparatory Phase Checklist, Initial Phase Checklist, Field Test reports, Summary reports, Rework Items List, etc.
- E. Meeting minutes for quality control meetings, progress meetings, pre-installation meetings, etc.
- F. Any general correspondence submitted.
- G. Project Photos: Project photos shall be posted monthly to PMWeb.

3.05 COMPLIANCE SUBMITTALS

- A. Test reports, certificates, and manufacture field report submittals shall be submitted on PMWeb as PDF attachments. Examples of compliance submittals include, but are not limited to:
 - 1. Field test reports.
 - 2. Quality Control certifications.
 - 3. Manufacturer's documentation and certifications for quality of products and materials provided.

3.06 RECORD AND CLOSEOUT SUBMITTALS

- A. Operation and maintenance data and closeout submittals shall be submitted on PMWeb as PDF documents during the approval and review stage as specified, with actual set of documents submitted for final. Examples of record submittals include, but are not limited to:
 - 1. Operation and Maintenance Manuals: Final documents shall be submitted as specified.
 - 2. Extra materials, spare stock, etc., submittal forms shall indicate when actual materials are submitted.

3.07 FINANCIAL SUBMITTALS

- A. Schedule of Value, Pay Estimates, and Change Request Proposals shall be submitted on PMWeb. Supporting material for Pay Estimates and Change Requests shall be submitted on PMWeb as PDF attachments. Examples of compliance submittals include, but are not limited to:
 - 1. Contractor's Schedule of Values.
 - 2. Contractor's Monthly Progress Payment Requests.

APRIL 2022

WEB BASED CONSTRUCTION DOCUMENT MANAGEMENT

ATTACHMENT E - TECHNICALS

01 33 22 - 4

3. Contract Change proposals requested by the Owner.

3.08 SUBMITTAL PAPER COPIES

- A. Contractor shall deliver bound and tabbed paper copies of every closed submittal to the Construction Manager within 1 week of the Construction Manager closing a submittal with any disposition as follows:
 - 1. Each copy shall have the closed PMWeb cover page including the disposition and any comments.
 - 2. Final copies of submittals returned with comments, but not requiring resubmittal shall incorporate revisions per the Engineer's comments.
 - 3. Number of Paper Copies:
 - a. Final O&M Manuals: Three copies as specified in the Section 01 78 23 OEPRATION AND MAINTENANCE DATA.
 - b. All Other Submittals: Five copies as specified in Section 01 33 00, SUBMITTAL PROCEDURES.
 - c. For submittals with attachments over 30 megabytes in size, provide one CD of the submittal for each required paper copy.

END OF SECTION

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

SECTION 01 43 33 MANUFACTURERS' FIELD SERVICES

PART 1 GENERAL

1.01 DEFINITIONS

A. Person-Day: One person for 8 hours within regular Contractor working hours.

1.02 SUBMITTALS

A. Informational Submittals:

- 1. Training Schedule: Submit, in accordance with requirements of this Specification, not less than 21 calendar days prior to start of equipment installation and revise as necessary for acceptance.
- 2. Lesson Plan: Submit, in accordance with requirements of this Specification, proposed lesson plan not less than 21 days prior to scheduled training and revise as necessary for acceptance.
- Training Session Recordings: Furnish Owner with two complete sets of recordings fully indexed and cataloged with printed label stating session and date recorded.
- 4. Written certification of training including listing of individuals who attended.

1.03 QUALIFICATION OF MANUFACTURER'S REPRESENTATIVE

- A. Authorized representative of the manufacturer, factory trained, and experienced in the technical applications, installation, operation, and maintenance of respective equipment, subsystem, or system, with full authority by the equipment manufacturer to issue the certifications required of the manufacturer. Additional qualifications may be specified in the individual specification section.
- B. Representative subject to acceptance by Owner, Construction Manager, and Engineer. No substitute representatives will be allowed unless prior written approval by such has been given.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 FULFILLMENT OF SPECIFIED MINIMUM SERVICES

A. Furnish manufacturers' services, when required by an individual specification section, to meet the requirements of this section.

APRIL 2022

MANUFACTURERS' FIELD SERVICES

ATTACHMENT E - TECHNICALS

- B. Where time is necessary in excess of that stated in the Specifications for manufacturers' services, or when a minimum time is not specified, time required to perform specified services shall be considered incidental.
- C. Schedule manufacturer' services to avoid conflict with other onsite testing or other manufacturers' onsite services.
- D. Determine, before scheduling services, that conditions necessary to allow successful testing have been met.
- E. Only those days of service approved by Construction Manager will be credited to fulfill specified minimum services.
- F. When specified in individual specification sections, manufacturer's onsite services shall include:
 - 1. Assistance during product (system, subsystem, or component) installation to include observation, guidance, instruction of Contractor's assembly, erection, installation or application procedures.
 - 2. Inspection, checking, and adjustment as required for product (system, subsystem, or component) to function as warranted by manufacturer and necessary to furnish Manufacturer's Certificate of Proper Installation.
 - 3. Providing, on a daily basis, copies of manufacturers' representatives field notes and data to Engineer and Construction Manager.
 - 4. Revisiting the Site as required to correct problems and until installation and operation are acceptable to Construction Manager.
 - 5. Resolution of assembly or installation problems attributable to or associated with respective manufacturer's products and systems.
 - 6. Assistance during functional and performance testing, and facility startup and evaluation.
 - 7. Training of Owner's personnel in the operation and maintenance of respective product as required.

3.02 MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

- A. A Manufacturer's Certificate of Proper Installation form, a copy of which is attached to this section, shall be completed and signed by equipment manufacturer's representative.
- B. Such form shall certify signing party is a duly authorized representative of manufacturer, is empowered by manufacturer to inspect, approve, and operate their equipment and is authorized to make recommendations required to ensure equipment is complete and operational.

3.03 TRAINING

A. General:

1. Furnish manufacturers' representatives for detailed classroom and hands-on training to Owner's personnel on operation and maintenance of specified

APRIL 2022

MANUFACTURERS' FIELD SERVICES

ATTACHMENT E - TECHNICALS

- product (system, subsystem, component) and as may be required in applicable Specifications.
- 2. Furnish trained, articulate personnel to coordinate and expedite training, to be present during training coordination meetings with Owner, and familiar with operation and maintenance manual information specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA.
- 3. Manufacturer's representative shall be familiar with facility operation and maintenance requirements as well as with specified equipment.
- 4. Furnish complete training materials, to include operation and maintenance data, to be retained by each trainee.

B. Training Schedule:

- 1. List specified equipment and systems that require training services and show:
 - a. Respective manufacturer.
 - b. Estimated dates for installation completion.
 - c. Estimated training dates.
- 2. Allow for multiple sessions when several shifts are involved.
- Adjust schedule to ensure training of appropriate personnel as deemed necessary by Owner, and to allow full participation by manufacturers' representatives. Adjust schedule for interruptions in operability of equipment.
- 4. Coordinate with Section 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION, and Section 01 91 14 TESTING AND STARTUP.

C. Lesson Plan:

- 1. When manufacturer or vendor training of Owner personnel is specified, prepare a lesson plan for each required course containing the following minimum information:
 - a. Title and objectives.
 - b. Recommended attendees (such as, managers, engineers, operators, maintenance).
 - c. Course description, outline of course content, and estimated class duration.
 - d. Format (such as, lecture, self-study, demonstration, hands-on).
 - e. Instruction materials and equipment requirements.
 - f. Resumes of instructors providing training.

D. Prestartup Training:

- Coordinate training sessions with Owner's operating personnel and manufacturers' representatives and with submission of operation and maintenance manuals in accordance with Section 01 78 23 OPERATION AND MAINTEANCE DATA.
- 2. Complete at least 14 calendar days prior to beginning of facility startup.
- E. Post-startup Training: Furnish and coordinate training of Owner's operating personnel by respective manufacturer's representatives.
- F. Recording of Training Sessions:

APRIL 2022

MANUFACTURERS' FIELD SERVICES

ATTACHMENT E - TECHNICALS

- 1. Furnish video recording of prestartup and post-startup instruction sessions, including manufacturers' representatives' hands-on equipment instruction and classroom sessions.
- 2. Provide video recording of training materials and instruction using video recording equipment other than cell or mobile phone. Recording shall be edited to remove extraneous material.
- 3. Use DVD format suitable for playback on standard equipment available commercially in the United States. Blu-ray® DVD format is not acceptable without Construction Manager's prior approval.
- 4. DVD may contain multiple training sessions. If multiple training sessions included on a DVD, provide with on-screen menu for playback selection.

END OF SECTION

APRIL 2022

MANUFACTURERS' FIELD SERVICES

ATTACHMENT E - TECHNICALS

MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

OWNER	EQPT SERIAL NO:
	EQPT/SYSTEM:
	SPEC. SECTION:
I hereby certify that the above-referenced equipment/sy	
(Check Applicable)	
☐ Installed in accordance with Manufacturer's re	commendations.
Inspected, checked, and adjusted.	
Serviced with proper initial lubricants.	
☐ Electrical and mechanical connections meet q	uality and safety standards.
☐ All applicable safety equipment has been prop	perly installed.
☐ Functional tests.	
	eets or exceeds specified performance requirements.
(When complete system of one manufacturer)	
Note: Attach any performance test documentation	from manufacturer.
Comments:	
of the manufacturer, (ii) empowered by the manufacture (iii) authorized to make recommendations required to	eby certify that I am (i) a duly authorized representative er to inspect, approve, and operate their equipment and o ensure equipment furnished by the manufacturer is se indicated herein. I further certify that all information
Date:, 20	-
Manufacturer:	
By Manufacturer's Authorized Representative:	
	(Authorized Signature)

APRIL 2022

MANUFACTURERS' FIELD SERVICES

ATTACHMENT E - TECHNICALS

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS MANUFACTURERS' FIELD SERVICES

SECTION 01 45 16.13 CONTRACTOR QUALITY CONTROL

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
 - 1. ASTM International (ASTM):
 - a. D3740, Evaluation of Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
 - b. E329, Use in the Evaluation of Testing and Inspection Agencies as Used in Construction.

1.02 DEFINITIONS

A. Contractor Quality Control (CQC): The means by which Contractor ensures that the construction, to include that performed by subcontractors and suppliers, complies with the requirements of the Contract.

1.03 SUBMITTALS

- A. Informational Submittals:
 - 1. CQC Plan: Submit, not later than 3 weeks after receipt of Notice to Proceed.
 - 2. CQC Report: Submit, weekly, an original and one copy in report form.

1.04 OWNER'S QUALITY ASSURANCE

- A. All Work is subject to Owner's quality assurance inspection and testing at all locations and at all reasonable times before acceptance to ensure strict compliance with the terms of the Contract Documents.
- B. Owner's quality assurance inspections and tests are for the sole benefit of Owner and do not:
 - 1. Relieve Contractor of responsibility for providing adequate quality control measures.
 - 2. Relieve Contractor of responsibility for damage to or loss of the material before acceptance.
 - 3. Constitute or imply acceptance.
 - 4. Affect the continuing rights of Owner after acceptance of the completed Work.
- C. The presence or absence of a quality assurance inspector does not relieve Contractor from any Contract requirement.

APRIL 2022

CONTRACTOR QUALITY CONTROL

ATTACHMENT E - TECHNICALS

01 45 16.13 - 1

- D. Promptly furnish all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by Construction Manager.
- E. Owner may charge Contractor for any additional cost of inspection or test when Work is not ready at the time specified by Contractor for inspection or test, or when prior rejection makes re-inspection or retest necessary. Quality assurance inspections and tests will be performed in a manner that will not unnecessarily delay the Work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. Maintain an adequate inspection system and perform such inspections as will ensure that the Work conforms to the Contract Documents.
- B. Maintain complete inspection records and make them available at all times to Owner and Construction Manager.
- C. The quality control system shall consist of plans, procedures, and organization necessary to produce an end product that complies with the Contract Documents. The system shall cover all construction and demolition operations, both onsite and offsite, including Work by subcontractors, fabricators, suppliers and purchasing agents, and shall be keyed to the proposed construction sequence.

3.02 COORDINATION MEETING

- A. After the Preconstruction Conference, but before start of construction, and prior to acceptance of the CQC Plan, schedule a meeting with Construction Manager and Owner to discuss the quality control system.
- B. Develop a mutual understanding of the system details, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite Work, and the interrelationship of Contractor's management and control with the Owner's Quality Assurance.
- C. There may be occasions when subsequent conferences may be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures that may require corrective action by Contractor.

3.03 QUALITY CONTROL

A. The Contractor shall monitor the quality of the equipment using a Quality Control Plan submitted by the vendor

APRIL 2022

CONTRACTOR QUALITY CONTROL

ATTACHMENT E - TECHNICALS

01 45 16.13 - 2

3.04 CONTRACTOR QUALITY CONTROL PLAN

A. General:

- 1. Plan shall identify personnel, procedures, control, instructions, test, records, and forms to be used.
- 2. An interim plan for the first 15 calendar days of operation will be considered.
- 3. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of Work to be started.
- 4. Work outside of the features of Work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of Work to be started.

B. Content:

- 1. Plan shall cover the intended CQC organization for the entire Contract and shall include the following, as a minimum:
 - a. Organization: Description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff will implement the three-phase control system (see Paragraph QC Phasing) for all aspects of the Work specified.
 - b. CQC Staff: The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a QC function.
 - c. Letters of Authority: A copy of a letter to the CQC System Manager signed by an authorized official of the firm, describing the responsibilities and delegating sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop Work which is not in compliance with the Contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities and responsibilities. Copies of these letters will also be furnished to Owner.
 - d. Submittals: Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers and purchasing agents.
 - e. Testing: Control, verification and acceptance testing procedures for each specific test to include the test name, frequency, specification paragraph containing the test requirements, the personnel and laboratory responsible for each type of test, and an estimate of the number of tests required.
 - f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests, including documentation.
 - g. Procedures for tracking deficiencies from identification through acceptable corrective action. These procedures will establish verification that identified deficiencies have been corrected.
 - h. Reporting procedures, including proposed reporting formats; include a copy of the CQC report form.
- C. Acceptance of Plans: Acceptance of the Contractor's basic and addendum CQC plans is required prior to the start of construction. Acceptance is conditional and

APRIL 2022

CONTRACTOR QUALITY CONTROL

ATTACHMENT E - TECHNICALS

will be predicated on satisfactory performance during the construction. Owner reserves the right to require Contractor to make changes in the CQC plan and operations including removal of personnel, as necessary, to obtain the quality specified.

D. Notification of Changes: After acceptance of the CQC plan, Contractor shall notify Construction Manager, in writing, a minimum of 7 calendar days prior to any proposed change. Proposed changes are subject to acceptance by Construction Manager.

3.05 CONTRACTOR QUALITY CONTROL REPORT

- A. As a minimum, prepare a CQC report for every 7 calendar days. Account for all days throughout the life of the Contract. Reports shall be signed and dated by CQC System Manager. Include copies of test reports and copies of reports prepared by QC staff.
- B. Maintain current records of quality control operations, activities, and tests performed, including the Work of subcontractors and suppliers.
- C. Records shall be on an acceptable form and shall be a complete description of inspections, the results of inspections, daily activities, tests, and other items, including but not limited to the following:
 - 1. Status of Noncompliances issued by the Construction Manager.
 - 2. Contractor/subcontractor and their areas of responsibility.
 - 3. Operating plant/equipment with hours worked, idle, or down for repair.
 - 4. Work performed today, giving location, description, and by whom. When a network schedule is used, identify each phase of Work performed each day by activity number.
 - 5. Test and/or control activities performed with results and references to specifications/plan requirements. The control phase should be identified (Preparatory, Initial, Follow-up). List deficiencies noted along with corrective action.
 - 6. Material received with statement as to its acceptability and storage.
 - 7. Identify submittals reviewed, with Contract reference, by whom, and action taken.
 - 8. Offsite surveillance activities, including actions taken.
 - 9. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
 - 10. List instructions given/received and conflicts in Drawings and/or Specifications.
 - 11. Contractor's verification statement.
 - 12. Indicate a description of trades working on the Project; the number of personnel working; weather conditions encountered; and any delays encountered.
 - 13. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in file work and workmanship comply with the Contract.

APRIL 2022

CONTRACTOR QUALITY CONTROL

ATTACHMENT E - TECHNICALS

3.06 SUBMITTAL QUALITY CONTROL

A. Submittals shall be as specified in Section 01 33 00 SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals are in compliance with the Contract requirements. Owner will furnish copies of test report forms upon request by Contractor. Contractor may use other forms as approved.

3.07 TESTING QUALITY CONTROL

A. Testing Procedure:

- 1. Perform tests specified or required to verify that control measures are adequate to provide a product which conforms to Contract requirements. Perform the following activities and record the following data:
 - a. Verify testing procedures comply with contract requirements.
 - b. Verify facilities and testing equipment are available and comply with testing standards.
 - c. Check test instrument calibration data against certified standards.
 - d. Verify recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
 - e. Documentation:
 - 1) Record results of all tests taken, both passing and failing, on the CQC report for the date taken.
 - 2) Include specification paragraph reference, location where tests were taken, and the sequential control number identifying the test.
 - 3) Actual test reports may be submitted later, if approved by Construction Manager, with a reference to the test number and date taken.
 - 4) Provide directly to Construction Manager an information copy of tests performed by an offsite or commercial test facility. Test results shall be signed by an engineer registered in the state where the tests are performed.
 - 5) Failure to submit timely test reports, as stated, may result in nonpayment for related Work performed and disapproval of the test facility for this Contract.
- B. Testing Laboratories: Laboratory facilities, including personnel and equipment, utilized for testing soils, concrete, asphalt and steel shall meet criteria detailed in ASTM D3740 and ASTM E329, and be accredited by the American Association of Laboratory Accreditation (AALA), National Institute of Standards and Technology (NIST), National Voluntary Laboratory Accreditation Program (NVLAP), the American Association of State Highway and Transportation Officials (AASHTO), or other approved national accreditation authority. Personnel performing concrete testing shall be certified by the American Concrete Institute (ACI).

3.08 COMPLETION INSPECTION

A. CQC System Manager shall conduct an inspection of the Work at the completion of all Work or any milestone established by a completion time stated in the Contract.

APRIL 2022

CONTRACTOR QUALITY CONTROL

ATTACHMENT E - TECHNICALS

B. Punchlist:

- 1. CQC System Manager shall develop a punchlist of items which do not conform to the Contract requirements.
- 2. Include punchlist in the CQC report, indicating the estimated date by which the deficiencies will be corrected.
- 3. CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected and so notify the Owner.
- 4. These inspections and any deficiency corrections required will be accomplished within the time stated for completion of the entire Work or any particular increment thereof if the Project is divided into increments by separate completion dates.

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS CONTRACTOR QUALITY CONTROL

SECTION 01 45 33 SPECIAL INSPECTION, OBSERVATION, AND TESTING

PART 1 GENERAL

1.01 SUMMARY

A. This section covers requirements for Special Inspection, Observation, and Testing required in accordance with Chapter 17 of the 2016 CBC and is in addition to and supplements requirements included in Statement of Special Inspections shown on Drawings.

1.02 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
 - 1. American Society of Civil Engineers (ASCE): 7, Minimum Design Loads for Buildings and Other Structures.
 - 2. 2016 California Building Code (CBC) by California Building Standards Commission.
 - 3. International Code Council (ICC).
 - a. International Building Code (IBC).
 - b. Evaluation Service (ICC-ES) Reports and Legacy Reports.

1.03 DEFINITIONS

A. Agencies and Personnel:

- Agency Having Jurisdiction (AHJ): Permitting building agency; may be a
 federal, state, local, or other regional department, or individual including
 building official, fire chief, fire marshal, chief of a fire prevention bureau, labor
 department, or health department, electrical inspector; or others having
 statutory authority. AHJ may be Owner when authorized to be self-permitting
 by governmental permitting agency or when no governmental agency has
 authority.
- 2. Approved Agency: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved.
- Registered Design Professional in Responsible Charge: An individual who is registered or licensed to practice their respective design profession as defined by statutory requirements of professional registration laws of state or jurisdiction in which Project is to be constructed.
- 4. Special Inspector: Qualified person employed by Owner who will demonstrate competence to the satisfaction of AHJ for inspection of a particular type of construction or operation requiring Special Inspection.

SPECIAL INSPECTION, OBSERVATION, AND TESTING

APRIL 2022

ATTACHMENT E - TECHNICALS

B. Statement of Special Inspections: Detailed written procedure contained on Drawings establishing systems and components subject to Special Inspection, Observation, and Testing during construction, type and frequency of testing, extent and duration of Special Inspection, and reports to be completed and distributed by Special Inspector.

C. Special Inspection:

- Special Inspection: Inspection required of materials, installation, fabrication, erection, or placement of components and connections requiring special expertise to ensure compliance with approved Contract Documents and referenced standards.
- 2. Special Inspection, Continuous: Full-time observation of work requiring Special Inspection by an approved Special Inspector who is present in area where the Work is being performed.
- 3. Special Inspection, Periodic: Part-time or intermittent observation of the Work requiring Special Inspection by an approved Special Inspector who is present in area where the Work has been or is being performed, and at completion of the Work.

D. Structural Systems and Components:

- 1. Diaphragm: Component of structural lateral load resisting system consisting of roof, floor, or other membrane or bracing system acting to transfer lateral forces to vertical resisting elements of structure.
- 2. Drag Strut or Collector: Component of structural lateral load resisting system consisting of diaphragm or shear wall element that collects and transfers diaphragm shear forces to vertical force-resisting elements or distributes forces within diaphragm or shear wall.
- 3. Seismic-Force-Resisting System: That part of structural lateral load resisting system that has been considered in the design to provide required resistance to seismic forces identified on Drawings.
- 4. Shear Wall: Component of structural lateral load resisting system consisting of a wall designed to resist lateral forces parallel to plane of the wall. Unless noted otherwise on Drawings, load-bearing walls with direct in-plane connections to roof and floors shall be considered to be shear walls.
- 5. Wind Force Resisting System: That part of the structural system that has been considered in the design to provide required resistance to wind forces identified on Drawings.

E. Nonstructural Components:

- 1. Architectural Component Supports: Structural members or assemblies of members which transmit loads and forces from architectural systems or components to structure, including braces, frames, struts, and attachments.
- 2. Electrical Component Supports: Structural members or assemblies which transmit loads and forces from electrical equipment to structure, including braces, frames, legs, pedestals, and tethers, as well as elements forged or cast as part of component for anchorage.

SPECIAL INSPECTION, OBSERVATION, AND TESTING

APRIL 2022

ATTACHMENT E - TECHNICALS

3. Mechanical and Plumbing Component Supports: Structural members or assemblies which transmit loads and forces from mechanical or plumbing equipment to structure, including braces, frames, skirts, legs, saddles, pedestals, snubbers, and tethers, as well as elements forged or cast as part of component for anchorage.

F. Professional Observation:

- 1. Does not include or waive responsibility for required Special Inspection or inspections by building official.
- 2. Requirements are indicated on Statement of Special Inspections provided on Drawings.
- 3. Structural Observation: Visual observation of structural system(s) by a registered design professional for general conformance to Contract Documents.
- 4. Observation: Visual observation of selected by registered design professional for general conformance to Contract Documents.

1.04 SUBMITTALS

A. Informational Submittals:

- Contractor's Statement of Responsibility: Form shall be completed by entity responsible for construction of and main seismic-force-resisting system, seismic-resisting component listed in Statement of Special Inspections. Refer to Article Supplements located at end of section.
- 2. Fabricator's Certificate of Compliance: Form shall be completed by entity responsible for shop fabrication of structural load-bearing members and assemblies. Refer to Article Supplements located at end of section. Form must be submitted no less than 2 weeks prior to commencing fabrication to provide for approval by AHJ and scheduling of Special Inspection, where required.

1.05 STATEMENT OF SPECIAL INSPECTIONS REQUIREMENTS

A. Designated Systems for Inspection:

- Seismic-force-resisting systems designated under CBC Section 1705 and subject to Special Inspection under Section 1705: See Drawings for basic lateral load resisting systems for each structure and other designated seismic systems.
- Wind-force-resisting systems designated under 2016 CBC Section 1705: See Drawings for basic lateral load resisting systems for each structure and other designated wind-resisting components. Not required for basic lateral load resisting system utilized.
- 3. Architectural, plumbing, mechanical, and electrical components subject to Special Inspection under CBC Section 1705.12.5 and 1705.12.6 for Seismic Resistance
- 4. As included in Drawings and in support of building permit application, Project-specific requirements were prepared by Registered Design Professional in Responsible Charge.

SPECIAL INSPECTION, OBSERVATION, AND TESTING

APRIL 2022

ATTACHMENT E - TECHNICALS

- B. Statement of Special Inspections:
 - As included on Drawings and in support of building permit application, Projectspecific requirements were prepared by Registered Design Professional in Responsible Charge. The following identifies elements of inspection, observation, and testing program to be followed in construction of the Work:
 - a. Designated seismic systems and main seismic force-resisting systems and components that are subject to Special Inspection and Structural Observation for lateral load resistance.
 - b. Special Inspection and testing required by CBC Section 1705 and other applicable sections and referenced standards therein.
 - c. Type and frequency of Special Inspection required.
 - d. Type and frequency of testing required.
 - e. Required frequency and distribution of testing and Special Inspection reports to be distributed by Special Inspector to Construction Manager, Contractor, building official, and Owner.
 - f. Geotechnical Observation to be Performed: Required frequency and distribution of Geotechnical Observation reports by registered design professional to Contractor, building official, and Owner.
 - g. Structural Observations to be Performed: Required frequency and distribution of Structural Observation reports by registered design professional to Contractor, building official, and Owner.
- C. Special Inspection and associated testing of shop fabrication and field construction will be performed by an approved accredited independent agency or by Authority Having Jurisdiction's (AHJ) approved, qualified inspection staff. Owner will secure and pay for services of agency to perform Special Inspection and associated testing.
- D. Code required Special Inspection with associated testing and Professional Observation, as provided in Statement of Special Inspections on Drawings and further provided in this section, is for benefit of Owner and does not:
 - 1. Relieve Contractor of responsibility for providing adequate quality control measures.
 - 2. Relieve Contractor of responsibility for damage to or loss of material before acceptance.
 - 3. Constitute or imply acceptance.
 - 4. Affect continuing rights of Owner after acceptance of completed Work.
- E. The presence or absence of code required Special Inspector and Professional Observer does not relieve Contractor from Contract requirements.
- F. Contractor is responsible for additional costs associated with Special Inspection and Testing and Observation when Work is not ready at time identified by Contractor and Special Inspectors and Professional Observer are onsite, but not able to provide contracted services.

SPECIAL INSPECTION, OBSERVATION, AND TESTING

APRIL 2022

ATTACHMENT E - TECHNICALS

G. Contractor is responsible for associated costs for additional Special Inspection and Testing and Professional Observation by Special Inspectors and Professional Observers required because of rejection of materials of in place Work that cannot be made compliant to Contract Document without additional inspections and observation and testing.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. Requirements of the Statement of Special Inspections are provided by the Owner. All other testing and inspections, unless noted otherwise, are provided by Contractor.
- B. Provide access to shop or Site for Special Inspection and Testing and Professional Observation requirements.
- C. Notify Construction Manager in advance of required Special Inspection and Professional Observation no later than 48 hours prior to date of Special Inspection and Professional Observation.
- D. Provide access for Special Inspector to construction documents.
- E. Retain special inspection records onsite to be readily available for review.
- F. Cooperate with Special Inspector and provide safe access to the Work to be inspected.
- G. Submit Fabricator's Certificates of Compliance for approved fabricators.
- H. Provide reasonable auxiliary services as requested by the Special Inspector. Auxiliary services required include, but not limited to:
 - 1. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests to assist the Special Inspector in performing test/inspections.
 - 2. Providing storage space for the Special Inspector's exclusive use, such as for storing and curing concrete test samples and delivery of samples to testing laboratories.
 - 3. Providing the Special Inspector with access to all approved submittals.
 - 4. Providing security and protection of samples and test equipment at the Project Site.
 - 5. Provide samples of materials to be tested in required quantities.

SPECIAL INSPECTION, OBSERVATION, AND TESTING

APRIL 2022

ATTACHMENT E - TECHNICALS

- I. When required by Registered Design Professional in Responsible Charge, provide access for plumbing, mechanical and electrical component inspections for those items requiring certification.
- J. Materials and systems shall be inspected during placement where Continuous Special Inspection is required.
- K. Where Periodic Special Inspection is indicated in the Statement of Special Inspections:
 - 1. Schedule inspections for either during or at completion of their placement or a combination or both.
 - 2. Schedule periodically inspected Work (either inspected during or after its placement) so that corrections can be completed and re-inspected before Work is inaccessible.
 - 3. Sampling a portion of the Work is not allowed. Schedules shall provide for inspection of all Work requiring periodic inspection.

3.02 AHJ INSPECTIONS

A. Schedule all AHJ inspections required to fulfill project permit requirements, including to Building and Fire Department inspections associated with City or County Building Permits, Fire Protection Permits and Hazardous Materials Permitting.

3.03 SUPPLEMENTS

- A. The supplements listed below, following "End of Section," are a part of this specification:
 - 1. Contractor's Statement of Responsibility.
 - 2. Fabricator's Certificate of Compliance.

END OF SECTION

SPECIAL INSPECTION, OBSERVATION, AND TESTING

CONTRACTOR'S STATEMENT OF RESPONSIBILITY

(Project)		
(- 1 1		
(Name of Contracting Company)		
(Business Address)		
()	()	
(Telephone)	(Fax)	

- I, (We) hereby certify that I am (we are) aware of the Special Inspection and Testing and Professional Observation requirements contained in Contract Documents for this Project for seismic force-resisting systems and for components including architectural, mechanical, and electrical components, as listed in Statement of Special Inspections on Drawings, and that:
- 1. I, (We) aware of the systems and the requirements of the special inspection and acknowledge our responsibility in the implementation of the Statement of Special Inspections for the construction of the following systems:

Facility	Specification	Lateral Force-Resisting System

- 2. Control of this Work will be exercised to obtain conformance with Contract Documents approved by building official.
- 3. Procedures within the Contractor's organization to be used for exercising control of the Work, method and frequency of reporting, and distribution of reports required under Statement of Special Inspections for Project are attached to this statement.
- 4. I, (We) will provide 48-hour notification to Construction Manager and approved inspection agency as required for structural tests and Special Inspection for Project.

SPECIAL INSPECTION, OBSERVATION, AND TESTING

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

5.	The following person is hereby identified as exercising control over requirements of this section for the Work designated above:
	Name:
	Qualifications:
	(Print name and official title of person signing this form)
	Signed by:
	Date:
	Project Name:

SPECIAL INSPECTION, OBSERVATION, AND TESTING

FABRICATOR'S CERTIFICATE OF COMPLIANCE

Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per Section 2016 CBC must submit Fabricator's Certificate of Compliance at the completion

of fabrication. (Project) (Fabricator's Name) (Business Address) (Certification or Approval Agency) (Certification Number) (Date of Last Audit or Approval) Description of structural members and assemblies that have been fabricated: I hereby certify that items described above were fabricated in strict accordance with approved construction documents. (Name and Title) type or print (Signature and Date) Attach copies of fabricator's certification or building code evaluation service report and fabricator's quality control manual.

APRIL 2022 ATTACHMENT E - TECHNICALS SPECIAL INSPECTION, OBSERVATION, AND TESTING 01 45 33 - 9 PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS SPECIAL INSPECTION, OBSERVATION, AND TESTING 01 45 33 - 10

SECTION 01 50 00 TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
 - 1. American Association of Nurserymen (AAN): American Standards for Nursery Stock.
 - 2. Federal Emergency Management Agency (FEMA).
 - 3. National Fire Prevention Association (NFPA): 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations.
 - 4. Telecommunications Industry Association (TIA); Electronic Industries Alliance (EIA): 568B, Commercial Building Telecommunications Cabling Standard.
 - 5. U.S. Department of Agriculture (USDA): Urban Hydrology for Small Watersheds.
 - 6. U.S. Weather Bureau: Rainfall-Frequency Atlas of the U.S. for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years.

1.02 SUBMITTALS

- A. Informational Submittals:
 - 1. Copies of permits and approvals for construction as required by Laws and Regulations and governing agencies.
 - 2. Temporary Construction Submittals:
 - a. Access Roads: Routes, cross-sections, and drainage facilities.
 - b. Parking area plans.
 - c. Staging area location plan.
 - 3. Temporary Control Submittals:
 - a. Noise control plan.
 - b. Dust control plan.
 - c. Plan for disposal of waste materials and intended haul routes.
 - 4. Temporary Utility Submittals:
 - a. Electric power supply and distribution plans.
 - b. Water supply and distribution plans.
 - c. Sanitary.

1.03 MOBILIZATION

- A. Mobilization includes, but is not limited to, these principal items:
 - 1. Obtaining required permits.
 - 2. Installing temporary construction power, wiring, and lighting facilities.

APRIL 2022

TEMPORARY FACILITIES AND CONTROLS

ATTACHMENT E - TECHNICALS

- 3. Providing onsite sanitary facilities and potable water facilities as specified and as required by Laws and Regulations, and governing agencies.
- 4. Posting OSHA required notices and establishing safety programs and procedures.
- 5. Having Contractor's superintendent at Site full time.
- B. Use area designated for Contractor's temporary facilities as shown on Drawings.

1.04 PROTECTION OF WORK AND PROPERTY

- A. Comply with Owner's safety rules while on Owner's property.
- B. Keep Owner informed of serious onsite accidents and related claims.
- C. Use of Explosives: No blasting or use of explosives will be allowed onsite.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 TEMPORARY UTILITIES

- A. Power: Cost of electric power will be borne by Contractor.
- B. Lighting: Provide temporary lighting to meet applicable safety requirements to allow erection, application, or installation of materials and equipment, and observation or inspection of the Work.
- C. Provide and bear costs of necessary water in excess of 100 gpm required for testing equipment, tanks or basins, and piping prior to Substantial Completion, unless otherwise specifically stated in Specifications for equipment, systems, or facilities to be tested.
- D. Provide means to prevent water used for testing from flowing back into source pipeline.
- E. Sanitary and Personnel Facilities: Provide and maintain facilities for Contractor's employees, Subcontractors, and other onsite employers' employees. Service, clean, and maintain facilities and enclosures.

F. Telephone Service:

- 1. Contractor: Arrange and provide mobile telephone service for Contractor's use during construction. Pay costs of monthly bills.
- G. Fire Protection: Furnish and maintain on Site adequate firefighting equipment capable of extinguishing incipient fires. Comply with applicable parts of NFPA 241.

APRIL 2022

TEMPORARY FACILITIES AND CONTROLS

ATTACHMENT E - TECHNICALS

3.02 PROTECTION OF WORK AND PROPERTY

A. General:

- 1. Perform Work within right-of-way and easements in a systematic manner that minimizes inconvenience to property owners and the public.
- 2. No residence or business shall be cut off from vehicular traffic. Contractor shall phase work to allow ingress/egress at all times, unless special arrangements have been made.
- 3. Maintain in continuous service existing oil and gas pipelines, underground power, telephone or communication cable, water mains, irrigation lines, sewers, poles and overhead power, and other utilities encountered along line of the Work, unless other arrangements satisfactory to owners of said utilities have been made.
- 4. Where completion of the Work requires temporary or permanent removal or relocation of existing utility, coordinate activities with owner of said utility and perform work to their satisfaction.
- 5. Protect, shore, brace, support, and maintain underground pipes, conduits, drains, and other underground utility construction uncovered or otherwise affected by construction operations.
- 6. Keep fire hydrants and water control valves free from obstruction and available for use at all times.
- 7. In areas where Contractor's operations are adjacent to or near a utility, such as gas, telephone, television, electric power, water, sewer, or irrigation system, and such operations may cause damage or inconvenience, suspend operations until arrangements necessary for protection have been made by Contractor.
- 8. Notify property owners and utility offices that may be affected by construction operation at least 2 calendar days in advance: Before exposing a utility, obtain utility owner's permission. Should service of utility be interrupted due to Contractor's operation, notify proper authority immediately. Cooperate with said authority in restoring service as promptly as possible and bear costs incurred.
- 9. Do not impair operation of existing sewer system. Prevent construction material, pavement, concrete, earth, volatile and corrosive wastes, and other debris from entering sewers, pump stations, or other sewer structures.
- 10. Maintain original Site drainage wherever possible.

B. Site Security:

1. Contractor shall adhere to Owner's Site Security policies at all times in conducting the Work.

C. Barricades and Lights:

- 1. Provide as necessary to prevent unauthorized entry to construction areas and as required to ensure public safety and the safety of Contractor's employees, other employer's employees, and others who may be affected by the Work.
- 2. Provide to protect existing facilities and adjacent properties from potential damage.

APRIL 2022

TEMPORARY FACILITIES AND CONTROLS

ATTACHMENT E - TECHNICALS

3. Locate to enable access by facility operators and property owners.

D. Signs and Equipment:

- 1. Conform to requirements of CA MUTCD.
- 2. Portable TOW-AWAY-NO STOPPING Signs: Place where approved by police department and Owner.
- 3. Traffic Cones: Provide to delineate traffic lanes to guide and separate traffic movements.
- 4. High-Level Warning Flag Units: Provide two in advance of traffic approaching the Work, each displaying three flags mounted at a height of 9 feet.
- 5. DETOUR Signs: Provide two, right arrow or left arrow, placed as approved by Construction Manager.
- 6. RIGHT or LEFT LANE CLOSED AHEAD Signs: Provide two, place in advance of lane to be closed.
- 7. Provide at obstructions, such as material piles and equipment.
- 8. Use to alert general public of construction hazards, which would include surface irregularities, unramped walkways, grade changes, and trenches or excavations in roadways and in other public access areas.
- 9. Conform to requirements of manual published by the California State Department of Transportation.

E. Trees and Plantings:

- 1. Protect from damage and preserve trees, shrubs, and other plants outside limits of the Work and within limits of the Work, which are designated on Drawings to remain undisturbed.
 - a. Employ hand excavation as necessary to prevent tree injury.
 - b. Do not stockpile materials or permit traffic within drip lines of trees.
 - c. Provide and maintain temporary barricades around trees.
 - d. Water vegetation as necessary to maintain health.
 - e. Cover temporarily exposed roots with wet burlap and keep burlap moist until soil is replaced around roots.
 - f. No trees, except those specifically shown on Drawings to be removed, shall be removed without written approval of Engineer.
 - g. Dispose of removed trees in a legal manner off the Site.
- 2. In event of damage to bark, trunks, limbs, or roots of plants that are not designated for removal, treat damage by corrective pruning, bark tracing, application of a heavy coating of tree paint, and other accepted horticultural and tree surgery practices.
- 3. Replace each plant that dies as a result of construction activities.

F. Existing Structures:

1. Replace items removed in their original location and a condition equal to or better than original.

APRIL 2022

TEMPORARY FACILITIES AND CONTROLS

ATTACHMENT E - TECHNICALS

- G. Finished Construction: Protect finished floors and concrete floors exposed as well as those covered with composition tile or other applied surfacing.
- H. Waterways: Keep ditches, culverts, and natural drainages continuously free of construction materials and debris.
- I. Endangered and Threatened Species:
 - 1. Take precautions necessary and prudent to protect native endangered and threatened flora and fauna.
 - 2. Notify Engineer of construction activities that might threaten endangered and threatened species or their habitats.
 - 3. Engineer will mark areas known as habitats of endangered and threatened species prior to commencement of onsite activities.
 - 4. Additional areas will be marked by Engineer as other habitats of endangered and threatened species become known during construction.

3.03 TEMPORARY CONTROLS

A. Air Pollution Control:

- Conform to Section 3-12.2 Air Pollution Control as specified in the 2021 GREENBOOK.
- 2. Minimize air pollution from construction operations.
- 3. Burning of waste materials, rubbish, or other debris will not be permitted on or adjacent to Site.
- 4. Conduct operations of dumping rock and of carrying rock away in trucks to cause a minimum of dust. Give unpaved streets, roads, detours, or haul roads used in construction area a dust-preventive treatment or periodically water to prevent dust. Strictly adhere to applicable environmental regulations for dust prevention. Wash down or sweep paved streets to control fugitive dust. Cover or tarp all vehicles hauling dirt or spoils off site.
- 5. Provide and maintain temporary dust-tight partitions, bulkheads, or other protective devices during construction to permit normal operation of existing facilities. Construct partitions of plywood, insulating board, plastic sheets, or similar material. Construct partitions in such a manner that dust and dirt from demolition and cutting will not enter other parts of existing building or facilities. Remove temporary partitions as soon as need no longer exists.

B. Noise Control:

- 1. Conform to Section 3-12.3 Noise Control as specified in the 2021 GREENBOOK.
- 2. Noise Control Ordinance: San Diego Municipal Code, Section 59.5.01.
- 3. Noise Control Plan: Propose plan to mitigate construction noise and to comply with noise control ordinances, including method of construction, equipment to be used, and acoustical treatments.

C. Water Pollution Control:

APRIL 2022

TEMPORARY FACILITIES AND CONTROLS

ATTACHMENT E - TECHNICALS

- 1. Conform to Part 10 STORM WATER for permanent and construction storm water requirements as specified in the 2021 WHITEBOOK.
- 2. Do not cause or permit action to occur which would cause an overflow to existing waterway.
- Do not dispose of volatile wastes such as mineral spirits, oil, chemicals, or paint thinner in storm or sanitary drains. Disposal of wastes into streams or waterways is prohibited. Provide acceptable containers for collection and disposal of waste materials, debris, and rubbish.

3.04 ACCESS ROADS AND DETOURS

- A. The Contractor shall conform to Part 6 TEMPORARY TRAFFIC CONTROL as specified in the 2021 WHITEBOOK.
- B. Coordinate with Construction Manager detours and other operations affecting traffic and access with the Construction Manager. Provide at least 72 hours' notice to Construction Manager of operations that will alter access to Site.

3.05 PARKING AREAS

- A. Control vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles, Owner's operations, or construction operations.
- B. If equipment staging and parking facilities are not identified in the Contract Documents, the Contractor's proposed locations for these purposes is subject to City approval.
- C. Provide parking facilities for personnel working on Project. No employee or equipment parking will be permitted on Owner's existing paved areas except as specifically designated for Contractor's use.

3.06 VEHICULAR TRAFFIC

- A. Comply with Laws and Regulations regarding closing or restricting use of public streets or highways. No public or private road shall be closed, except by written permission of proper authority. Ensure the least possible obstruction to traffic and normal commercial pursuits.
- B. Conduct the Work to interfere as little as possible with public travel, whether vehicular or pedestrian.
- C. Whenever it is necessary to cross, close, or obstruct roads, driveways, and walks, whether public or private, provide and maintain suitable and safe bridges, detours, or other temporary expedients for accommodation of public and private travel.
- D. Road Closures: Not permitted without approval of the Owner/Construction Manager.
- E. Maintenance of traffic is not required if Contractor obtains written permission from Owner/Construction Manager and tenant of private property, or from authority

APRIL 2022

TEMPORARY FACILITIES AND CONTROLS

ATTACHMENT E - TECHNICALS

- having jurisdiction over public property involved, to obstruct traffic at designated point.
- F. In making street crossings, do not block more than one-half the street at a time. Whenever possible, widen shoulder on opposite side to facilitate traffic flow. Provide temporary surfacing on shoulders as necessary.
- G. Maintain top of backfilled trenches before they are paved, to allow normal vehicular traffic to pass over. Provide temporary access driveways where required. Cleanup operations shall follow immediately behind backfilling.
- H. When flaggers and guards are required by regulation or when deemed necessary for safety, furnish them with approved orange wearing apparel and other regulation traffic control devices.
- I. Notify fire department and police department before closing street or portion thereof. Notify said departments when streets are again passable for emergency vehicles. Do not block off emergency vehicle access to consecutive arterial crossings or dead-end streets, in excess of 300 linear feet, without written permission from fire department. Conduct operations with the least interference to fire equipment access, and at no time prevent such access. Furnish Contractor's night emergency telephone numbers to police department.
- J. Coordinate traffic routing with that of others working in same or adjacent areas.

3.07 CLEANING DURING CONSTRUCTION

- A. The Contractor shall conform to Section 3-12.1 General as specified in the 2021 GREENBOOK and 2021 WHITEBOOK.
- B. In accordance with General Conditions, as may be specified in other Specification sections, and as required herein.
- C. Wet down exterior surfaces prior to sweeping to prevent blowing of dust and debris. At least weekly, sweep floors (basins, tunnels, platforms, walkways, roof surfaces), and pick up and dispose of debris.
- D. Provide approved containers for collection and disposal of waste materials, debris, and rubbish. At least weekly, dispose of such waste materials, debris, and rubbish offsite.
- E. At least weekly, brush sweep entry drive, roadways, and other streets and walkways affected by the Work and where adjacent to the Work.

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS TEMPORARY FACILITIES AND CONTROLS

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS TEMPORARY FACILITIES AND CONTROLS 01 50 00 - 8

SECTION 01 61 00 COMMON PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 DEFINITIONS

A. Products:

- 1. New items for incorporation in the Work, whether purchased by Contractor or Owner for the Project, or taken from previously purchased stock, and may also include existing materials or components required for reuse.
- Includes the terms material, equipment, machinery, components, subsystem, system, hardware, software, and terms of similar intent and is not intended to change meaning of such other terms used in Contract Documents, as those terms are self-explanatory and have well recognized meanings in construction industry.
- 3. Items identified by manufacturer's product name, including make or model designation, indicated in manufacturer's published product literature, that is current as of the date of the Contract Documents.

1.02 DESIGN REQUIREMENTS

- A. Where Contractor design is specified, design of installation, systems, equipment, and components, including supports and anchorage, shall be in accordance with provisions of the 2016 California Building Code (CBC) by California Building Standards Commission.
 - 1. Wind: Basic wind speed, V: 115 mph (3-second gust), with exposure Category C, and Risk Category III.
 - 2. Seismic: Risk Category III, importance factor, I_e , of 1.25, Site Class Definition D, mapped maximum considered earthquake, 5 percent damped, spectral response at short periods, S_s 0.906G, mapped maximum considered earthquake, 5 percent damped, spectral response at a period of 1 second, S_1 0.354G, unless specified otherwise.

1.03 ENVIRONMENTAL REQUIREMENTS

- A. Altitude: Provide materials and equipment suitable for installation and operation under rated conditions at 320 feet above sea level.
- B. Provide equipment and devices installed outdoors or in unheated enclosures capable of continuous operation within an ambient temperature range of 35 degrees F to 100 degrees F for the Penasquitos Pump Station site.

APRIL 2022

COMMON PRODUCT REQUIREMENTS

ATTACHMENT E - TECHNICALS

1.04 PREPARATION FOR SHIPMENT

- A. When practical, factory assemble products. Mark or tag separate parts and assemblies to facilitate field assembly. Cover machined and unpainted parts that may be damaged by the elements with strippable protective coating.
- B. Package products to facilitate handling and protect from damage during shipping, handling, and storage. Mark or tag outside of each package or crate to indicate its purchase order number, bill of lading number, contents by name, name of Project and Contractor, equipment number, and approximate weight. Include complete packing list and bill of materials with each shipment.
- C. Extra Materials, Special Tools, Test Equipment, and Expendables:
 - 1. Furnish as required by individual Specifications.
 - 2. Schedule:
 - a. Ensure that shipment and delivery occur concurrent with shipment of associated equipment.
 - b. Transfer to Owner shall occur immediately subsequent to Contractor's acceptance of equipment from Supplier.
 - 3. Packaging and Shipment:
 - a. Package and ship extra materials and special tools to avoid damage during long term storage in original cartons insofar as possible, or in appropriately sized, hinged-cover, wood, plastic, or metal box.
 - b. Prominently displayed on each package, the following:
 - 1) Manufacturer's part nomenclature and number, consistent with Operation and Maintenance Manual identification system.
 - 2) Applicable equipment description.
 - 3) Quantity of parts in package.
 - 4) Equipment manufacturer.
 - 4. Deliver materials to Site.
 - 5. Notify Construction Manager upon arrival for transfer of materials.
 - 6. Replace extra materials and special tools found to be damaged or otherwise inoperable at time of transfer to Owner.
- D. Request a minimum 7-day advance notice of shipment from manufacturer. Upon receipt of manufacturer's advance notice of shipment, promptly notify Construction Manager of anticipated date of equipment arrival.
- E. Factory Test Results: Reviewed and accepted by Design Engineer before product shipment as required in individual Specification sections.

1.05 DELIVERY AND INSPECTION

A. Deliver products in accordance with accepted current Progress Schedule and coordinate to avoid conflict with the Work and conditions at Site. Deliver anchor bolts and templates sufficiently early to permit setting prior to placement of structural concrete.

APRIL 2022

COMMON PRODUCT REQUIREMENTS

ATTACHMENT E - TECHNICALS

- B. Deliver products in undamaged condition, in manufacturer's original container or packaging, with identifying labels intact and legible. Include on label, date of manufacture and shelf life, where applicable.
- C. Unload products in accordance with manufacturer's instructions for unloading or as specified. Record receipt of products at Site. Promptly inspect for completeness and evidence of damage during shipment.
- D. Remove damaged products from Site and expedite delivery of identical new undamaged products, and remedy incomplete or lost products to provide that specified, so as not to delay progress of the Work.

1.06 HANDLING, STORAGE, AND PROTECTION

- A. Handle and store products in accordance with manufacturer's written instructions and in a manner to prevent damage. Store in approved storage yards or sheds provided in accordance with Section 01 50 00 TEMPORARY FACILITIES AND CONTROLS. Provide manufacturer's recommended maintenance during storage, installation, and until products are accepted for use by Owner.
- B. Manufacturer's instructions for material requiring special handling, storage, or protection shall be provided prior to delivery of material.
- C. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to ensure that products are maintained under specified conditions, and free from damage or deterioration. Keep running account of products in storage to facilitate inspection and to estimate progress payments for products delivered, but not installed in the Work.
- D. Store electrical, instrumentation, and control products, and equipment with bearings in weather-tight structures maintained above 60 degrees F. Protect electrical, instrumentation, and control products, and insulate against moisture, water, and dust damage. Connect and operate continuously space heaters furnished in electrical equipment.
- E. Store fabricated products above ground on blocking or skids, and prevent soiling or staining. Store loose granular materials in well-drained area on solid surface to prevent mixing with foreign matter. Cover products that are subject to deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.
- F. Store finished products that are ready for installation in dry and well-ventilated areas. Do not subject to extreme changes in temperature or humidity.
- G. After installation, provide coverings to protect products from damage due to traffic and construction operations. Remove coverings when no longer needed.
- H. Hazardous Materials: Prevent contamination of personnel, storage area, and Site. Meet requirements of product specification, codes, and manufacturer's instructions.

APRIL 2022

COMMON PRODUCT REQUIREMENTS

ATTACHMENT E - TECHNICALS

PART 2 PART 2 PRODUCTS

2.01 GENERAL

- A. Provide manufacturer's standard materials suitable for service conditions, unless otherwise specified in the individual Specifications.
- B. Where product specifications include a named manufacturer, with or without model number, and also include performance requirements, named manufacturer's products must meet the performance specifications.
- C. Like items of products furnished and installed in the Work shall be end products of one manufacturer and of the same series or family of models to achieve standardization for appearance, operation and maintenance, spare parts and replacement, manufacturer's services, and implement same or similar process instrumentation and control functions in same or similar manner.
- D. Do not use materials and equipment removed from existing premises, except as specifically permitted by Contract Documents.
- E. Provide interchangeable components of the same manufacturer, for similar components, unless otherwise specified.
- F. Equipment, Components, Systems, and Subsystems: Design and manufacture with due regard for health and safety of operation, maintenance, and accessibility, durability of parts, and shall comply with applicable OSHA, state, and local health and safety regulations.
- G. Regulatory Requirement: Coating materials shall meet federal, state, and local requirements limiting the emission of volatile organic compounds and for worker exposure.
- H. Safety Guards: Provide for all belt or chain drives, fan blades, couplings, or other moving or rotary parts. Cover rotating part on all sides. Design for easy installation and removal. Use 16-gauge or heavier; galvanized steel, aluminum coated steel, or galvanized or aluminum coated 1/2-inch mesh expanded steel. Provide galvanized steel accessories and supports, including bolts. For outdoors application, prevent entrance of rain and dripping water.
- I. Authority Having Jurisdiction (AHJ):
 - Provide the Work in accordance with NFPA 70 National Electrical Code (NEC) and NFPA 820 Standard for Fire Protection in Wastewater Treatment and Collection Facilities. Where required by the AHJ, material and equipment shall be labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ in order to provide a basis for approval under NEC.
 - 2. Materials and equipment manufactured within the scope of standards published by Underwriters Laboratories, Inc. (UL) shall conform to those standards and shall have an applied UL listing mark.

APRIL 2022

COMMON PRODUCT REQUIREMENTS

ATTACHMENT E - TECHNICALS

J. Equipment Finish:

- 1. Provide manufacturer's standard finish and color, except where specific color is indicated.
- 2. If manufacturer has no standard color, provide equipment with finish as approved by Construction Manager.
- K. Special Tools and Accessories: Furnish to Owner, upon acceptance of equipment, all accessories required to place each item of equipment in full operation. These accessory items include, but are not limited to, adequate oil and grease (as required for first lubrication of equipment after field testing), light bulbs, fuses, hydrant wrenches, valve keys, handwheels, chain operators, special tools, and other spare parts as required for maintenance.
- L. Lubricant: Provide initial lubricant recommended by equipment manufacturer in sufficient quantity to fill lubricant reservoirs and to replace consumption during testing, startup, and operation until final acceptance by Owner.
- M. Components and Materials in Contact with Water for Human Consumption: Comply with the requirements of the Safe Drinking Water Act and other applicable federal, state, and local requirements. Provide certification by manufacturer or an accredited certification organization recognized by the Authority Having Jurisdiction that components and materials comply with the maximum lead content standard in accordance with NSF/ANSI 61 and NSF/ANSI 372.
 - 1. Use or reuse of components and materials without a traceable certification is prohibited.

2.02 FABRICATION AND MANUFACTURE

A. General:

- 1. Manufacture parts to U.S.A. standard sizes and gauges.
- 2. Two or more items of the same type shall be identical, by the same manufacturer, and interchangeable.
- 3. Design structural members for anticipated shock and vibratory loads.
- 4. Use 1/4-inch minimum thickness for steel that will be submerged, wholly or partially, during normal operation.
- 5. Modify standard products as necessary to meet performance specifications.

B. Lubrication System:

- 1. Require no more than weekly attention during continuous operation.
- Convenient and accessible; oil drains with bronze or stainless steel valves and fill-plugs easily accessible from the normal operating area or platform. Locate drains to allow convenient collection of oil during oil changes without removing equipment from its installed position.
- 3. Provide constant-level oilers or oil level indicators for oil lubrication systems.
- 4. For grease type bearings, which are not easily accessible, provide and install stainless steel tubing; protect and extend tubing to convenient location with suitable grease fitting.

APRIL 2022

COMMON PRODUCT REQUIREMENTS

ATTACHMENT E - TECHNICALS

2.03 SOURCE QUALITY CONTROL

- A. Where Specifications call for factory testing to be witnessed by Design Engineer, Owner, or Construction Manager, notify Construction Manager not less than 30 days prior to scheduled test date, unless otherwise specified.
- B. Calibration Instruments: Bear the seal of a reputable laboratory certifying instrument has been calibrated within the previous 12 months to a standard endorsed by the National Institute of Standards and Technology (NIST).
- C. Factory Tests: Perform in accordance with accepted test procedures and document successful completion.

PART 3 EXECUTION

3.01 INSPECTION

A. Inspect materials and equipment for signs of pitting, rust decay, or other deleterious effects of storage. Do not install material or equipment showing such effects. Remove damaged material or equipment from the Site and expedite delivery of identical new material or equipment. Delays to the Work resulting from material or equipment damage that necessitates procurement of new products will be considered delays within Contractor's control.

3.02 MANUFACTURER'S CERTIFICATE OF COMPLIANCE

- A. When so specified, a Manufacturer's Certificate of Compliance, a copy of which is attached to this section, shall be completed in full, signed by entity supplying the product, material, or service, and submitted prior to shipment of product or material or execution of the services.
- B. Construction Manager may permit use of certain materials or assemblies prior to sampling and testing if accompanied by accepted certification of compliance.
- C. Such form shall certify proposed product, material, or service complies with that specified. Attach supporting reference data, affidavits, and certifications as appropriate.
- D. May reflect recent or previous test results on material or product, if acceptable to Construction Manager.

3.03 INSTALLATION

- A. Equipment Drawings show general locations of equipment, devices, and raceway, unless specifically dimensioned.
- B. No shimming between machined surfaces is allowed.
- C. Install the Work in accordance with NECA Standard of Installation, unless otherwise specified.

APRIL 2022

COMMON PRODUCT REQUIREMENTS

ATTACHMENT E - TECHNICALS

- D. Install the Equipment per Section 01 88 15 ANCHORAGE AND BRACING.
- E. Repaint painted surfaces that are damaged prior to equipment acceptance.
- F. Do not cut or notch any structural member or building surface without specific approval of Design Engineer.
- G. Handle, install, connect, clean, condition, and adjust products in accordance with manufacturer's instructions, and as may be specified. Retain a copy of manufacturers' instruction at Site, available for review at all times.
- H. For material and equipment specifically indicated or specified to be reused in the Work:
 - 1. Use special care in removal, handling, storage, and reinstallation to assure proper function in the completed Work.
 - 2. Arrange for transportation, storage, and handling of products that require offsite storage, restoration, or renovation. Include costs for such Work in the Contract Price.

3.04 FIELD FINISHING

A. In accordance with Section 09 90 00 PAINTING AND COATING and individual Specification sections.

3.05 ADJUSTMENT AND CLEANING

A. Perform required adjustments, tests, operation checks, and other startup activities.

3.06 LUBRICANTS

A. Fill lubricant reservoirs and replace consumption during testing, startup, and operation prior to acceptance of equipment by Owner.

3.07 ANCHOR BOLTS

A. Provide anchor bolts as specified in the specification sections and in accordance with Section 05 05 19 POST-INSTALLED CONCRETE ANCHORS.

3.08 SUPPLEMENTS

- A. The supplement listed below, following "End of Section", is part of this Specification.
 - 1. Manufacturer's Certificate of Compliance.

END OF SECTION

APRIL 2022

COMMON PRODUCT REQUIREMENTS

ATTACHMENT E - TECHNICALS

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS COMMON PRODUCT REQUIREMENTS 01 61 00 - 8

MANUFACTURER'S CERTIFICATE OF COMPLIANCE

OWNER:	PRODUCT, MATERIAL, OR SERVICE SUBMITTED:
PROJECT NAME:	
PROJECT NO:	
Comments:	
named Project will be furnished in acco	red product, material, or service called for by the Contract for the ordance with all applicable requirements. I further certify that the quality specified and conform in all respects with the Contract hown.
Date of Execution:	, 20
Manufacturer:	
	tive (print):
	(Authorized Signature)

APRIL 2022 ATTACHMENT E - TECHNICALS COMMON PRODUCT REQUIREMENTS

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS COMMON PRODUCT REQUIREMENTS 01 61 00 - 10

SECTION 01 73 24

DESIGN REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS AND NON-BUILDING STRUCTURES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Minimum structural requirements for the design, anchorage, and bracing of non-structural components such as architectural / mechanical / HVAC / electrical components, equipment, or systems, and non-building structures such as tanks.
- B. The requirements of this section apply to design of the structural elements and features of equipment and to platforms/walkways that are provided with equipment or non-building structures.
- C. This section applies to non-building structures and non-structural components that are permanently attached to structures as defined below and in ASCE 7.
- D. Design and conform to criteria and design codes listed within this section. Engineering design is not required for attachments, anchorage, or bracing detailed on the Drawings or where the size of attachments, anchorage, or bracing is defined in specific technical specification sections.
- E. The following non-structural components are exempt from seismic design loading requirements of this section. Components in direct contact with oxygen shall have a component importance factor, Ip, equal to 1.5.
 - 1. Components in Seismic Design Category A.
 - 2. Furniture (except permanent floor supported storage cabinets over 6 ft tall).
 - 3. Temporary or movable equipment.
 - 4. Architectural components in Seismic Design Category B other than parapets supported by bearing walls or shear walls provided that the component importance factor, I_D, is equal to 1.0.
 - 5. Mechanical and electrical components in Seismic Design Category B.
 - 6. Mechanical and electrical components in Seismic Design Category C provided that the component importance factor, I_p, is equal to 1.0.
 - 7. Mechanical and electrical components in Seismic Design Categories D, E, or F where all the following apply:
 - a. The component importance factor, I_D, is equal to 1.0;
 - b. The component is positively attached to the structure;
 - c. Flexible connections are provided between the component and associated ductwork, piping, and conduit;

DESIGN REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS AND NON-BUILDING STRUCTURES

APRIL 2022

ATTACHMENT E - TECHNICALS

d. And either:

- 1) the component weighs 400 lb or less and has a center of mass located 4 ft or less above the adjacent floor level; or
- 2) the component weighs 20 lb or less, or in the case of a distributed systems, 5 lb/ft or less.

1.02 RELATED SECTIONS

- A. This section contains specific references to the following related section. Additional related sections may apply that are not specifically listed below.
 - 1. Section 40 05 07.13 SEISMIC RESTRIANTS FOR PIPING
 - 2. Section 05 05 19 POST-INSTALLED CONCRETE ANCHORS

1.03 REFERENCES

A. The references listed below are a part of this section. 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.

Reference	Title
Aluminum Design Manual	Aluminum Association, Aluminum Design Manual with Specifications and Guidelines for Aluminum Structures
AAMA	American Architectural Manufacturer's Association
ACI 318	Building Code Requirements for Structural Concrete
ACI 350	Code Requirements for Environmental Engineering Concrete Structures
ACI 350.3	Seismic Design of Liquid-Containing Concrete Structures
AISC 341	Seismic Provisions for Structural Steel Buildings
ACI 360	Specification for Structural Steel Buildings
ASCE 7	Minimum Design Loads for Buildings and Other Structures
ASTM C635	Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
ASTM C636	Installation for Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
AWS D1.1	Structural Welding Code – Steel
AWS D1.2	Structural Welding Code - Aluminum
AWS D1.6	Structural Welding Code – Stainless Steel
AWS D1.8	Structural Welding Code – Seismic Supplement
Cal/OSHA	The Division of Occupational Safety and Health of California
CBC	California Building Code
ICC-ES AC 156	Acceptance Criteria for Seismic Certification by Shake Table Testing of

DESIGN REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS AND NON-BUILDING STRUCTURES

APRIL 2022

ATTACHMENT E - TECHNICALS

Reference	Title
	Non-structural Components
NFPA-13	Installation of Sprinkler Systems
SMACNA	Seismic Restraint Manual Guidelines for Mechanical Systems

1.04 DEFINITIONS

- A. Structure: The structural elements of a building that resist gravity, seismic, wind, and other types of loads. Structural components include columns, posts, beams, girders, joists, bracing, floor or roof sheathing, slabs or decking, load-bearing walls, and foundations.
- B. Non-structural Components: Non-structural portions of a building include every part of the building and all its contents, except the structural portions, that carry gravity loads and that may also be required to resist effects of wind, snow, impact, temperature and seismic loads. Non-structural components include, but are not limited to, ceilings, partitions, windows, equipment, piping, ductwork, furnishings, lights, etc.
- C. Non-building Structures: Self-supporting structures that carry gravity loads and that may also be required to resist the effects of wind, snow, impact, temperature and seismic loads. Non-building structures include, but are not limited to, pipe racks, storage racks, stacks, tanks, vessels and structural towers that support tanks and vessels.

1.05 SUBMITTALS

A. Action Submittals:

- 1. Procedures: Section 01 33 00 SUBMITTAL PROCEDURES.
- 2. A copy of this specification section with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements.
- 3. Check-marks (✓) shall denote full compliance with a paragraph as a whole. Deviations shall be underlined and denoted by a number in the margin to the right of the identified paragraph. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Include a detailed, written justification for each deviation. Failure to include a copy of the marked-up specification sections, along with justification(s) for requested deviations to specification requirements, with the submittal is sufficient cause for rejection of the entire submittal with no further consideration.
- 4. For structural elements of non-structural components and non-building structures required to be designed per this section, provide Drawings and design calculations stamped by a California licensed Professional Civil Engineer or Structural Engineer qualified to perform structural engineering.

DESIGN REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS AND NON-BUILDING STRUCTURES

APRIL 2022

ATTACHMENT E - TECHNICALS

- 5. List of non-structural components and non-building structures requiring wind and seismic design and anchorage.
- 6. Shop drawings showing details of complete wind and seismic bracing and anchorage attachment assemblies including connection hardware, and embedment into concrete.
- 7. Shop drawings showing plans, elevations, sections and details of equipment support structures and non-building structures, including anchor bolts, structural members, platforms, stairs, ladders, and related attachments.
- 8. Identify interface points with supporting structures or foundations, as well as size, location, and grip of required attachments and anchor bolts. Clearly indicate who will be providing each type of attachment/anchor bolt. Equipment vendor shall design anchor bolts where required, including embedment into concrete, and submit stamped calculations.
- 9. Calculations for supports, bracing, and attachments, where required, shall clearly indicate design criteria applied. Coordinate concrete embedment calculations with thickness and strength of concrete members. Submit a tabulation of the magnitude of unfactored (service level) equipment loads at each support point, broken down by type of loading (dead, live, wind, seismic, etc.). Indicate impact factors applied to these loads in design calculations.
- 10. Special Seismic Certification for non-structural components identified in article 1.07 of this section.

1.06 QUALITY ASSURANCE

A. Quality Control By City:

- Special Inspection of non-structural components and non-building structures, and their anchorages shall be performed by the Special Inspector under contract with the City and in conformance with CBC Chapter 17. Special Inspector(s) and laboratory shall be acceptable to the City in their sole discretion. Special Inspection is in addition to, but not replacing, other inspections and quality control requirements. Where sampling and testing required conforms to Special Inspection standards, such sampling and testing need not be duplicated.
- 2. For non-structural components requiring Special Seismic Certification, the Special Inspector shall verify that the label, anchorage, and mounting conform with the Special Seismic certificate of compliance.

1.07 SPECIAL SEISMIC CERTIFICATION

A. Special Seismic Certification is certification of equipment and components to not only withstand the effects of earthquakes, but also to function following the design seismic event.

DESIGN REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS AND NON-BUILDING STRUCTURES

APRIL 2022

ATTACHMENT E - TECHNICALS

- B. Special Seismic Certification is required for the following non-structural components in Seismic Design Categories C through F, which have a component importance factor of I_p=1.5 (referred to as "Designated Seismic Systems" in ASCE 7):
 - 1. Components required to function for life-safety purposes after an earthquake, including fire protection sprinkler systems and fire dampers.
 - 2. Components that contain or convey toxic, hazardous, or explosive substances where the quantity of the material exceeds threshold quantities established by the governing code authority, or the component is attached to a structure classified as a hazardous occupancy.
 - 3. Components in or attached to a Risk Category IV structure and needed for continued operation.
- C. Non-structural components requiring Special Seismic Certification include, but are not limited to, the following:
 - 1. Fire protection systems and dampers
 - 2. Tanks containing quantities of materials that exceed threshold quantities established by governing code authority
- D. Methods for Achieving Special Seismic Certification:
 - 1. For active components (e.g., equipment with parts that rotate, move mechanically, or are energized during operation), Special Seismic Certification is achieved by the following method, unless the component is listed below as being considered inherently rugged:
 - a. Shake table testing (see below for requirements).
 - 2. For non-active components and active components listed below as being considered inherently rugged, Special Seismic Certification is achieved by one of the following methods:
 - a. Analysis demonstrating a complete load path and capacity of components to resist loading, including seismic loading calculated in accordance with design criteria in this section.
 - b. Shake table testing (see below for requirements).
 - c. Experience data meeting requirements described in ASCE 7, Chapter 13.
 - 3. The following non-structural components are considered "inherently rugged":
 - a. Pumps
 - b. Pressure Filters
 - c. Generators
 - 4. Shake table testing requirements:
 - a. In accordance with ICC-ES AC 156.
 - b. Test for a minimum S_{DS} (0.687 second design spectral response) shown in the design criteria in this section.
 - c. Base testing on a ratio of height of component attachment in structure with respect to base of structure of z/h equal to 1.0.

DESIGN REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS AND NON-BUILDING STRUCTURES

APRIL 2022

ATTACHMENT E - TECHNICALS

d. Mount equipment in the shake table test in a similar manner to mounting on the project (e.g. mounting to floor vs wall vs suspended mounting, and rigid vs isolated mountings).

PART 2 PRODUCTS

2.01 GENERAL

A. Provide materials in conformance with information shown on the Drawings and in other technical specification sections. See individual component and equipment specifications for additional requirements.

2.02 DESIGN CRITERIA

A. Design Codes:

Design	Code
Buildings/Structures:	2016 California Building Code and ASCE 7-10
Reinforced concrete:	ACI 350-06 and ACI 350.3-06 for Concrete Liquid Containing Structures, ACI 318-14 for all other reinforced concrete
Structural steel:	AISC 360-10 and AISC 341-10
Aluminum:	Aluminum Design Manual, Latest Edition
Welding:	AWS Welding Codes, Latest Edition
Occupational health and safety requirements:	Cal/OSHA

Note: When conflicting requirements occur, the most stringent requirements will govern the design.

B. Design Loads:

- 1. Design non-structural components and non-building structures for the following minimum loads: (Do not apply wind and snow loads to non-structural components and non-building structures that are located inside buildings.)
- 2. Dead Loads:
 - a. Add an additional allowance for piping and conduit when supported and hung from the underside of equipment and platforms.
 - b. Typical allowance for piping and conduit: 20 psf
- 3. Uniform Live Loads:

Elevated grating floors:	100 psf
Columns:	No column live load reduction allowed
Exit ways, stairs and landings:	100 psf
Grating at MBR tank area	100 psf

DESIGN REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS AND NON-BUILDING STRUCTURES

APRIL 2022

ATTACHMENT E - TECHNICALS

4. Wind Loads:

Code:	2016 CBC & ASCE 7-10
Risk Category:	III
Basic Wind Speed (Ultimate, 3-second gust) for Risk Category Shown Above:	115 mph
Exposure:	С
Topographic Factor (K _{zt})	1.0

Note:Design exterior non-structural components and non-building structures, unless located in a pit or basin, to withstand design wind loads without consideration of shielding effects by other structures.

5. Seismic Loads:

Code:	2016 CBC & ASCE 7-10
Risk Category:	III
0.2 Sec. Mapped Spectral Response, S _S :	0.906 g
1.0 Sec. Mapped Spectral Response, S ₁ :	0.354 g
Site Class:	D
0.2 Sec. Design Spectral Response, S _{DS} :	0.687 g
1.0 Sec. Design Spectral Response, S _{D1} :	0.400 g
Importance Factor (I _e):	1.25
Component Importance Factor (I _p):	1.0, except I_p =1.5 for components identified in Section 13.1.3 of ASCE 7. Components in direct contact with oxygen shall have I_p = 1.5.
Seismic Design Category	D

Notes:

- Calculate seismic loads based on governing building code. Include equipment operating loads in structure dead load.
- Check individual members for seismic and full member live load acting simultaneously, except that flooded equipment loads (infrequent occurrence) need not be combined with seismic loads. Combine equipment operating loads with seismic loads.

6. Impact Loads:

- a. Consider impact loads in design of support systems.
- b. Use the following impact load factors unless recommendations of the equipment manufacturer will cause a more severe load case:

Rotating machinery:	20% of moving load
Reciprocating machinery:	50% of moving load

7. Temperature: Include effects of temperature in design where non-structural components and non-building structures are exposed to differential climatic conditions. See climatic conditions below for temperature extremes.

DESIGN REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS AND NON-BUILDING STRUCTURES

APRIL 2022

ATTACHMENT E - TECHNICALS

C. Load Combinations: Design non-structural components and non-building structures to withstand load combinations as specified in the governing building code. Where the exclusion of live load or impact load would cause a more severe load condition for the member under investigation, ignore the load when evaluating that member.

D. Design Considerations:

1. Design non-structural components and non-building structures for the following conditions:

2. Climatic Conditions:

Maximum design temperature:	120	degrees Fahrenheit
Minimum design temperature:	30	degrees Fahrenheit

3. Foundations:

- a. Extend foundations supporting non-structural components and non-building structures below the frost line, or support on non-frost susceptible structural fill down to the frost line.
- b. Frost line for foundations: Not applicable.

E. Column Base Fixity:

- 1. Design column bases as pinned connections. No moments shall be assumed to be transferred to foundations.
- 2. Where significant shear loads (greater than 5,000 lb. per anchor bolt) are transferred at column base plates, provide a shear key designed to transfer shear load.

F. Deflection:

- 1. Maximum beam deflection as a fraction of span for walkways and platforms: L/240 for total load and L/360 for live load.
- 2. Maximum total load deflection for equipment support: L/450.

PART 3 EXECUTION

3.01 GENERAL

- A. Make attachments and braces in such a manner that component force is transferred to the lateral force-resisting system of the structure. Base attachment requirements and size and number of braces per calculations submitted by Contractor.
- B. Anchorage of equipment is specified to be made by cartridge injection adhesive anchors in concrete elements unless specifically noted otherwise on the Drawings or other specification sections.

DESIGN REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS AND NON-BUILDING STRUCTURES

APRIL 2022

ATTACHMENT E - TECHNICALS

- C. Provide anchorage in accordance with Section 05 05 19. Base size of anchors and embedment as shown on drawings.
- D. Submit details of and calculations for anchorages prior to placement of concrete or erection of other structural supporting members. Submittals received after structural supports are in place will be rejected if proposed anchorage method would create an overstressed condition of the supporting member. Contractor is responsible for revisions to anchorages and/or strengthening of structural support so that there is no overstress condition, at no additional cost to City.

END OF SECTION

DESIGN REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS AND NON-BUILDING STRUCTURES

APRIL 2022

ATTACHMENT E - TECHNICALS

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

DESIGN REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS AND NON-BUILDING STRUCTURES

APRIL 2022

ATTACHMENT E - TECHNICALS

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous construction waste.
 - 2. Recycling nonhazardous construction waste.
 - 3. Disposing of nonhazardous construction waste.

1.03 DEFINITIONS

- A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.
- C. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- D. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- E. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.04 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition and construction waste become property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

APRIL 2022

ATTACHMENT E - TECHNICALS

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.05 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within 7 days of date established for the Notice to Proceed

1.06 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit monthly report. Use Form CWM-7 for construction waste. Include the following information:
 - 1. Material category.
 - 2. Generation point of waste.
 - 3. Total quantity of waste in tons.
 - 4. Quantity of waste salvaged, both estimated and actual in tons.
 - 5. Quantity of waste recycled, both estimated and actual in tons.
 - 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
 - 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Qualification Data: For waste management coordinator.

1.07 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, or individual employed and assigned by General Contractor, with a record of successful waste

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

APRIL 2022

ATTACHMENT E - TECHNICALS

- management coordination of projects with similar requirements. Superintendent may serve as Waste Management Coordinator.
- B. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.
- C. Waste Management Conference(s): Conduct conference(s) at Project site to comply with requirements in Section 01 31 13 PROJECT COORDINATION. Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan including responsibilities of each contractor and waste management coordinator.
 - 2. Review requirements for documenting quantities of each type of waste and its disposition.
 - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 - 5. Review waste management requirements for each trade.

1.08 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to the requirements in this Section and in accordance with the LEED BD+C v4 prerequisite for Construction and Demolition Waste Management Planning, the LEED BD+C v4 credit Construction and Demolition Waste Management, the City of San Diego's New Construction and Demolition Debris Diversion Requirement and the California Green Building Code. Plan shall consist of waste identification, waste reduction work plan, including identification of five material streams. Indicate quantities by weight or volume but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of site-clearing and construction waste generated by the Work. Use Form CWM-1 for construction waste. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - 1. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 2. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

APRIL 2022

ATTACHMENT E - TECHNICALS

- 3. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
- 4. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

PART 2 PRODUCTS

2.01 RECYCLING RECEIVERS AND PROCESSORS

- A. Subject to compliance with requirements, available recycling receivers and processors include, but are not limited to, the following:
 - 1. The City of San Diego's published Certified Construction & Demolition Recycling Facilities recyclingworks.com

2.02 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 75 percent by weight of total nonhazardous solid waste generated by the Work and separation of four waste streams excluding landfill. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:
 - 1. Construction Waste:
 - a. Masonry and CMU.
 - b. Lumber.
 - c. Wood sheet materials.
 - d. Wood trim.
 - e. Metals.
 - f. Roofing.
 - g. Insulation.
 - h. Carpet and pad.
 - i. Gypsum board.
 - j. Piping.
 - k. Electrical conduit.
 - I. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Plastic sheet and film.

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

APRIL 2022

ATTACHMENT E - TECHNICALS

- 5) Polystyrene packaging.
- 6) Wood crates.
- 7) Wood pallets.
- 8) Plastic pails.
- m. Construction Office Waste: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following construction office waste materials:
 - 1) Paper.
 - 2) Aluminum cans.
 - 3) Glass containers.
- n. Electrical wiring

PART 3 EXECUTION

3.01 PLAN IMPLEMENTATION

A. General:

- 1. Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
- 2. Comply with operation, termination, and removal requirements in Section 01 50 00 TEMPORARY FACILITIES AND CONTROLS.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
 - 1. Distribute waste management plan to everyone concerned within 3 days of submittal return.
 - 2. Distribute waste management plan to entities when they first begin work onsite. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.
 - 2. Comply with Section 01 50 00, TEMPORARY FACILITIES AND CONTROLS for controlling dust and dirt, environmental protection, and noise control.

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

APRIL 2022

ATTACHMENT E - TECHNICALS

3.02 RECYCLING CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor
- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type (minimum allowable is 4 streams) at Project site to the maximum extent practical according to approved construction waste management plan.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - 4. Store components off the ground and protect from the weather.
 - 5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

3.03 RECYCLING CONSTRUCTION WASTE

A. Packaging:

- 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
- 2. Polystyrene Packaging: Separate and bag materials.
- 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
- 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.
- C. Paint: Seal containers and store by type.

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

APRIL 2022

ATTACHMENT E - TECHNICALS

3.04 DISPOSAL OF WASTE

A. General:

- 1. Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
- 2. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
- 3. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. General: Except for items or materials to be salvaged or recycled, remove waste materials and legally dispose of at designated spoil areas on Owner's property.
- C. Burning: Burning of waste materials is permitted only at designated areas on Owner's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.

3.05 FINAL STATUS REPORT

A. A Final Status Report demonstrating final disposition, either diverted or disposed, of materials generated by the Project is required before final payment.

3.06 ATTACHMENTS

- A. Form CWM-1 for construction waste identification.
- B. Form CWM-3 for construction waste reduction work plan.
- C. Form CWM-7 for construction waste reduction progress report.

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

FORM CWM-1: CONSTRUCTION WASTE IDENTIFICATION										
MATERIAL CATEGORY	GENERATION POINT	EST. QUANTITY OF MATERIALS RECEIVED* (a)	EST. WASTE - % (b)	TOTAL EST. QUANTITY OF WASTE* (c = a x b)	EST. VOLUME cy (cm)	EST. WEIGHT TONS (tonnes)	REMARKS AND ASSUMPTIONS			
Packaging: Cardboard										
Packaging: Boxes										
Packaging: Plastic Sheet or Film										
Packaging: Polystyrene										
Packaging: Pallets or Skids										
Packaging: Crates										
Packaging: Paint Cans										
Packaging: Plastic Pails										
Site-Clearing Waste										
Masonry or CMU										
Lumber: Cut-Offs										
Lumber: Warped Pieces										
Plywood or OSB (scraps)										
Wood Forms										
Wood Waste Chutes										
Wood Trim (cut-offs)										
Metals										
Insulation										
Roofing										

FORM CWM-1: CONSTRUCTION WASTE IDENTIFICATION										
MATERIAL CATEGORY	GENERATION POINT	EST. QUANTITY OF MATERIALS RECEIVED* (a)	EST. WASTE - % (b)	TOTAL EST. QUANTITY OF WASTE* (c = a x b)	EST. VOLUME cy (cm)	EST. WEIGHT TONS (tonnes)	REMARKS AND ASSUMPTIONS			
Joint Sealant Tubes										
Gypsum Board (scraps)										
Carpet and Pad (scraps)										
Piping										
Electrical Conduit										
Other:										

FORM CWM-3: CONSTRUCTION WASTE REDUCTION WORK PLAN									
		TOTAL FOT	DISF	OSAL METHOD AND Q					
MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS (tonnes)	EST. AMOUNT SALVAGED TONS (tonnes)	EST. AMOUNT RECYCLED TONS (tonnes)	EST. AMOUNT DISPOSED TO LANDFILL TONS (tonnes)	HANDLING AND TRANSPORTATION PROCEDURES			
Packaging: Cardboard									
Packaging: Boxes									
Packaging: Plastic Sheet or Film									
Packaging: Polystyrene									
Packaging: Pallets or Skids									
Packaging: Crates									
Packaging: Paint Cans									
Packaging: Plastic Pails									
Site-Clearing Waste									
Masonry or CMU									
Lumber: Cut-Offs									
Lumber: Warped Pieces									
Plywood or OSB (scraps)									
Wood Forms									
Wood Waste Chutes									
Wood Trim (cut-offs)									
Metals									
Insulation									
Roofing									

APRIL 2022

FORM CWM-3: CONSTRUCTION WASTE REDUCTION WORK PLAN								
			DISF	OSAL METHOD AND Q				
MATERIAL CATEGORY	GENERATION POINT	TOTAL EST. QUANTITY OF WASTE TONS (tonnes)	EST. AMOUNT SALVAGED TONS (tonnes) EST. AMOUNT RECYCLED TONS (tonnes)		EST. AMOUNT DISPOSED TO LANDFILL TONS (tonnes)	HANDLING AND TRANSPORTATION PROCEDURES		
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

FORM CWM-7: CONSTRU	FORM CWM-7: CONSTRUCTION WASTE REDUCTION Progress Report									
		TOTAL QUANTITY	QUANTITY OF WA	STE SALVAGED	QUANTITY OF WA	STE RECYCLED	TOTAL QUANTITY OF WASTE RECOVERED tons (tonnes) (d = b + c)	TOTAL QUANTITY		
MATERIAL CATEGORY	GENERATION POINT	OF WASTE tons (tonnes) (A)	ESTIMATED tons (tonnes)	ACTUAL tons (tonnes) (b)	ESTIMATED tons (tonnes)	ACTUAL tons (tonnes) (c)		OF WASTE RECOVERED % (d / a X 100)		
Packaging: Cardboard										
Packaging: Boxes										
Packaging: Plastic Sheet or Film										
Packaging: Polystyrene										
Packaging: Pallets or Skids										
Packaging: Crates										
Packaging: Paint Cans										
Packaging: Plastic Pails										
Site-Clearing Waste										
Masonry or CMU										
Lumber: Cut-Offs										
Lumber: Warped Pieces										
Plywood or OSB (scraps)										
Wood Forms										
Wood Waste Chutes										
Wood Trim (cut-offs)										
Metals										
Insulation										
Roofing										

FORM CWM-7: CONSTRUCTION WASTE REDUCTION Progress Report										
MATERIAL CATEGORY	GENERATION POINT	TOTAL QUANTITY OF WASTE tons (tonnes) (A)	•		ESTIMATED tons (tonnes) QUANTITY OF WASTE RECYCLED ACTUAL tons (tonnes) (c)		TOTAL QUANTITY OF WASTE RECOVERED tons (tonnes) (d = b + c)	TOTAL QUANTITY OF WASTE RECOVERED % (d / a X 100)		
Joint Sealant Tubes										
Gypsum Board (scraps)										
Carpet and Pad (scraps)										
Piping										
Electrical Conduit										
Other:										

END OF SECTION

SECTION 01 77 00 CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 SUBMITTALS

A. Informational Submittals:

- 1. Submit prior to application for final payment.
 - a. Record Documents: As described in Section 01 33 00 SUBMITTAL PROCEDURES and as required in General Conditions.
 - b. Approved Shop Drawings and Samples: As described in Section 01 33 00, SUBMITTAL PROCEDURES, Special bonds, Special Guarantees, and Service Agreements and as required in General Conditions.
 - c. Consent of Surety to Final Payment: As required in General Conditions.
 - d. Releases or Waivers of Liens and Claims: As required in General Conditions.
 - e. Releases from Agreements.
 - f. All documentation as required by all Funding Agencies.
 - g. Final Application for Payment: Submit in accordance with procedures, requirements stated in Section 01 29 00 PAYMENT PROCEDURES and requirements stated in the General Conditions.
 - h. Extra Materials: As required by individual specification sections.

1.02 RECORD DOCUMENTS

A. Conform to Section 3-7 Contract Documents of the 2021 GREENBOOK and Section 3-7.3 Red-lines and Record Documents of the 2021 WHITEBOOK.

B. Quality Assurance:

- 1. Furnish qualified and experienced person, whose duty and responsibility shall be to maintain record documents and to ensure compliance with the requirements of the Contract Documents and Funding Agencies.
- 2. Accuracy of Records:
 - a. Coordinate changes within record documents, making legible and accurate entries on each sheet of Drawings and other documents where such entry is required to show change.
 - b. Purpose of Project record documents is to document factual information regarding aspects of the Work, both concealed and visible, to enable future modification of the Work to proceed without lengthy and expensive Site measurement, investigation, and examination.
- 3. Make entries within 24 hours after receipt of information that a change in the Work has occurred.
- 4. Prior to submitting each request for progress payment, request Construction Manager's review and approval of current status of record documents. Failure

APRIL 2022

CLOSEOUT PROCEDURES

ATTACHMENT E - TECHNICALS

to properly maintain, update, and submit record documents may result in a deferral by Construction Manager to recommend whole or any part of Contractor's Application for Payment, either partial or final.

1.03 RELEASES FROM AGREEMENTS

- A. Furnish Owner written releases from property owners or public agencies where side agreements or special easements have been made, or where Contractor's operations have not been kept within the Owner's construction right-of-way.
- B. In the event Contractor is unable to secure written releases:
 - 1. Inform Owner of the reasons.
 - 2. Owner or its representatives will examine the Site, and Owner will direct Contractor to complete the Work that may be necessary to satisfy terms of the side agreement or special easement.
 - Should Contractor refuse to perform this Work, Owner reserves right to have it done by separate contract and deduct cost of same from Contract Price, or require Contractor to furnish a satisfactory bond in a sum to cover legal Claims for damages.
 - 4. When Owner is satisfied that the Work has been completed in agreement with Contract Documents and terms of side agreement or special easement, right is reserved to waive requirement for written release if: (i) Contractor's failure to obtain such statement is due to grantor's refusal to sign, and this refusal is not based upon any legitimate Claims that Contractor has failed to fulfill terms of side agreement or special easement, or (ii) Contractor is unable to contact or has had undue hardship in contacting grantor.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 MAINTENANCE OF RECORD DOCUMENTS

A. General:

- 1. Promptly following commencement of Contract Times, secure from Construction Manager at no cost to Contractor, one complete set of Contract Documents. Drawings will be full size.
- 2. Label or stamp each record document with title, "RECORD DOCUMENTS," in neat large printed letters.
- 3. Record information concurrently with construction progress and within 24 hours after receipt of information that change has occurred. Do not cover or conceal Work until required information is recorded.

B. Preservation:

1. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.

APRIL 2022

CLOSEOUT PROCEDURES

ATTACHMENT E - TECHNICALS

2. Make documents and Samples available at all times for observation by Construction Manager.

C. Making Entries on Drawings:

- 1. Clearly describe change by graphic line and note as required. Entries shall be adequately clear to accurately locate and indicate changes on Drawings. Entries shall be dark enough to allow scanned copies.
 - a. Color Coding:
 - 1) Green when showing information deleted from Drawings.
 - 2) Red when showing information added to Drawings.
 - 3) Blue and circled in blue to show notes.
- 2. Date entries.
- 3. Call attention to entry by "cloud" drawn around area or areas affected.
- 4. Legibly mark to record actual changes made during construction, including, but not limited to:
 - a. Depths of various elements of foundation in relation to finished first floor data if not shown or where depth differs from that shown.
 - b. Horizontal and vertical locations of existing and new Underground Facilities and appurtenances, and other underground structures, equipment, or Work. Horizontal and vertical locations of utilities placed at locations different than the coordinates shown on Drawings shall be surveyed, with revised coordinates to two decimal places, marked on Record Documents. Reference to at least two measurements to permanent surface improvements.
 - c. Location of internal utilities and appurtenances concealed in the construction referenced to visible and accessible features of the structure.
 - d. Locate existing facilities, piping, equipment, and items critical to the interface between existing physical conditions or construction and new construction.
 - e. Changes made by Addenda and Field Orders, Work Change Directive, Change Order, and Construction Manager's written interpretation and clarification using consistent symbols for each and showing appropriate document tracking number. Changes shall also be physically annotated on Drawings, in addition to noting the associated change.
- 5. Dimensions on Schematic Layouts: Show on Record Drawings, by dimension, the centerline of each run of items such as are described in previous subparagraph above.
 - a. Clearly identify the item by accurate note such as "cast iron drain," "galv. water," and the like.
 - b. Show, by symbol or note, vertical location of item ("under slab," "in ceiling plenum," "exposed," and the like).
 - c. Make identification so descriptive that it may be related reliably to Specifications.

APRIL 2022

CLOSEOUT PROCEDURES

ATTACHMENT E - TECHNICALS

3.02 FINAL CLEANING

- A. At completion of the Work or of a part thereof and immediately prior to Contractor's request for certificate of Substantial Completion; or if no certificate is issued, immediately prior to Contractor's notice of completion, clean entire Site or parts thereof, as applicable.
 - 1. Leave the Work and adjacent areas affected in a cleaned condition satisfactory to Owner and Construction Manager.
 - 2. Remove grease, dirt, dust, paint or plaster splatter, stains, labels, fingerprints, and other foreign materials from exposed surfaces.
 - 3. Repair, patch, and touch up marred surfaces to specified finish and match adjacent surfaces.
 - 4. Clean all windows.
 - 5. Clean and wax wood, vinyl, or painted floors.
 - 6. Broom clean exterior paved driveways and parking areas.
 - 7. Hose clean sidewalks, loading areas, and others contiguous with principal structures.
 - 8. Rake clean all other surfaces.
 - 9. Remove snow and ice from access to buildings.
 - 10. Replace air-handling filters and clean ducts, blowers, and coils of ventilation units operated during construction.
 - 11. Leave water courses, gutters, and ditches open and clean.
- B. Use only cleaning materials recommended by manufacturer of surfaces to be cleaned.

3.03 SUBSTANTIAL COMPLETION

- A. Conform to Section 3-13 COMPLETION, ACCEPTANCE, AND WARRANTY as specified in the 2021 GREENBOOK and Section 3-13.1 Completion, and 3-13.1.1 Requirements Before Requesting Substantial Completion.
- B. Promptly after Contractor's notification, Owner, Contractor, and Construction Manager shall make an inspection of the Work to determine the status of completion. If Construction Manager does not consider the Work substantially complete, Construction Manager will notify Contractor in writing giving the reasons therefor.
- C. At the time of delivery of the tentative certificate of Substantial Completion, Construction Manager will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Construction Manager in writing prior to Construction Manager's issuing the definitive certificate of Substantial Completion, Construction Manager's aforesaid recommendation will be binding on Owner and Contractor until final payment.

APRIL 2022

CLOSEOUT PROCEDURES

ATTACHMENT E - TECHNICALS

3.04 FINAL INSPECTION

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Construction Manager will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS **CLOSEOUT PROCEDURES**

01 77 00 - 5

203 I Page

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS **CLOSEOUT PROCEDURES**

SECTION 01 78 23 OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Detailed information for the preparation, submission, and Engineer's review of Operations and Maintenance (O&M) Data, as required by individual specification sections.

1.02 DEFINITIONS

- A. Preliminary Data: Initial and subsequent submissions for Engineer's review.
- B. Final Data: Engineer-accepted data, submitted as specified herein.
- C. Maintenance Operation: As used on Maintenance Summary Form is defined to mean any routine operation required to ensure satisfactory performance and longevity of equipment. Examples of typical maintenance operations are lubrication, belt tensioning, adjustment of pump packing glands, and routine adjustments.

1.03 SEQUENCING AND SCHEDULING

- A. Equipment and System Data:
 - 1. Preliminary Data:
 - a. Do not submit until Shop Drawing for equipment or system has been reviewed and approved by Engineer.
 - b. Submit prior to shipment date.
 - 2. Final Data: Submit Instructional Manual Formatted data not less than 30 days prior to equipment or system field functional testing.
 - 3. Record Data: Submit final Compilation Formatted and Electronic Media Formatted data prior to Substantial Completion of Project.
- B. Materials and Finishes Data:
 - 1. Preliminary Data: Submit at least 14 calendar days prior to request for final inspection.
 - 2. Final Data: Submit within 7 calendar days after final inspection.

1.04 DATA FORMAT

A. Prepare preliminary data in the form of an instructional manual. Prepare final data in data compilation format and on electronic media.

APRIL 2022

OPERATION AND MAINTENANCE DATA

ATTACHMENT E - TECHNICALS

B. Instructional Manual Format:

- 1. Binder: Commercial quality, permanent, three-ring or three-post binders with durable plastic cover.
- 2. Size: 8-1/2 inches by 11 inches, minimum.
- 3. Cover:
 - a. Identify manual with typed or printed title "OPERATION AND MAINTENANCE DATA" and list:
 - 1) Project title.
 - 2) Include name of piece of equipment and equipment tag number.
 - 3) Designate applicable system, equipment, material, or finish.
 - 4) Identity of separate structure as applicable.
 - 5) Identify volume number if more than one volume.
 - 6) Identity of general subject matter covered in manual. Identity of equipment number and Specification section.

4. Spine:

- a. Project title.
- b. Identify volume number if more than one volume.

5. Title Page:

- a. Contractor name, address, and telephone number.
- b. Subcontractor, Supplier, installer, or maintenance contractor's name, address, email address and telephone number, as appropriate.
 - 1) Identify area of responsibility of each.
 - 2) Provide name and telephone number of local source of supply for parts and replacement.

6. Table of Contents:

- a. Neatly typewritten and arranged in systematic order with consecutive page numbers.
- b. Identify each product by product name and other identifying numbers or symbols as set forth in Contract Documents.
- 7. Paper: 20-pound minimum, white for typed pages.
- 8. Text: Manufacturer's printed data, or neatly typewritten.
- 9. Three-hole punch data for binding and composition; arrange printing so that punched holes do not obliterate data.
- 10. Material shall be suitable for reproduction, with quality equal to original. Photocopying of material will be acceptable, except for material containing photographs. FAX and thermal copies are not acceptable.

C. Data Compilation Format:

- 1. Compile all Design Engineer-accepted preliminary O&M data into a hard-copy, hard-bound set.
- 2. Each set shall consist of the following:
 - a. Binder: Commercial quality, permanent, three-ring or three-post binders with durable plastic cover.

APRIL 2022

OPERATION AND MAINTENANCE DATA

ATTACHMENT E - TECHNICALS

- b. Cover: Identify each volume with typed or printed title "OPERATION AND MAINTENANCE DATA, VOLUME NO. OF ", and list:
 - 1) Project title.
 - 2) Contractor's name, address, and telephone number.
 - 3) If entire volume covers equipment or system provided by one Supplier include the following:
 - a) Identity of general subject matter covered in manual.
 - b) Identity of equipment number and Specification section.
- c. Provide each volume with title page and typed table of contents with consecutive page numbers. Place contents of entire set, identified by volume number, in each binder.
- d. Table of contents neatly typewritten, arranged in a systematic order:
 - 1) Include list of each product, indexed to content of each volume.
 - 2) Designate system or equipment for which it is intended.
 - 3) Identify each product by product name and other identifying numbers or symbols as set forth in Contract Documents.
- e. Section Dividers:
 - 1) Heavy, 80-pound cover weight, tabbed with numbered plastic index tabs.
 - 2) Divider Page:
 - a) For each separate product, or each piece of operating equipment, with typed description of product and major component parts of equipment.
 - b) List with Each Product:
 - (1) Name, address, and telephone number of Subcontractor, Supplier, installer, and maintenance contractor, as appropriate.
 - (2) Identify area of responsibility of each.
 - (3) Provide local source of supply for parts and replacement.
 - c) Identity of separate structure as applicable.
- f. Assemble and bind material, as much as possible, in same order as specified in the Contract Documents.

D. Electronic Media Format:

- Portable Document Format (PDF):
 - a. After all preliminary data has been found to be acceptable to Design Engineer, submit Operation and Maintenance data in PDF format on CD. Minimize the number of files in each manual. Files should not be broken up unless the size is greater than 1 GB.
 - b. Files to be exact duplicates of Design Engineer-accepted preliminary data. Arrange by specification number and name.
 - c. Files to be processed for optical character recognition, bookmarked, and viewable in most recent version of Adobe Acrobat.
 - d. Document properties requirements of each file shall be set as follows:
 - 1) Title: Name of the system

APRIL 2022

OPERATION AND MAINTENANCE DATA

ATTACHMENT E - TECHNICALS

- 2) Author: Manufacturer's name
- 3) Subject: Equipment Service Manual
- 4) Keywords: Equipment Tag Number, equipment type
- 5) Initial View Navigation Tab: Bookmarks Panel and Page
- 6) Layout: Single Page
- 7) Magnification: Fit Page
- 8) Window Option: Show document title
- 9) Security: No security

1.05 SUBMITTALS

A. Informational:

- Data Outline: Submit three copies and electronic copies of a detailed outline of proposed organization and contents of Final Data prior to preparation of Preliminary Data.
- 2. Preliminary Data:
 - a. Submit three copies and electronic copies for Design Engineer's review.
 - b. If data meets conditions of the Contract: Design Engineer will accept manual.
 - 1) One copy will be returned to Contractor.
 - 2) One copy will be forwarded to Resident Project Representative.
 - 3) One copy will be retained in Engineer's file.
 - c. If data does not meet conditions of the Contract: Resubmit manual revised in accordance with Design Engineer's comments.
 - 1) All copies will be returned to Contractor with Engineer's comments (on separate document) for revision.
 - 2) Engineer's comments will be retained in Engineer's file.
 - 3) Resubmit two copies revised in accordance with Engineer's comments.
- 3. Final Data: Submit two printed copies and an electronic copy in format specified herein.
- Record data: Submit two printed copies and an electronic copy in format specified herein, incorporating all modifications made during testing and commissioning.

1.06 DATA FOR EQUIPMENT AND SYSTEMS

- A. Content for Each Unit (or Common Units) and System:
 - 1. Product Data:
 - a. Include only those sheets that are pertinent to specific product.
 - b. Clearly annotate each sheet to:
 - 1) Identify specific product or part installed.
 - 2) Identify data applicable to installation.
 - 3) Delete references to inapplicable information.
 - c. Function, normal operating characteristics, and limiting conditions.

APRIL 2022

OPERATION AND MAINTENANCE DATA

ATTACHMENT E - TECHNICALS

- d. Performance curves, engineering data, nameplate data, and tests.
- e. Complete nomenclature and commercial number of replaceable parts.
- f. Original manufacturer's parts list, illustrations, detailed assembly drawings showing each part with part numbers and sequentially numbered parts list, and diagrams required for maintenance.
- g. Spare parts ordering instructions.
- h. Where applicable, identify installed spares and other provisions for future work (e.g., reserved panel space, unused components, wiring, terminals).
- 2. As-installed, color-coded piping diagrams.
- 3. Charts of valve tag numbers, with the location and function of each valve.
- 4. Drawings: Supplement product data with Drawings as necessary to clearly illustrate:
 - a. Format:
 - 1) Provide reinforced, punched, binder tab; bind in with text.
 - 2) Reduced to 8-1/2 inches by 11 inches, or 11 inches by 17 inches folded to 8-1/2 inches by 11 inches.
 - 3) Where reduction is impractical, fold and place in 8-1/2-inch by 11-inch envelopes bound in text.
 - 4) Identify Specification section and product on Drawings and envelopes.
 - b. Relations of component parts of equipment and systems.
 - c. As-built control and flow diagrams.
 - d. Coordinate drawings with Project record documents to assure correct illustration of completed installation.
- 5. Instructions and Procedures: Within text, as required to supplement product data.
 - a. Format:
 - 1) Organize in consistent format under separate heading for each different procedure.
 - 2) Provide logical sequence of instructions for each procedure.
 - 3) Provide information sheet for Owner's personnel, including:
 - a) Proper procedures in event of failure.
 - b) Instances that might affect validity of guarantee or Bond.
 - b. Installation Instructions: Including alignment, adjusting, calibrating, and checking.
 - c. Operating Procedures:
 - 1) Startup, break-in, routine, and normal operating instructions.
 - 2) Test procedures and results of factory tests where required.
 - 3) Regulation, control, stopping, and emergency instructions.
 - 4) Description of operation sequence by control manufacturer.
 - 5) Shutdown instructions for both short and extended duration.
 - 6) Summer and winter operating instructions, as applicable.
 - 7) Safety precautions.

APRIL 2022

OPERATION AND MAINTENANCE DATA

ATTACHMENT E - TECHNICALS

- 8) Special operating instructions.
- d. Maintenance and Overhaul Procedures:
 - 1) Routine maintenance.
 - 2) Guide to troubleshooting.
 - 3) Disassembly, removal, repair, reinstallation, and re-assembly.
- 6. Guarantee, Bond, and Service Agreement: In accordance with Section 01 77 00 CLOSEOUT PROCEDURES.
- B. Content for Each Electric or Electronic Item or System:
 - 1. Description of Unit and Component Parts:
 - a. Function, normal operating characteristics, and limiting conditions.
 - b. Performance curves, engineering data, nameplate data, and tests.
 - c. Complete nomenclature and commercial number of replaceable parts.
 - d. Interconnection wiring diagrams, including control and lighting systems.
 - 2. Circuit directories of panelboards:
 - 3. Electrical service.
 - 4. Control requirements and interfaces.
 - 5. Communication requirements and interfaces.
 - 6. List of electrical relay settings, and control and alarm contact settings.
 - 7. Electrical interconnection wiring diagram, including as applicable, single-line, three-line, schematic and internal wiring, and external interconnection wiring.
 - 8. As-installed control diagrams by control manufacturer.
 - 9. Operating Procedures:
 - a. Routine and normal operating instructions.
 - b. Startup and shutdown sequences, normal and emergency.
 - c. Safety precautions.
 - d. Special operating instructions.
 - 10. Maintenance Procedures:
 - a. Routine maintenance.
 - b. Guide to troubleshooting.
 - c. Adjustment and checking.
 - d. List of relay settings, control and alarm contact settings.
 - 11. Manufacturer's printed operating and maintenance instructions.
 - 12. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
- C. Maintenance Summary:
 - 1. Compile individual Maintenance Summary for each applicable equipment item, respective unit or system, and for components or sub-units.
 - 2. Format:
 - a. Use Maintenance Summary Form bound with this section or electronic facsimile of such.

APRIL 2022

OPERATION AND MAINTENANCE DATA

ATTACHMENT E - TECHNICALS

- b. Each Maintenance Summary may take as many pages as required.
- c. Use only 8-1/2-inch by 11-inch size paper.
- d. Complete using typewriter or electronic printing.
- e. Provide in electronic media format.
- 3. Include detailed lubrication instructions and diagrams showing points to be greased or oiled; recommend type, grade, and temperature range of lubricants and frequency of lubrication.
- 4. Recommended Spare Parts:
 - a. Data to be consistent with manufacturer's Bill of Materials/Parts List furnished in O&M manuals.
 - b. "Unit" is the unit of measure for ordering the part.
 - c. "Quantity" is the number of units recommended.
 - d. "Unit Cost" is the current purchase price.

1.07 DATA FOR MATERIALS AND FINISHES

- A. Content for Architectural Products, Applied Materials, and Finishes:
 - 1. Manufacturer's data, giving full information on products:
 - a. Catalog number, size, and composition.
 - b. Color and texture designations.
 - c. Information required for reordering special-manufactured products.
 - 2. Instructions for Care and Maintenance:
 - a. Manufacturer's recommendation for types of cleaning agents and methods.
 - b. Cautions against cleaning agents and methods that are detrimental to product.
 - c. Recommended schedule for cleaning and maintenance.
- B. Content for Moisture Protection and Weather Exposed Products:
 - 1. Manufacturer's data, giving full information on products:
 - a. Applicable standards.
 - b. Chemical composition.
 - c. Details of installation.
 - 2. Instructions for inspection, maintenance, and repair.

1.08 SUPPLEMENT

- A. The supplement listed below, following "End of Section", is part of this Specification.
 - 1. Maintenance Summary Form.

APRIL 2022

OPERATION AND MAINTENANCE DATA

ATTACHMENT E - TECHNICALS

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS OPERATION AND MAINTENANCE DATA 01 78 23 - 8 PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE INTENTIONALLY LEFT BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS OPERATION AND MAINTENANCE DATA 01 78 23 - 9

MAINTENANCE SUMMARY FORM

PROJECT:	CONTRACT NO.:
1. EQUIPMENT ITEM_	
2. MANUFACTURER _	
3. EQUIPMENT/TAG N	IUMBER(S)
4. WEIGHT OF INDIVII	DUAL COMPONENTS (OVER 100 POUNDS)
5. NAMEPLATE DATA	(hp, voltage, speed, etc.)
6. MANUFACTURER'S	S LOCAL REPRESENTATIVE
a. Name Telephone N	0
b.	
c. Email	

7. MAINTENANCE REQUIREMENTS

Maintenance Operation Comments	Frequency	Lubricant (If Applicable)
List briefly each maintenance operation required and refer to specific information in manufacturer's standard maintenance manual, if applicable. (Reference to manufacturer's catalog or sales literature is not acceptable).	List required frequency of each maintenance operation.	Refer by symbol to lubricant required.

APRIL 2022

OPERATION AND MAINTENANCE DATA

ATTACHMENT E - TECHNICALS

8. LUBRICANT LIST

Reference Symbol	Shell	Exxon Mobile	Chevron Texaco	BP Amoco	Or Equal		
List symbols used in No. 7 above.	List equivalent lubricants, as distributed by each manufacturer for the specific use recommended.						

9. RECOMMENDED SPARE PARTS FOR OWNER'S INVENTORY.

Part No.	Description	Unit	Quantity	Unit Cost				
Note: Identify parts pre	Note: Identify parts provided by this Contract with two asterisks.							

APRIL 2022 ATTACHMENT E - TECHNICALS OPERATION AND MAINTENANCE DATA 01 78 23 - 11

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS OPERATION AND MAINTENANCE DATA 01 78 23 - 12

SECTION 01 88 15 ANCHORAGE AND BRACING

PART 1 GENERAL

1.01 SUMMARY

A. This section covers requirements for anchorage and bracing of equipment, distribution systems, and other nonstructural components required in accordance with the 2016 California Building Code (CBC), for seismic, wind, gravity, soil, and operational loads.

1.02 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
 - 1. American Institute of Steel Construction (AISC) 360, Specification for Structural Steel Buildings.
 - 2. American Society of Civil Engineers (ASCE): ASCE 7, Minimum Design Loads for Buildings and Other Structures.
 - 3. California Building Commission: 2016 CBC
 - 4. International Code Council (ICC): International Building Code (IBC).

1.03 DEFINITIONS

- A. Agency Having Jurisdiction (AHJ): Permitting building agency; may be a federal, state, local, or other regional department, or individual including building official, fire chief, fire marshal, chief of a fire prevention bureau, labor department, or health department, electrical inspector; or others having statutory authority. AHJ may be Owner when authorized to be self-permitting by governmental permitting agency or when no governmental agency has authority.
- B. Designated Seismic System: Architectural, electrical, and mechanical system or their components for which component importance factor is greater than 1.0. Components in direct contact with oxygen shall have a component importance factor, lp, equal to 1.5.

1.04 DESIGN AND PERFORMANCE REQUIREMENTS

A. General:

- Contractor shall be responsible for designing code required gravity, wind and seismic supports, attachments, braces, and anchors to the structure including concrete pads and foundations for elements of the architectural, mechanical, and electrical systems included in the Work in accordance with this section unless a design is specifically provided within the Contract Documents.
- 2. Anchorage and bracing systems shall be designed by a qualified professional civil or structural engineer registered in the State of California.

APRIL 2022

ANCHORAGE AND BRACING

ATTACHMENT E - TECHNICALS

- 3. Design anchorage and bracing of architectural, mechanical, and electrical components and systems in accordance with this section, unless a design is specifically provided within Contract Documents or where exempted hereinafter.
- 4. Design attachments, braces, and anchors for equipment, components, and distribution systems to structure for gravity, seismic, wind, and operational loading.
- 5. Design seismic anchorage and bracing for modified existing architectural, mechanical, or electrical systems where code requirements would dictate design for similar new components.
- 6. Anchor and brace piping and ductwork, whether exempt or not exempt for this section, so that lateral or vertical displacement does not result in damage or failure to essential architectural, mechanical, or electrical equipment.
- 7. Architectural Components: Includes, but are not limited to, nonstructural walls and elements, partitions, cladding and veneer, access flooring, signs, cabinets, suspended ceilings, and glass in glazed curtain walls and partitions.
- 8. Provide supplementary framing where required to transfer anchorage and bracing loads to structure.
- 9. Adjust equipment pad sizes or provide additional anchorage confinement reinforcing to provide required anchorage capacities.
- 10. Design anchorage and bracing for:
 - a. Equipment and components that weigh more than 400 pounds and have center of mass located 4 feet or less above adjacent finished floor.
 - b. Equipment weighing more than 20 pounds that has center of mass located more than 4 feet above adjacent finished floor.
 - c. Mechanical and electrical components that are not provided with flexible connections between components and associated ductwork, piping, or conduit.
 - d. Distribution systems that weigh more than 5 pounds per foot that have center of mass located more than 4 feet above adjacent finished floor.
- 11. Design seismic anchorage and bracing for Designated Seismic Systems regardless of weight or mounting height.
 - a. Component Important Factor:
 - 1) Ip equals 1.0, unless noted otherwise.
 - 2) Ip shall be taken as 1.5 if any of the following conditions apply:
 - a) Component is required to function for life-safety purposes after an earthquake, including fire protection sprinkler systems and egress stairways.
 - b) Component contains hazardous materials.
 - c) Component is in or attached to Risk Category IV structure and is needed for continued operation of facility or its failure could impair continued operation of facility.
 - d) Component is in direct contact with oxygen.
 - 3) Per Section 01 61 00 COMMON PRODUCT REQUIREMENTS.

APRIL 2022

ANCHORAGE AND BRACING

ATTACHMENT E - TECHNICALS

12. For components exempted from design requirements of this section, provide bolted, welded, or otherwise positively fastened attachments to supporting structure.

B. Design Loads:

- 1. Gravity: Design anchorage and bracing for self-weight and superimposed loads on components and equipment.
- 2. Wind: Design anchorage and bracing for wind criteria provided in Section 01 61 00 COMMON PRODUCT REQUIREMENTS and on General Structural Notes on Drawings for architectural components and exterior and wind-exposed mechanical and electrical equipment. Alternately, manufacturer certification may be provided for components such as roofing and flashing to verify attachments meet Project-specific design criteria.

3. Operational:

- a. For loading supplied by equipment manufacturer for CBC required load cases.
- b. Loads may include equipment vibration, torque, thermal effects, effects of internal contents (weight and sloshing), water hammer, and other load-inducing conditions.
- c. Locate braces to minimize vibration to or movement of structure.
- d. For vibrating loads, use anchors with designated capacities for vibratory loading per manufacturer's ICC-ES report.
- 4. Hydraulic: Design of anchorage for submerged gates and other mechanical equipment shall include hydrostatic and hydrodynamic loads determined in accordance with Section 15.7 of ASCE 7-10.

5. Seismic:

- a. In accordance with 2016 CBC, Section 1613, and Chapter 13 of ASCE 7.
- b. Design anchorage and bracing for design criteria listed on General Structural Notes on Drawings.
- c. Design forces for anchors in concrete or masonry shall be in accordance with ASCE 7, Section 13.4.2 or CBC Section 1905.1.9 as applicable for Project Seismic Design Category.

C. Seismic Design Requirements:

- 1. Nonstructural Components: Design as nonbuilding structures for components with weights greater than or equal to 25 percent of effective seismic weight of overall structure.
- 2. Analyze local region of body of nonstructural component for load transfer of anchorage attachment if component lp equals 1.5.
- 3. The following are exempt from requirements for provision of seismic anchorages and bracing, in addition to those items specifically exempted in ASCE 7, Part 13. 6 for electrical and mechanical equipment:
 - a. Temporary or movable equipment.
 - b. Furniture, except storage cabinets and bookshelves over 6 feet tall.
- 4. Fire protection sprinkler systems designed and constructed in accordance with NFPA 13 shall be considered to meet requirements of Chapter 13 of ASCE 7.

APRIL 2022

ANCHORAGE AND BRACING

ATTACHMENT E - TECHNICALS

- 5. Provide support drawings and calculations for electrical distribution components if any of the following conditions apply:
 - a. Conduit diameter is greater than 2.5-inch trade size.
 - b. Total weight of bus duct, cable tray, or conduit supported by trapeze assemblies exceeds 10 pounds per foot.
- 6. Existing components, systems, and equipment in their final condition that are modified by Project requirements and are not exempted by above paragraph require the same anchorage and bracing drawing and calculation submittals as new equipment. Field verify existing conditions.
- 7. Other seismic design and detailing information identified in ASCE 7, Chapter 13, is required to be provided for new and modified or noted architectural, mechanical and electrical components, systems, or equipment.

1.05 SUBMITTALS

A. Action Submittals:

Shop Drawings:

- 1. List of mechanical and electrical equipment requiring Contractor-designed anchorage and bracing, unless specifically exempted.
 - a. Manufacturers' engineered seismic and non-seismic hardware product data sealed by a civil or structural engineer registered in the State of California.
 - b. Attachment assemblies' drawings including seismic attachments; include connection hardware, braces, and anchors or anchor bolts for nonexempt components, equipment, and systems.
 - c. List of existing mechanical, and electrical equipment or components to be modified in Project requiring Contractor-designed anchorage and bracing in final retrofitted condition.
 - d. Drawings for seismic attachment assemblies include connection hardware, braces, and anchors (or anchor bolts) for modified, nonexempt existing components, equipment, and systems where a combination of new and existing systems or components' final condition would require anchorage or bracing under this Specification for new equipment.
 - e. Submittal will be rejected if proposed anchorage method would create excessive stress to supporting member. Revise anchorages and strengthen structural support to eliminate overstressed condition.

B. Informational Submittals:

- Anchorage and Bracing Calculations: For attachments, braces, and anchorages, include CBC and Project-specific criteria as noted on General Structural Notes on Drawings, in addition to manufacturer's specific criteria used for design; sealed by a civil or structural engineer registered in the State of California.
- 2. Manufacturer's hardware installation requirements.

C. Deferred Submittals:

APRIL 2022

ANCHORAGE AND BRACING

ATTACHMENT E - TECHNICALS

- 1. Submitted seismic anchorage drawings and calculations for Designated Seismic Systems are identified as CBC deferred submittals and will be submitted to and must be accepted by AHJ prior to installation of component, equipment, or distribution system.
- 2. Submit deferred Action Submittals such as Shop Drawings with supporting deferred informational submittals such as calculations no less than 8-weeks in advance of installation of component, equipment or distribution system to be anchored to structure.

1.06 SOURCE QUALITY CONTROL

- A. Provide all other specified, regulatory required, or required repair verification inspection and testing that is not listed in Statement of Special Inspections in accordance with Section 01 45 16.13 CONTRACTOR QUALITY CONTROL.
- B. Contractor and supplier responsibilities to accommodate Owner-furnished shop fabrication related special inspections and testing are provided in Project's Statement of Special Inspections on Drawings, and Section 01 45 33 SPECIAL INSPECTION, OBSERVATION AND TESTING.

PART 2 PRODUCTS

2.01 GENERAL

- A. Design and construct attachments and supports transferring seismic and non-seismic loads to structure of materials and products suitable for application and in accordance with design criteria shown on Drawings and nationally recognized standards.
- B. Provide anchor bolts for anchorage of equipment to concrete in accordance with this Section. Provide anchor bolts of the size, minimum embedment, and spacing designated in calculations submitted by Contractor and accepted by Design Engineer.
- C. Provide post-installed concrete anchors for anchorage of equipment to concrete in accordance with Section 05 05 19 POST-INSTALLED CONCRETE ANCHORS. Provide post-installed anchors of the type, size, minimum embedment, and spacing designated in calculations submitted by Contractor and accepted by Design Engineer.
- D. Use only cartridge injection adhesive anchors in concrete elements.

APRIL 2022 ATTACHMENT E - TECHNICALS ANCHORAGE AND BRACING

PART 3 EXECUTION

3.01 GENERAL

- A. Make attachments, bracing, and anchorage in such a manner that component lateral force is transferred to lateral force-resisting system of structure through a complete load path.
- B. Design, provide, and install overall seismic anchorage system to provide restraint in all directions, including vertical, for each component or system so anchored.
- C. Provide snubbers in each horizontal direction and vertical restraints for components mounted on vibration isolation systems where required to resist overturning.
- D. Provide piping anchorage that maintains design flexibility and expansion capabilities at flexible connections and expansion joints.
 - Piping and ductwork suspended more than 12 inches below supporting structure shall be braced for seismic effects to avoid significant bending of hangers and their attachments unless high- or limited- deformability piping is used per ASCE 7, Section 13.6.8 or HVAC ducts have a cross-sectional area of less than 6 square feet or weigh 17 pounds per foot or less.
- E. Anchor tall and narrow equipment such as motor control centers and telemetry equipment at base and within 12 inches from top of equipment, unless approved otherwise by Design Engineer.
- F. Do not attach mechanical, or electrical components to more than one element of a structure at a single restraint location where such elements may respond differently during a seismic event. Do not make such attachments across building expansion and contraction joints.

3.02 INSTALLATION

- A. Do not install components or their anchorages or restraints prior to review and acceptance by Design Engineer and AHJ.
- B. Notify Construction Manager upon completion of installation of seismic restraints in accordance with Section 01 45 33 SPECIAL INSPECTION, OBSERVATION, AND TESTING.

3.03 FIELD QUALITY ASSURANCE AND QUALITY CONTROL

- A. Furnish anchors in accordance with this Section and Section 05 05 19 POST-INSTALLED CONCRETE ANCHORS.
- B. Owner-Furnished Quality Assurance, in accordance with CBC Chapter 17 requirements, is provided in Statement of Special Inspections Plan on Drawings. Contractor responsibilities and related information are included in Section 01 45 33 SPECIAL INSPECTION, OBSERVATION AND TESTING.

APRIL 2022

ANCHORAGE AND BRACING

ATTACHMENT E - TECHNICALS

C. Provide any other specified, regulatory required, or required repair verification inspection and testing that is not listed in Statement of Special Inspections.

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS ANCHORAGE AND BRACING 01 88 15 - 7

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS ANCHORAGE AND BRACING 01 88 15 - 8

SECTION 01 91 14 TESTING AND STARTUP

PART 1 GENERAL

1.01 STARTUP

- A. The goal of startup is to verify proper performance and operation of the Equipment.
- B. Testing will include a 7-day commissioning period and 7-day Facility Acceptance Test

1.02 DEFINITIONS

- A. Acceptance Testing: A contractually required, specific and measurable test, often with liquidated damages attached, to demonstrate a system or facility performs to its intended function (e.g., flow amounts, duration and quality criteria are met). A successor activity to Performance Testing. All major defects are resolved at this point.
- B. Distributed Control System Provider (DCSP): Entity who is responsible for the development and programming of the Facility DCS.
- C. Auxiliary Systems: Subsystems and systems selected by the Owner as critical to the operation and function of the Work. Auxiliary systems are more specifically identified in the Contract Documents.

D. Commissioning:

- The disciplined and systematic process of assuring that all components, subsystems and systems of a constructed unit are designed, installed, tested and operated in conformance with the design intent, and functional intent and operational requirements of the Owner.
- 2. This includes:
 - a. Proof testing of design intent using static check sheets, dynamic check sheets and defined procedures to ensure compliance with design drawings, data sheets and specifications.
 - b. Achieving a smooth and safe transition from an inert state to a completely tested, clean, leak tight, operable and safe unit ready for startup and performance testing.
- E. Components: Individual items of equipment or portions of the Work that when combined with other components make up subsystems or systems. Components may be minor items such as pressure gauges, or they may be significant items such as pump motors.
- F. Facility: The combined equipment and systems co-located to perform a specified function e.g., Penasquitos Pump Station Oxygenation System (PQPSOS)

APRIL 2022 TESTING AND STARTUP

ATTACHMENT E - TECHNICALS

- G. Facility Acceptance Test: A 7-day operational run of the completed systems demonstrating that all portions of the facility operate continuously as intended.
- H. Factory Acceptance Testing (FAT): All testing required to be conducted at the fabricator's / manufacturer's / vendor's off-site locations, witnessed or unwitnessed. Includes all such testing, regardless of the specific descriptive title used for said testing in the Contract Documents.
- I. Final Completion: Refer to the Contract Requirements and Supplementary Provisions
- J. Functional Testing: A test of a given component, subsystem or system to confirm its operation meets specifications and Contract requirements. Often a prerequisite to Performance and Acceptance Testing.
- K. Intermediate Substantial Completion: The time at which the Project's operating facilities or systems are sufficiently complete to begin to deliver oxygen to the wastewater pumped by the PQPS.
- L. Major Equipment Systems: Systems, subsystems, or major equipment components selected by the Owner as critical to the operation and function of the Work. Major equipment systems are more specifically identified in the Contract Documents.
- M. Manufacturer's Installation Inspection: Preliminary inspection conducted by Manufacturer or Manufacturer's accepted representative to confirm proper installation of components, systems, and subsystems.
- N. Mechanical/Electrical Functional Testing: Testing performed to confirm general performance of mechanical and electrical systems. Hydrostatic leak testing of pipes is an example. Electrical testing specified in Division 26, Electrical, shall be considered Mechanical/Electrical Functional Testing.
- O. Performance Test: A defined test of a system, systems or facility over a period of 7 days, unless otherwise specified, to demonstrate the system or facility is fully operational and meets all specifications, performance objectives and Contract requirements. Performance testing will be done with wastewater pumped by PQPS as defined with these Contract Documents.
- P. Operational Readiness Test Part 1. See Part 3 of this specification.
- Q. Operational Readiness Test Part 2. See Part 3 of this specification.
- R. Process Instrumentation and Control (PIC): Computer-based system whose purpose is to control and supervise the overall Facility operation.
- S. Staging Site Demonstration: Startup phase during which the DCSP performs a FAT to test the proper communication and action of the DCSP-developed software system. This testing will be conducted offsite.

APRIL 2022

TESTING AND STARTUP

ATTACHMENT E - TECHNICALS

- T. Startup: The act of starting or operating a component, subsystem or system and testing its functionality and performance against defined metrics.
- U. Subsystems: A group of related equipment that performs a defined function and is an element of a larger system.
- V. Substantial Completion: Upon satisfactory completion of the 7-Day Facility Acceptance Test, See Attachment 1 Phase 1 Commissioning Model. Refer to Contract requirements and Supplementary Provisions.
- W. Systems: A group of related components, equipment or subsystems that perform a defined function or set of functions within a facility.
- X. Training: Classroom and equipment area instruction by Manufacturer or Manufacturer accepted representative intended to educate the Owner on the proper operation and maintenance of components, systems, and subsystems.

1.03 SUBMITTALS

A. Action Submittals:

- 1. Startup Personnel Qualifications: The qualifications submittal for the Startup Manager and Project Integrator shall be provided at the Preconstruction Conference.
- 2. Startup Management Plan: Submitted within 30 calendar days after Notice to Proceed.
- 3. Overall Facility Startup Plan.
- 4. Factory Acceptance Test Plans.
- 5. Acceptance Test Plans.
- 6. Commissioning Test Plans including sampling
- 7. Startup Schedule:
 - a. Schedule shall be a detailed Oracle Primavera P6 schedule linked to the milestones and key startup activities contained in the Construction Schedule as specified in Section 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION.
 - b. The Startup Schedule shall include each phase of testing for the systems defined herein.
 - c. Schedule shall be submitted in both XER and PDF format and updated monthly.
 - d. The detailed Startup Schedule shall be submitted no later than 60 calendar days to the start of ORT Part 1 in the accepted Baseline Schedule, as specified in Section 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION.

8. Startup Results Submittal:

- a. Include the following:
 - 1) Results documentation from all Factory Acceptance Testing.
 - 2) Completed test plans (endorsed by Construction Manager and Contractor).

APRIL 2022 TESTING AND STARTUP

ATTACHMENT E - TECHNICALS

- 3) Record of all Training:
 - a) Training requests.
 - b) Agendas.
 - c) Sign in sheets.
 - d) Handouts.
 - e) Electronic copy of all training presentations.
- 4) Record of all Manufacturer Services/Inspections.
- 5) Record of all testing not covered above.
- 9. Testing methodology and instrumentation and laboratory, if needed.
- 10. Commissioning Test Results
 - a. Show compliance with specified design criteria

1.04 ORGANIZATION OF STARTUP PHASES

A. The following table summarizes the various phases of startup:

Description	Duration	Preceding Constraints	Comments
Submittals	As required to meet testing schedule		
Factory Acceptance Testing	As required to meet testing schedule	Approved submittals required prior to testing.	
Mechanical/Electrical Functional Testing and Equipment Testing	As required to meet testing schedule for individual unit process	Complete all FATs. Complete equipment and piping installation. Approved submittals required prior to testing (including O&Ms).	Includes hydrostatic testing. Includes Equipment Manufacturer Services per 46 51 50
PIC Operational Readiness Test Part 1	As required to meet testing schedule	Manufacturer's installation assistance and inspection. Completion of staging site demonstration test and loading of application software.	
		Approved submittals required prior to testing (including O&Ms).	

APRIL 2022 ATTACHMENT E - TECHNICALS **TESTING AND STARTUP**

Description	Duration	Preceding Constraints	Comments
PIC Operational Readiness Test Part 2	As required to meet testing schedule	Completion of PIC Operational Readiness Test Part 1.	
		Completion of staging site demonstration test and loading of application software.	
		Approved submittals required prior to testing (including O&Ms).	
Functional and Performance Testing	As required to meet testing schedule	Completion of PIC Operational Readiness Test Part 2.	
		Approved submittals required prior to testing (including O&Ms).	
Training	As specified	Completion of all functional and performance testing.	
Facility Commissioning	7 days	Completion of Functional and Performance Testing and Training.	
Facility Acceptance Test	7 days	Intermediate Substantial Completion	
		Completion of commissioning of the installed system.	
		Manufacturer's CPI.	
		Training.	
		Approved submittals required prior to testing	

1.05 CONTRACTOR STARTUP PERSONNEL

- A. Contractor shall provide personnel, both supervisory and from the applicable trades, who are experienced in startup, testing, and commissioning for the execution of the work described in these Contract Documents.
- B. Startup Manager: The Startup Manager shall have the necessary experience to fully understand all startup requirements and the authority to dedicate Contractor's resources as required to execute the Work.
 - 1. The Startup Manager shall have the following minimum qualifications:
 - a. Has provided startup services for wastewater facilities and conveyance facilities similar to those included in the Work.

APRIL 2022

TESTING AND STARTUP

ATTACHMENT E - TECHNICALS

- 2. The Contractor shall allocate the costs for the Startup Manager as a monthly allocation starting at the project limited NTP and terminating at Final Completion.
- Once the Owner and Construction Manager accept the Startup Manager, the Contractor shall not change the Startup Manager throughout the full period of performance of the Work, beginning after the limited NTP, without the express written permission of Construction Manager and Owner.
- 4. The minimum scope of services to be managed and/or executed by the Startup Manager shall include the following tasks:
 - a. Formation of an onsite startup team of supervisory staff, qualified in each and every element of the startup process required as part of the Work. This staff shall prepare all Contractor-performed startup and testing documentation and direct the associated startup activities, including all required Contractor and Subcontractor personnel required for testing. This requirement is also applicable to all factory testing, whether witnessed by Construction Manager or not.
 - b. Complete planning, development, and where required, the preparation of all Startup and Test Plans, testing procedures, schedules, and related prerequisite, and final documentation for startup activities required by the Contract Documents. This requirement is applicable to all required startup and/or testing plans, reports, and procedures, regardless of the specific portion of the Contract Documents where they may be specified or otherwise required.
 - c. Overall coordination and scheduling of all startup and testing activities. This shall include the development of detailed startup and testing schedules, integrated with Contractor's construction schedule. It shall also include all coordination with the Owner and Construction Manager for operation of the system to accommodate test flows and joint testing activities.
 - d. Coordination of all manufacturers' startup activities and certification of proper installation and/or function as required by the Contract Documents.
 - e. Coordination, direction, and management of the actual day-to-day testing.
 - f. Review and certify all test results. Prepare and/or compile all versions of all test reports and related submittals. Prior to being submitted to the Construction Manager, all test reports shall be certified by the Startup Manager that the reports and associated test results comply with the Contract Documents.
 - g. Coordinate all testing and startup with the Engineer, Construction Manager, and Owner.
 - h. Integration with the vendor packaged control systems.

1.06 THE STARTUP MANAGEMENT PLAN

A. The Contractor Startup Manager shall conduct a startup coordination workshop/meeting and prepare and submit a Startup Management Plan that describes how Contractor will accomplish the minimum scope of services and manage the daily startup activities. The coordination workshop shall, at a minimum, include the Contractor's Startup Manager, Project Integrator, and Project Superintendent. The requirements for Startup requirements for the Work

APRIL 2022 TESTING AND STARTUP

ATTACHMENT E - TECHNICALS

will be reviewed at the workshop. The Startup Management Plan shall be prepared immediately following the workshop and shall include a detailed description, including procedures and examples of how the Startup Team will manage the interface between Contractor's trades, Contractor's management, Contractor's subcontractors, Contractor's PLC programmers, Construction Manager's field team, Owner, and the DCSP programming team. The workshop shall be conducted within 4 weeks of Notice to Proceed. The draft Startup Management Plan shall be completed and submitted no later than 2 weeks of the startup coordination workshop. The plan will be reviewed and processed for acceptance in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

1.07 THE STARTUP AND TEST PLANS

- A. The Contractor will develop specific plans for the testing of all elements of the Facility. These plans shall outline the detailed sequence of activities necessary to confirm the proper operation of every component, system, and subsystem.
- B. Test plans will be prepared including, but not limited to the following:
 - 1. Factory acceptance testing.
 - 2. Staging site demonstration.
 - 3. Manufacturer's installation inspection.
 - 4. Mechanical/electrical functional testing.
 - 5. Operational Readiness Test Part 1.
 - 6. Operational Readiness Test Part 2.
 - 7. Functional and performance testing on the following unit processes shall have individual test plans for each unit process with its auxiliary systems.
 - 8. Pump Performance Testing
 - 9. Pre-Selected Equipment Permit Testing and Extended Performance Tests.
- C. Test plans will be developed as described below:
 - 1. The Overall Startup Plan shall include FOUR main sections arranged as follows:
 - a. Overall Startup Plan Summary.
 - b. Factory Acceptance Testing.
 - c. Operational Readiness Testing.
 - d. Functional and Performance Testing.
 - 2. The contents and requirements pertaining to each section are described below. It is expected that each section could require multiple volumes, depending on the size and complexity of the Work.
 - 3. Overall Startup Plan Summary:
 - a. The Overall Startup Plan Summary is the master startup plan document. It includes a brief summary of all testing and startup activities and provides the basic organization of the startup and testing program. It shall be submitted in advance of any other test plans except for Factory Acceptance Test Plans as described herein.
 - b. The Overall Startup Plan Summary shall include the following:

APRIL 2022 TESTING AND STARTUP

ATTACHMENT E - TECHNICALS

- Introduction with a narrative description of the overall testing and startup program planned for implementation by the Contractor. Tables and flowcharts in addition to those described below should be included to clearly illustrate the Contractor's intent for the testing and startup program.
- 2) List of major Acceptance Test Plan categories. Factory Acceptance Testing shall be a specific subset for each category. At a minimum, a separate acceptance test plan shall be prepared for the following four categories:
 - a) All PIC and DCS testing specified in Division 40, Process Integration, of the specifications and including all related testing referring to Division 40 from other specification sections and divisions.
 - b) All electrical testing specified in Division 26, Electrical, of the specifications and including all related testing referring to Division 26, Electrical, from other specification sections and divisions.
 - c) All hydrostatic testing of piping and appurtenances, pipelines, aqueducts, valves, water holding structures, pressure vessels, tanks, and any other component, subsystem, or system specified to be hydrostatic or pressure tested.
 - d) Unless otherwise indicated in the Contract Documents, all other testing.
- c. In addition to the breakdown listed above, the Contractor may propose to further divide, or group, the testing into categories assigned by process area or physical site delineation. However, said division or grouping must be agreed to, in writing, by the Construction Manager prior to the initial submittal of the Overall Startup Plan Summary. The Construction Manager will be the sole judge as to the acceptability of the additional division or grouping of testing proposed by the Contractor.
 - Complete listing of component, subsystem, and system tests within each Test Plan category. Special focus should be placed on a complete listing of tests for all major equipment items and all auxiliary systems identified in the Contract Document. In any case, all components, subsystems, and systems and their associated testing shall be included in the listing.
 - 2) Complete listing of Factory Acceptance Testing (witnessed and unwitnessed). All specified Factory Acceptance Testing will be required to be successfully completed to achieve Substantial Completion. It may be to the Contractor's benefit to obtain concurrence on the listing of Factory Acceptance Testing early in the project. In that case, this section would simply be a copy of the material already agreed to, with any updates.
 - 3) Flowchart the full testing program from Factory Acceptance Testing and initial shakedown through Acceptance Testing and ending at Substantial Completion. The flowchart shall demonstrate the precedence, or order, by which the testing will take place. The order of

APRIL 2022 TESTING AND STARTUP

ATTACHMENT E - TECHNICALS

- testing shall be such that it is consistent with the requirements of the Contract Documents.
- 4) Provide a preliminary schedule illustrating the timeline associated with the flowchart described above. This schedule does not need to be CPM based as it will be replaced with schedules developed according to requirements stated below for the Startup Schedule.
- 4. Factory Acceptance Test Plan:
 - a. The Factory Test Plan shall be a comprehensive description of the complete test setup, procedures, analyses, and reporting program for each factory test required for the Work. Detailed step by step procedures describing all activities in the test process shall be included for all factory tests, witnessed or unwitnessed. Unwitnessed readiness tests prior to witnessed PIC Factory Acceptance Test are exempt from this requirement. However, all other shop or factory tests, witnessed, or unwitnessed, that require testing to demonstrate compliance with the Contract Documents and require submittal of test results, must have a Factory Acceptance Test Plan accepted by the Engineer and Construction Manager at least 2 weeks prior to the test.
 - b. At a minimum, the following shall be included for each Factory Acceptance Test Plan:
 - 1) Identification information for the component, subsystem, or system being tested. All applicable tag numbers shall be included.
 - 2) A narrative description of the purpose and goals of the test.
 - 3) Pass/Fail criteria.
 - 4) A listing and copy of all pertinent reference documents (Contract Documents and industry standards or specifications applicable to the testing).
 - 5) Complete description, including drawings, for all test stands and/or test apparatuses.
 - 6) Credentials of test personnel.
 - 7) Descriptions of all test equipment.
 - 8) Descriptions and product information, including calibration certificates, for all test instruments.
 - 9) Step-by-step detailed procedures of how the test will be conducted. The level of detail shall be sufficient for any witness with a rudimentary technical aptitude to be able to follow the steps and develop confidence that the tests were being performed as planned. All steps are significant, and all steps shall be included in the procedures.
 - 10) Copies of the actual data logs and/or data recording forms that will be used for the test.
 - 11) A complete disclosure of all calculation methodologies.
 - 12) Sample computations or analyses with results in the same format as the final report. This item is intended to demonstrate how data collected will be used to generate final results. A sample shall be included for each type of computation required for the test and analysis of results.
 - 13) A detailed outline of the final factory testing report.

APRIL 2022 TESTING AND STARTUP

ATTACHMENT E - TECHNICALS

- c. Each factory test shall be described separately. Factory Acceptance Test Plans are the only portion of the Startup and Test Plans that will be accepted prior to acceptance of the Overall Startup Plan Summary. Also, Factory Acceptance Test Plans will be allowed to be submitted and reviewed individually. However, the Overall Startup Plan Summary is required to summarize the factory testing program and all submittal numbers for individually submitted Factory Acceptance Test Plans shall be accurately accounted for in that document.
- d. This section is not intended to supersede the specific requirements for PIC/DCS Factory Acceptance Tests described for the Work. However, Factory Acceptance Test Plans shall be provided for the PIC/DCS FATs in accordance with these requirements. In the case of conflict, the specific testing requirements of the FATs in the PIC/DCS specification sections shall prevail. All other Factory Acceptance Testing Plans shall strictly comply with this section unless otherwise approved by the Construction Manager.
- D. Contractor shall execute these test plans with the witnessing of the Construction Manager and/or Engineer and/or Owner.
- E. Contractor shall submit the completed test reports as part of the Startup Results Submittal.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL STARTUP AND TESTING REQUIREMENTS

- A. Contractor is responsible for the complete testing, check out, startup, and commissioning of all elements of the Facility. Verify these activities through daily inspection reports, test records/reports, onsite vendor certifications, specified testing, and by other appropriate means. Startup and Testing Plans and Test Reports shall include specific language to demonstrate that the requirements stated herein are planned, executed, and accomplished. The requirements below are complementary to those indicated elsewhere in the Contract Documents.
- B. Facility Startup Meetings: Schedule, in accordance with requirements of Section 01 31 19 PROJECT MEETINGS, to discuss test schedule, test methods, materials, facilities operations interface, and Owner involvement.
- C. Provide temporary valves, gauges, piping, test equipment and other materials and equipment required for testing and startup.
- D. Owner will:
 - 1. Provide water and power, unless otherwise indicated, for permanently installed equipment operation.
 - 2. Provide labor and materials as required for laboratory analyses.

APRIL 2022 TESTING AND STARTUP

ATTACHMENT E - TECHNICALS

3.02 FACTORY ACCEPTANCE TESTING (FAT)

- A. Contractor shall coordinate the timing and location of all Factory Acceptance Testing.
- B. The following Contractor personnel are required to attend all FATs:
 - 1. Project Integrator.
 - 2. Manufacturer Representative(s).

3.03 MANUFACTURER'S INSTALLATION INSPECTION

A. When Contractor has completed installation of components, systems, or subsystems, they shall schedule a manufacturer inspection. This manufacturer or approved manufacturer's representative shall certify that the component or system is properly installed and that testing of the component or system may commence.

B. Preparation:

- 1. Complete installation before testing.
- 2. Furnish qualified manufacturers' representatives, when required by individual Specification sections.
- Obtain and submit from equipment manufacturer's representative Manufacturer's Certificate of Proper Installation Form, in accordance with Section 01 43 33 MANUFACTURERS' FIELD SERVICES, when required by individual Specification sections.
- 4. Cleaning and Checking:
 - a. Prior to beginning functional testing:
 - 1) Calibrate testing equipment in accordance with manufacturer's instructions.
 - 2) Inspect and clean equipment, devices, connected piping, and structures to ensure they are free of foreign material.
 - 3) Lubricate equipment in accordance with manufacturer's instructions.
 - 4) Turn rotating equipment by hand when possible to confirm that equipment is not bound.
 - 5) Open and close valves by hand and operate other devices to check for binding, interference, or improper functioning.
 - 6) Check power supply to electric-powered equipment for correct voltage.
 - 7) Adjust clearances and torque.
 - 8) Test piping for leaks.
- 5. Ready-to-test determination will be by Engineer based at least on the following:
 - a. Acceptable Operation and Maintenance Data.
 - b. Notification by Contractor of equipment readiness for testing.
 - c. Receipt of Manufacturer's Certificate of Proper Installation, if so specified.
 - d. Adequate completion of work adjacent to, or interfacing with, equipment to be tested, including Membrane Equipment System.

APRIL 2022

TESTING AND STARTUP

ATTACHMENT E - TECHNICALS

- e. Availability and acceptability of manufacturer's representative, when specified, to assist in testing of respective equipment.
- f. Satisfactory fulfillment of other specified manufacturer's responsibilities.
- g. Equipment and electrical tagging complete.
- h. Delivery of all spare parts and special tools.

3.04 MECHANICAL/ELECTRICAL FUNCTIONAL TESTING

- A. After each mechanical system is completely installed, the Contractor shall confirm proper installation according to these Contract Documents. Mechanical system testing shall include, but not be limited to the following system types:
 - 1. Piping (buried and exposed).
 - 2. Freestanding tanks.
 - 3. Pumps, Motors, and Drives
- B. After the complete installation of electrical systems (or portions thereof), the Contractor shall conduct all testing, including the independent electrical testing, as specified in Division 26, Electrical.

3.05 OPERATIONAL READINESS TEST PART 1

- A. This work shall consist of manual verification of controls, verification of instrument calibration, and the completion of all loop checks.
- B. The Operational Readiness Test Part 1 shall be performed by the PIC Integrator to test and document the PIC, excluding DCSP provided applications software, is ready for operation.

3.06 OPERATIONAL READINESS TEST PART 2

A. The Operational Readiness Test shall be a coordinated effort between the Contractor, PIC System Integrator, and DCSP to confirm the PIC, including the applications software is ready for operation. This testing is described in Section 40 61 21 PROCESS CONTROL SYSTEM TESTING.

3.07 EQUIPMENT PERFORMANCE TESTING

- A. Testing specified within specific equipment specifications to verify performance requirements of a piece of equipment.
- B. This testing shall be performed by the equipment supplier with support from the Contractor.
- C. The method for testing to validate the performance requirements shall be provided in submitted and approved test plan submittals.

APRIL 2022

TESTING AND STARTUP

ATTACHMENT E - TECHNICALS

3.08 FACILITY COMMISSIONING

A. Commissioning Testing:

- The disciplined and systematic process of assuring that all components, subsystems and systems are designed, installed, tested and operated in conformance with the design intent, and functional intent and operational requirements of the Owner.
- 2. Notify Construction Manager, Engineer and Owner in writing at least 10 calendar days prior to scheduled date of test.
- 3. Commissioning shall not commence until equipment has been accepted by Construction Manager and Engineer as having satisfied performance test requirements specified.
- 4. Type of fluid, gas, or solid for testing shall be as specified.
- 5. Unless otherwise indicated, furnish labor, materials, and supplies for conducting the test and taking samples and performance measurements.
- 6. Prepare Test Reports summarizing test method and results.
- 7. When, in Construction Manager's and Engineer's opinion, the integrated facility operates as specified and is accepted to progress to the Facility Acceptance Testing. Such acceptance will be evidenced by Construction Manager's and Engineer's signature on Facility Commissioning Report.

3.09 TRAINING

- A. All components, systems, or subsystems require separate training by the manufacturer.
- B. Training for each component, system, or subsystem shall be a minimum of 4 hours if no specific requirements are described in the individual specification sections.
- C. All training shall be requested at least 14 calendar days in advance of proposed training date.
 - 1. Proposed training shall be requested by the Contractor in an acceptable format including the following information as a minimum:
 - a. Description of training.
 - b. Name and contact information of trainer.
 - c. Location of training.
 - d. Proposed date.
 - e. Alternative dates (if applicable).
 - f. Proposed start time.
 - g. Proposed duration.
 - h. Proposed detailed agenda including topics, times, breaks, etc.
- D. All training shall be scheduled through the Construction Manager.
- E. If suitable training facilities are not available at the Facility, Contractor shall arrange and pay for training offsite.

APRIL 2022

TESTING AND STARTUP

ATTACHMENT E - TECHNICALS

3.10 FACILITY ACCEPTANCE TEST

- A. The Facility Acceptance Test shall be a 7-day operational run of the completed systems demonstrating that all portions of the facility operate continuously as intended.
- B. All aspects of the Work and all Project facilities must be functional and operate in automatic mode 24 hours per day, 7 days per week during the acceptance test at varying flow rates established by the Construction Manager.
- C. Sampling to confirm that the design requirements specified in 46 51 50 OXYGENATION SYSTEM have been achieved
 - 1. Liquid grab samples (dissolved sulfide and dissolved oxygen) shall be taken to confirm each design criteria at least four (4) times per calendar week at times approved by the Construction Manager.
 - 2. H₂S gas phase concentration testing shall be continuous
 - a. Transmit to remote recording device and saved for future examination
 - b. Able to observe real time to facilitate optimization of the oxygenation system
 - 3. Oxygen gas concentration at force main high points
 - a. Transmit to remote recording device and saved for future examination
 - b. Able to observe real time to facilitate optimization of the oxygenation system
 - 4. Cost of sampling and testing of samples shall be responsibility of the Contractor
 - 5. Method of testing, testing locations, and the testing laboratory, if needed, shall be approved by Owner
 - a. Provide testing plan submittal identifying details of testing 60 days prior to start of testing.
 - Force main terminus structure is a manhole in a public street. Contractor shall provide all traffic control and safety elements involved with access.
 Traffic control plans shall be submitted to, and approved by the appropriate City department
- D. Unless indicated otherwise, if any item fails or malfunctions during the test, the item shall be repaired, and the test restarted at time zero with no credit given for the operating time before the failure or malfunction. Malfunctions meeting all of the following conditions, in the opinion of the Owner/Construction Manager, will not be considered grounds for restarting the test at time zero:
 - 1. All required repairs and retesting shall be done at no cost to the Owner.
 - 2. Malfunctions that do not cause any interruption of the continuous operation of any other components, subsystems, systems, and equipment during the acceptance test.
 - 3. Malfunctions that are corrected without causing or requiring any components, subsystems, systems, and equipment to cease operations during the acceptance.

APRIL 2022

TESTING AND STARTUP

ATTACHMENT E - TECHNICALS

- 4. Malfunctions that are corrected properly and permanently, in the opinion of the Owner and Construction Manager, within 4 hours of the time the malfunction is detected (the 4-hour period includes the time required to locate the cause of the malfunction and shall begin upon Contractor's notification from the Construction Manager that a malfunction exists and shall end when the item is corrected, and the system is successfully placed back into operation).
- E. Time lost during the test for equipment repairs, wiring corrections, control point settings, or other reasons that are not determined by the Construction Manager to be grounds to restart the test shall be justifiable cause for extending the test duration by an amount of time equal to the time required to repair the problems.
- F. Operation of the system for the acceptance test shall be conducted on a schedule or plan of operations developed by the Owner or its representative and supported by Contractor as specified. The Contractor shall provide personnel to operate the Work and support said testing activities to be performed jointly with the Construction Manager in accordance with a test plan prepared by the Owner or its representative.
- G. During the test, furnish the services of authorized representatives of the manufacturers, in addition to those services required in support of other testing, as necessary, to correct faulty equipment operation, calibration, adjustment, or related flaws
- H. Contractor's acceptance test personnel shall include qualified representatives for the electrical and instrumentation crews as indicated for Acceptance Testing.

3.11 WITNESSING AND SUPERINTENDENCE

- A. The Engineer, Owner, Construction Manager, and others as necessary shall be allowed to witness all testing conducted during any phase of startup.
- B. The Contractor shall maintain overall superintendence of the Work during all phases of startup.
- C. The Contractor shall promptly and permanently repair damage to any portion of the Work during startup and testing.
 - 1. All repair work shall be performed by the manufacturer or with manufacturer's approved published methods.
- D. The Contractor shall perform all scheduled maintenance in strict compliance with manufacturers' published procedures and with products acceptable to manufacturers.
- E. Authorized representatives of equipment suppliers or manufacturers shall certify that all corrective actions for all defects, malfunctions, faulty equipment operation, calibration, adjustment, or related flaws are complete and acceptable.

APRIL 2022

TESTING AND STARTUP

ATTACHMENT E - TECHNICALS

F. The Contractor shall keep on 24-hour local standby and provide all crews, materials, and equipment required to repair, replace adjust, balance, modify and provide other services as may be required to immediately correct all failures or malfunctions of any kind.

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS **TESTING AND STARTUP**

SECTION 01 99 90 REFERENCE FORMS

PART 1 FORMS

1.01 DESCRIPTION

A. The forms listed below and included in this section are referenced from other sections of the project manual.

Form No.	Title
26 05 00-A	Wire and Cable Resistance Test Data Form
26 05 00-B	Installed Motor Test Data Form
26 05 00-C	Dry Transformer Test Data Form
40 61 13-A	Loop Wiring and Insulation Resistance Test Data Form
40 61 13-B	Control Circuit Piping Leak Test Form
40 61 13-C	Controller Calibration Test Data Form
40 61 13-J	Individual Loop Test Data Form
40 61 13-K	Loop Commissioning Test Data Form
43 05 11-A	Manufacturer's Installation Certification Form
43 05 11-B	Manufacturer's Instruction Certification Form
43 05 11-C	Unit Responsibility Certification Form
43 05 13-A	Rigid Equipment Mount Installation Inspection Checklist
43 05 21-A	Motor Data Form

APRIL 2022
ATTACHMENT E - TECHNICALS

REFERENCE FORMS

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS REFERENCE FORMS

26 05 00-A. WIRE AND CABLE R	ESISTANCE TEST DATA FORM	
Wire or Cable No.:	Temperature, °F:	
Location of Test		Insulation resistance, megohms
1.		
2.		
2		
4.		
E		
6.		
7.		
CERTIFIED	Date	
Contractor's Reproduction 26 08 00	esentative (Individual must be an employee of the E l-1.01.B.2)	ngineering and Testing Firm as
WITNESSED	Date	
Owner's Repres		

APRIL 2022 ATTACHMENT E - TECHNICALS REFERENCE FORMS

26 05 00-B. INSTAL	LED MOTOR	R TEST D	ATA FORM						
Motor Equipment Nu	ımber:			Date of te	st:				
Equipment Driven: _									
MCC Location:									
						T		1	1
D : (Ambie	ent temp		°F
Resistance: Insulation resis	tanco nhaco t	o around r	mogohme:						
Phase A	tarice priase-t	.o-ground i	Phase B			Pł	nase C		
Current at Full Loa	d:		1 11000 2	<u> </u>					
	Phase				Current	, amps			
	Phase				Current	, amps			
	Phase				Current	, amps			
Thermal Overload	Device:	Mar	nufacturer/catalog	#		Amp	eres		
Circuit breaker (MC	CP) setting:								
Mfr	M	fr Model		Frame		HP			
Volts	Pł	hase		RPM		Se	rvice facto	or**	
Amps	Fr	eq		Ambient temp	rating			1	(
Time rating				Design I	etter**				
		(NEMA	1-10.35)				(NEMA MG-1.16)		.16)
Code letter				Insulatio	n class				
**Required for 3-phase	squirrel cage i	induction m	otors only.						
CERTIFIED				[Date				
			e (Individual must b	be an employee	of the Engi	neering a	nd Testin	g Firm as	
defined in S	ection 26 08 0	(0-1.01.B.2)							
WITHEOLED					. .				
WITNESSED					uate				
^	wner's Repres								

APRIL 2022 ATTACHMENT E - TECHNICALS REFERENCE FORMS

26 05 00-C. DRY TRANSFORMER TEST DATA FORM

`	pe transformers with voltage rating of 600 Vac or less and sizes to 167 kVA single phase and 50, est Forms and Test Procedures for higher voltages and larger transformers.)
Equipment Tag No.:	Temperature Rating:
Description/Location:	Feeder size/Source:
Primary Voltage:	Secondary Voltage: Winding Connection:

A. VISUAL INSPECTION

Tra	Transformer Inspection		Fail	Note
1.	Nameplate data as specified			
2.	Mechanical condition			
	a. Free of dents and scratches			
	b. Anchored properly			
	c. Shipping brackets removed			
	d. Spacing from wall per nameplate			
3.	Grounding *			
	a. Equipment grounding			
	b. System grounding			

B. INSULATION-RESISTANCE TESTS:

Perform tests with calibrated megohmeter. Apply 1000 Vdc test voltage for 60 seconds and record readings in megohms at 30-seconds and 60-seconds intervals.

Test Group	Resist between		30-second reading	60-second reading	Absorption Ratio Index 60-sec. / 30-sec.
	А	GRD			
Primary Winding to ground	В	GRD			
	С	GRD			
Secondary Winding to ground with * N-G Bond removed	а	GRD			
	b	GRD			
	С	GRD			
	Α	а			
Primary Winding to Secondary Winding	В	b			
Secondary Willding	С	С			

APRIL 2022 ATTACHMENT E - TECHNICALS REFERENCE FORMS

Submit resistance readings to the Construction Manager immediately after the tests manufacturer's recommended value or less than 10-megohms. Record the Absorptive reference. Ratio must be 1.0 or greater, with infinity (∞) equal to 1.0.	
Contractor Representative Certified:	
(Individual must be an employee of the Engineering and Testing Firm as defined in Section	on 26 08 00-1.01.B.2)
Owner Representative Witnessed:	_ Date

APRIL 2022 ATTACHMENT E - TECHNICALS REFERENCE FORMS

			Continuity	Resistance	Insulation	Resistanceb		
Wire No.	Panel Tie	Field TB	Cond./	Cond./ Shield	Shield/ Gnd.	Shield/ Cond.	Cond./ Gnd.	Shield/ Shield
Α				(A/SH)				
В			(A/B)					
С			(A/C)					
D			(A/D)					
etc.								
	eac	h completely c	lisconnected wi	of a 500 volt me re and shield. Te	st the insulation	n resistance and	d record each r	eading.
CERTIFI	ED							
	Cor defined in Se			dividual must be	an employee	of the Engineer	ring and Testin	g Firm as

40 61 13-A. LOOP WIRING AND INSULATION RESISTANCE TEST DATA FORM

APRIL 2022 ATTACHMENT E - TECHNICALS REFERENCE FORMS

pilots from circ		pelow. Make applicable meas	surements arter isolating a	iny all consuming		
Tube No.	Tubing Equivalent Length of 1/4-Inch Copper ^a	Test Period (seconds)	Permitted Pressure Drop (psi) ^b	Measured Pressure Drop (psi)		
Α						
В						
С						
D						
etc.						
	TIFIED Date					
CERTIFIED _						
CERTIFIED	Contractor's Represent	tative (Individual must meet or		<u> </u>		

APRIL 2022 ATTACHMENT E - TECHNICALS REFERENCE FORMS

40 61 13-C.	. CONTROL	LER CALIBRA	ATION TEST	DATA FORM					
Tag No. and	d Description	n:							
Make & Mod	del No.:			Serial No.:					
Input:				Process Variable (PV) Scale:					
Output:				Output Scale:					
PV Scale Ca	<u>alibration</u>								
% of Range		Input		Expected Reading		Reading	% Deviation		
С									
50									
10	00				% Devi	ation Allowed:			
					/0 DGVIC	AUDIT / HIDVVGU.			
et Point (SP) Indicator Accuracy			Output Meter Accuracy			Controlle	Controller Accuracy		
Р	PV Reading	Expected % Dev.	Actual Reading	Expected Reading	Actual % Dev.	OUTPUT	OUTPUT	% Dev.	
(0%)									
(50%)									
(100%)									
% Deviation Allowed:		% Deviation Allowed:			% Devi	% Deviation Allowed:			
				dual must meet		te e requirements			
WITNESSE		er's Representat			Da	te			
	OWITO	o respressina							

APRIL 2022 ATTACHMENT E - TECHNICALS REFERENCE FORMS

40 61 13-J. INDIV	/IDUAL 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 40 61 13-A)						
b.	Instrumentation tubing/piping tested:						
	(Attach test form 40 61 13-B)						
C.	Instruments calibrated:						
	(Attach test forms 40 61 13-C through I)						
d.	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						
1.07.E.2.	Contractor's Representative (Individual must meet or exceed the requirements of Section 40 61 13-						
WITNESSED	Date						
	Owner's Representative						

APRIL 2022 ATTACHMENT E - TECHNICALS REFERENCE FORMS

	OP COMMISSIONING TEST DATA FORM				
a.	Loop tested:				
	(Attach test form 40 61 13-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 demonstrat 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				
1.07.E.	Contractor's Representative (Individual must meet or exceed the requirements of Section 40 61 13-2.d)				
WITNESSED _	Date Owner's Representative				
	Owner's representative				

APRIL 2022 ATTACHMENT E - TECHNICALS REFERENCE FORMS

43 05 11-A. MANUFACTURER'S INSTALLATION CERTIFICATION FORM

Contract No:	Specification section	on:
Equipment name:		
Contractor:		
Manufacturer of equipmer	nt item:	
the installation of the equip	pment and that the equip	em described above hereby certifies that he has checked oment, as specified in the project manual, has been provided lations, and that the trial operation of the equipment item
Comments:		
Manufacturer		Contractor
Signature of Authorized Representative Signature of Authorized Represe		
Date		Date

APRIL 2022 ATTACHMENT E - TECHNICALS

43 05 11-B. MANUFACTURER'S INSTRUCTION CERTIFICATION FORM

Contract No:	Specification Section:	
Equipment name:		
Contractor:		
Manufacturer of equip	oment item:	
•		gineer has instructed the wastewater treatment plant ation of the equipment designated herein.
Operations Check Lis	st (check appropriate spaces)	
Start-up procedu	re reviewed	
Shutdown proced	dure reviewed	
Normal operation	procedure reviewed	
Others:		
Maintenance Check L	List (check appropriate spaces)	
Described norma	l oil changes (frequency)	
Described specia	Il tools required	
Described norma	I items to be reviewed for wear	
Described preven	ntive maintenance instructions	
Described greasi	ng frequency	
Others:		
Manufacturer		Signature of Contractor Representative Date
Signature of Authorize	ed Representative	
Date		Signature of Authorized Representative Date

APRIL 2022 ATTACHMENT E - TECHNICALS REFERENCE FORMS

43 05 11-C. UNIT RESPONSIBILITY CERTIFICATION FORM

PQPS OXYGENATION SYSTEM

CERTIFICATE OF UNIT RESPONSIBILITY
FOR SPECIFICATION SECTION

In accordance with Section 43 05 11-1.02 Unit Responsi manufacturer of driven equipment ("manufacturer") acceequipment furnished to the Project under specification Smanufactured under sections,, and	epts unit responsibility for all components of Section, and for related equipment
We have reviewed the requirements for sections 43 05 11 referencing this (these) section(s), including but not limited and all other specified appurtenances to be furnished to the reviewed, and modified as necessary, the requirements for centers. We hereby certify that all specified components a for the specified performance and design requirements where will make no claim nor establish any condition that problem specification Section are due to incompatibility of Responsibility. Nor will we condition or void any warranty as Section due to incompatibility of any components. Our signature on this Certificate of Unit Responsibility does warrant the workmanship, quality, or performance of relate sections,, and Our obligation to wunaffected.	d to drivers, supports for driving and driven equipment the Project by manufacturer. And, we have further or associated variable speed drives and motor control are compatible and comprise a functional unit suitable mether or not the equipment was furnished by us. We may in operation for the product provided under this any components covered by this Certificate of Unit for the performance of the product of this specification covered under this Certificate of Unit Responsibility.
Notary Public	Name of Corporation
Commission expiration date	Address
Seal:	Ву:
	Duly Authorized Official
	Legal Title of Official
	Date

APRIL 2022 ATTACHMENT E - TECHNICALS REFERENCE FORMS

43 05 13-A. RIGID EQUIPMENT MOUNT INSTALLATION CHECKLIST

CITY OF SAN DIEGO, PQPS OXYGENATION SYSTEM

Equipment Tag No.: Date:	
Grout Product Name and Type:	
Grouting System Manufacturer:	
Grouting Application Contractor:	
General Contractor:	
Step 1: Verify Equipment Anchor Installation	Conformance to Equipment Pad Details
Name: Contractor Rep.	Date
Name: Construction Manager	Date
Name: Millwright	Date
Step 2: Completion of Cleaning and Concret	e Substrate Preparation Prior to Grouting
Name: Contractor Rep.	Date
Name: Construction Manager	Date
Name: Grouting Contractor Rep.	Date
Name: Grout Manufacturer's Technical Rep.	Date
Step 3: Equipment Leveling	
Name: Contractor Rep.	Date
Name: Construction Manager	Date
Name: Millwright	Date
Step 4: Installation of Protection of Adjacent	Surfaces or Structures NOT TO BE GROUTED
Name: Contractor Rep.	Date
Name: Construction Manager	Date
Name: Grouting Contractor Rep.	Date
Name: Grout Manufacturer's Technical Rep.	Date
Step 5: Preparation and Construction of For	ms and Epoxy Grout Filling Standpipes
Name: Contractor Rep.	Date
Name: Construction Manager	Date
Name: Grouting Contractor Rep.	Date
Name: Grout Manufacturer's Technical Rep.	Date
	ontrol in Structure or Building Area and Acceptance of Ambient d Curing Requirements for the Grouting System
Name: Contractor Rep.	Date
Name: Construction Manager	Date
Name: Grouting Contractor Rep.	Date
Name: Grout Manufacturer's Technical Rep.	Date
Step 7: Epoxy Grout Installation	
Name: Contractor Rep.	Date

APRIL 2022

REFERENCE FORMS

ATTACHMENT E - TECHNICALS

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

Name: Construction Manager	Date			
Name: Grouting Contractor Rep.	Date			
Name: Grout Manufacturer's Technical Rep.	Date			
Step 8: Completion of Full and Proper Cure of Epoxy Grout				
Name: Contractor Rep.	Date			
Name: Construction Manager	Date			
Name: Grouting Contractor Rep.	Date			
Name: Grout Manufacturer's Technical Rep.	Date			
Step 9: Completion of Localized Repair of Grout Voids				
Name: Contractor Rep.	Date			
Name: Construction Manager	Date			
Name: Grouting Contractor Rep.	Date			
Name: Grout Manufacturer's Technical Rep.	Date			
Step 10: Final Acceptance of Grouting System Installation Including Final Clean-Up of the Work Site Complying with All Specification Requirements and the GSM's Quality Requirements				
Name: Contractor Rep.	Date			
Name: Construction Manager	Date			
Name: Grouting Contractor Rep.	Date			
Name: Grout Manufacturer's Technical Rep.	Date			

APRIL 2022 ATTACHMENT E - TECHNICALS REFERENCE FORMS

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

Equipment Name:		Equipmer	_ Equipment No(s):				
Project Site Loc	ation:						
lameplate Mark							
<u>-</u>							
Mfr:		Mfr Model:		Frame:		Horsepower:	
Volts:		Phase:		RPM:		Service Factor:	
FLA:		LRA:		Frequency:		Amb Temp Rating:	°C
Time rating:				Design	Letter:		
	(NEI	MA MG1-10.35)				(NEMA MG-1.16)	
KVA Code Letter:				Insula	ion Class:		
•	UL frame formation is	temperature of temper	ode (NE0	ss, Div C Tables 500-8l ersepower and la	3) rger:		
В.	UL frame formation is	temperature of temper	ode (NE0	C Tables 500-86	rger:		
B. The following inf	UL frame formation is Guarante	temperature of required for all red minimum e	ode (NE0	C Tables 500-86	3) rger: 43 05 21-2.0	 4 Motor Efficiency)	
B. The following inf A.	UL frame formation is Guarante Namepla	required for all red minimum e	ode (NE0	C Tables 500-86 rsepower and la (Section	3) rger: 43 05 21-2.0	 4 Motor Efficiency)	
B. The following inf A. B.	UL frame formation is Guarante Namepla sarily Marke	required for all red minimum e	ode (NE0	C Tables 500-86 rsepower and la (Section	rger: 43 05 21-2.0	 4 Motor Efficiency)	
B. The following inf A. B. Data Not Neces	UL frame formation is Guarante Namepla sarily Marke	required for all red minimum e	ode (NE0	C Tables 500-86 rsepower and la (Section	rger: 43 05 21-2.0	 4 Motor Efficiency)	
B. The following inf A. B. Data Not Neces Type of Enclosure	UL frame formation is Guarante Namepla sarily Marke	required for all red minimum e	motors 1/2 hor	C Tables 500-86 rsepower and la (Section	rger: 43 05 21-2.0	 4 Motor Efficiency)	

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS REFERENCE FORMS

SECTION 03 30 00 CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

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

1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement.
- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

1.03 INFORMATIONAL SUBMITTALS

- A. Material certificates.
- B. Material test reports.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Testing Agency Qualifications: An independent agency, acceptable to the City of San Diego 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 Documents:
 - 1. ACI 301, "Specifications for Structural Concrete."
 - 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.

APRIL 2022

CAST-IN-PLACE CONCRETE

ATTACHMENT E - TECHNICALS

PART 2 PRODUCTS

2.01 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.

2.02 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- 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".

2.03 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:
 - 2. Flv Ash: ASTM C 618, Class F.
- B. Normal-Weight Aggregates: ASTM C 33, graded.
 - 1. Maximum Coarse-Aggregate Size: 1 inch nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94 and potable.

2.04 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.

APRIL 2022

CAST-IN-PLACE CONCRETE

ATTACHMENT E - TECHNICALS

- 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
- 6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

2.05 WATERSTOPS

- A. Flexible Rubber Waterstops: CE CRD-C 513 for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
- B. Chemically Resistant Flexible Waterstops: Thermoplastic elastomer rubber waterstops, for embedding in concrete to prevent passage of fluids through joints; resistant to oils, solvents, and chemicals. Factory fabricate corners, intersections, and directional changes.

2.06 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745. Include manufacturer's recommended adhesive or pressure-sensitive tape.
- B. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.

2.07 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./sg. 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 with fugitive dye. Apply two coats minimum at ninety degrees to one another.

2.08 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

2.09 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.

APRIL 2022

CAST-IN-PLACE CONCRETE

ATTACHMENT E - TECHNICALS

- B. Cementitious Materials: Use fly ash as needed to reduce the total amount of portland cement by weight, which would otherwise be used, by a maximum of 15 percent.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing, high-range water-reducing or 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 pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
- D. Proportion normal-weight concrete mixture as follows:
 - 1. Minimum Compressive Strength: 4000 psi at 28 days.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.50.
 - 3. Slump Limit: 4 inches, plus or minus 1 inch.
 - 4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
 - 5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.10 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice." Welding of reinforcement is not permitted unless otherwise noted on drawings.

2.11 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.
 - 1. 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

3.01 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.

APRIL 2022

CAST-IN-PLACE CONCRETE

ATTACHMENT E - TECHNICALS

3.02 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.

3.03 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 12 inches and seal with manufacturer's recommended tape.

3.04 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.05 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 by Architect.
- 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:
 - 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.

APRIL 2022

CAST-IN-PLACE CONCRETE

ATTACHMENT E - TECHNICALS

3.06 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.
 - 1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
- C. Hot-Weather Placement: Comply with ACI 301.

3.07 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces at equipment pads.
- B. Smooth-Formed Finish: 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 fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view or as noted on drawings.
- C. 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.

3.08 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: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
 - 1. Apply scratch finish to surfaces to receive concrete floor toppings.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

APRIL 2022

CAST-IN-PLACE CONCRETE

ATTACHMENT E - TECHNICALS

- 1. Apply float finish to surfaces to receive trowel finish.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

Apply a trowel finish to surfaces exposed to view.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

3.09 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with 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 according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
 - 2. 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.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Second coat of curing compound with fugitive dye is to be applied at a right angle to the first coat. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. 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 when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

APRIL 2022

CAST-IN-PLACE CONCRETE

ATTACHMENT E - TECHNICALS

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

APRIL 2022 ATTACHMENT E - TECHNICALS CAST-IN-PLACE CONCRETE

SECTION 03 62 13 NON-METALLIC NON-SHRINK GROUT

PART 1 GENERAL

1.01 SUMMARY

- A. This section includes interior/exterior non-metallic non-shrink grout to be installed under pumps.
- B. Related Sections: Division 03 Concrete sections.

1.02 SUBMITTALS

A. Manufacturer's data shall be provided for non-metallic non-shrink grout.

1.03 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, acceptable to the City of San Diego, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated

PART 2 PRODUCTS

2.01 MATERIALS

- A. Portland Cement: Provide portland cement grout conforming to ASTM C150/C150M for Cement, Type I.
- B. Aggregates: Submit samples conforming to ASTM C33/C33M for aggregates and the gradation as directed.
- C. Water: Provide potable water.
- D. Expansive Grout:
 - 1. Provide non-shrink non-metallic aggregate grout under equipment, bearing plates and column base plates.
 - 2. Grout to be used under rotating equipment shall be recommended by manufacturer for such use.
 - 3. Holes required for grouting shall be blown clean with compressed air and are to be free of dust or standing water. Horizontal holes are to be drilled at a slight downward angle with the inserted bolt or dowel bent to match.

APRIL 2022

NON-METALLIC NON-SHRINK GROUT

ATTACHMENT E - TECHNICALS

03 62 13 - 1

PART 3 EXECUTION

3.01 PREPARATION

- A. Prepare cavities for grouting by cleaning away foreign matter, laitance, dirt, grease, or oil. Clean all contact surfaces of concrete and masonry no less than 24 hours before grout application.
 - 1. Mixing:
 - a. Mix grout ingredients for cementitious grout in accordance with the manufacturer's written mixing instructions and recommendations.
 - b. Mix grout materials in proper mechanical mixers.
 - c. Mix grout as close to the work area as possible.

3.02 APPLICATION

A. Placing Grout:

- 1. Place grout in accordance with the manufacturer's written installation instructions and recommendations. Do not use grout that has begun to set or if more than 1 hour has elapsed after initial mixing.
- 2. Fill blind cavities by pressure injection under controlled venting. Start injection and continue with the vent open until waste grout is expelled through the vent with the same consistency. Then block the vent for pressurization to 60 psi. Use lower pressures when damage to construction may result.

3.03 FIELD QUALITY CONTROL

- A. Provide testing and special inspection. Submit test reports in accordance with ASTM C1107/C1107M strength and expansion as noted below and where required by ICC reports.
 - 1. Expansion: 28 calendar days
 - a. Percent maximum: 0.3b. Percent minimum: 0.0
 - 2. Compressive strength: 7,000 psi

3.04 PROTECTION

A. Protect freshly placed grout from premature drying and excessive hot temperatures. Comply with manufacturer's requirements for hot-weather protection during curing.

END OF SECTION

APRIL 2022

NON-METALLIC NON-SHRINK GROUT

ATTACHMENT E - TECHNICALS

03 62 13 - 2

SECTION 05 05 14 HOT-DIP GALVANIZING

PART 1 GENERAL

1.01 DESCRIPTION

A. Section includes: Hot-dip galvanizing of steel materials.

1.02 RELATED SECTIONS

- A. This section contains specific references to the following related sections. Additional related sections may apply that are not specifically listed below.
 - 1. Section 09 90 00 Painting and Coating

1.03 REFERENCES

A. The references listed below are a part of this section. 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.

Reference	Title
ASTM A123	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A143	Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
ASTM A153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A384	Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies
ASTM A385	Providing High-Quality Zinc Coatings (Hot-Dip)
ASTM A780	Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM B6	Zinc
ASTM D6386	Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting
ASTM E536	Test Methods for Chemical Analysis of Zinc and Zinc Alloys
DOD-P-21035A	Paint, High Zinc Dust Content, Galvanizing Repair

1.04 SUBMITTALS

A. Action Submittals

1. Procedure: Section 01 33 00 SUBMITTAL PROCEDURES:

APRIL 2022

HOT-DIP GALVANIZING

ATTACHMENT E - TECHNICALS

05 05 14 - 1

- 2. A copy of this specification section with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements.
- 3. Check-marks (✓) shall denote full compliance with a paragraph as a whole. Deviations shall be underlined and denoted by a number in the margin to the right of the identified paragraph. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Include a detailed, written justification for each deviation. 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.
- 4. Coating applicator's Certificate of Compliance that the hot-dip galvanized coating meets or exceeds the specified requirements of ASTM A123 or A153, as applicable.
- 5. Evidence that the galvanized coating applicator is a member of the American Galvanizing Association.

1.05 QUALITY ASSURANCE

A. Hot-dip galvanized coating applicator shall be a member of the American Galvanizing Association.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Zinc used for galvanizing shall conform to ASTM B6, and shall be at least equal to the grade designated as Prime Western.
- B. Maximum amount of aluminum added to a galvanizing bath shall not exceed 0.01 percent.
- C. Hot-Dip Galvanized Coating: Conform to ASTM A123 and A153, as applicable.
- D. Repair: Zinc dust-zinc oxide coating conforming to DOD-P-21035A and containing 95 percent zinc in the dry film. Acceptable product is ZRC Cold Galvanizing Compound by ZRC Worldwide, or approved equal.

2.02 FABRICATION REQUIREMENTS

- A. Fabrication practices for products to be galvanized: In accordance with applicable portions of ASTM A143, A384 and A385. Avoid fabrication techniques that could cause steel distortion or embrittlement.
- B. Coordinate with steel detailer to provide vent and drain holes of sufficient size and quantity to achieve specified galvanized coating.

APRIL 2022

HOT-DIP GALVANIZING

ATTACHMENT E - TECHNICALS

05 05 14 - 2

PART 3 EXECUTION

3.01 PREPARATION

- A. Casting surfaces to be galvanized shall be sand blasted or ground smooth. When a smooth cast is required, castings shall be tumbled and all high spots ground flush. Castings shall be normalized to prevent cracking. Malleable iron shall be safeguarded against embrittlement by pre-annealing.
- B. Steel work shall be precleaned utilizing a caustic bath, acid pickle and flux or shall be blast cleaned and fluxed to obtain an acceptable surface for quality hot dip galvanizing.

3.02 APPLICATION

- A. Steel Members, Fabrications, and Assemblies: Hot-dip galvanize after fabrication in accordance with ASTM A123.
- B. Steel Bolts, Screws, Nuts, Washers and Hardware Components: Hot-dip galvanize in accordance with ASTM A153.

3.03 COATING REQUIREMENTS

A. Hot-dip Coating Thickness: Conform to ASTM A123 or ASTM A153, as applicable.

3.04 TESTING

- A. Chemical analysis for impurities in the bath shall be made in conformity with ASTM E536.
- B. Test Requirements and Methods: In accordance with ASTM A123 or ASTMA153, as applicable.

3.05 GALVANIZED SURFACES TO BE PAINTED

A. Where galvanized surfaces are specified to be painted in Section 09 90 00 PAINTING AND COATING or elsewhere in the Project Manual, conform to ASTM D6386.

3.06 REPAIR OF DEFECTIVE GALVANIZED COATING

A. Where zinc coating has been damaged after installation, clean substrate surface and repair with zinc dust-zinc oxide coating in accordance with ASTM A780. Apply zinc dust-zinc oxide coating in accordance with manufacturer's recommendation. Apply multiple coats to achieve a minimum film thickness of 8 mils.

APRIL 2022 ATTACHMENT E - TECHNICALS HOT-DIP GALVANIZING

05 05 14 - 3

271 I Page

B. Remove items not physically damaged, but which have insufficient or deteriorating zinc coatings, and items damaged in shipment or prior to installation, from the project site for repair by the hot-dip zinc coating method.

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS HOT-DIP GALVANIZING

SECTION 05 05 19 POST-INSTALLED CONCRETE ANCHORS

PART 1 GENERAL

1.01 SUMMARY

- A. This section includes cast-in and drilled in anchors for concrete.
- B. Related Sections:
 - 1. Division 3 Concrete Sections.
 - 2. Division 5 Metals Sections.

1.02 SUBMITTALS

- A. General: Submit in accordance with *Conditions of the Contract* and Division 1 Submittal Procedures Section.
 - 1. Product specifications with recommended design values and physical characteristics for epoxy dowels.
 - 2. Quality Assurance Submittals:
 - a. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
 - 3. Manufacturer's installation instructions.
 - 4. Installer Qualifications & Procedures: Submit installer qualifications as stated in Section 1.03.B. Submit a letter of procedure stating method of drilling, the product proposed for use, the complete installation procedure, manufacturer training date, and a list of the personnel to be trained on anchor installation.
 - 5. Calculations: Submit calculations for alternate epoxy dowels.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications.
 - 1. Drilling-in anchors shall be installed by a contractor with verifiable experience performing similar installations.
- B. Installer Training Conduct a thorough training with the manufacturer or the manufacturer's representative for the contractor on the project. Training to consist of a review of the complete installation process for drilled-in anchors, to include but not limited to:
 - 1. Hole drilling procedure
 - 2. Hole preparation & cleaning technique
 - 3. Adhesive injection technique & dispenser training / maintenance
 - 4. Rebar dowel preparation and installation
 - 5. Proof loading/torquing

APRIL 2022

POST-INSTALLED CONCRETE ANCHORS

ATTACHMENT E - TECHNICALS

1.04 DELIVERY, STORAGE AND HANDLING

- A. General: Comply with Division 1 section-Product Storage and Handling Requirements.
 - 1. Store anchors in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Fasteners and Anchors:
 - 1. Bolts and Studs: ASTM A307; ASTM A449 where "high strength" is indicated on the Drawings.
 - 2. Carbon and Alloy Steel Nuts: ASTM A563.
 - 3. Carbon Steel Washers: ASTM F436.
 - 4. Carbon Steel Threaded Rod: ASTM A36; or ASTM A193 Grade B7.
 - 5. Wedge Anchors: ASTM A510; or ASTM A108.
 - 6. Stainless Steel Bolts, Hex Cap Screws, and Studs: ASTM F593.
 - 7. Stainless Steel Nuts: ASTM F594.
 - 8. Zinc Plating: ASTM B633.
 - 9. Hot-Dip Galvanizing: ASTM A153.
 - 10. Reinforcing Dowels: ASTM A615

2.02 DRILLED-IN ANCHORS

- A. Cartridge Injection Adhesive Anchors: Threaded steel rod, inserts or reinforcing dowels, complete with nuts, washers, polymer or hybrid mortar adhesive injection system, and manufacturer's installation instructions. Type and size as indicated on Drawings.
 - 1. Interior Use: Unless otherwise indicated on the Drawings, provide carbon steel threaded rods conforming to ASTM A36 or ASTM A 193 Type B7.
 - 2. Exterior Use: As indicated on the Drawings, provide stainless steel anchors. Stainless steel anchors shall be AISI Type 304 stainless steel provided with stainless steel nuts and washers of matching alloy group and minimum proof stress equal to or greater than the specified minimum full-size tensile strength of the externally threaded fastener. All nuts shall conform to ASTM F594 unless otherwise specified. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.
 - 3. Reinforcing dowels shall be A615 Grade 60.
 - 4. Where anchor manufacturer is not indicated, subject to compliance with requirements and acceptance by the Engineer, provide the following:
 - a. Hilti HAS threaded rods with RE 500 SD Injection Adhesive Anchoring System, or equal, for anchorage to concrete.

APRIL 2022

POST-INSTALLED CONCRETE ANCHORS

ATTACHMENT E - TECHNICALS

PART 3 EXECUTION

3.01 INSTALLATION

A. Cast-In-Place Bolts: Use templates to locate bolts accurately and securely in formwork.

B. Drilled-In Anchors:

- Drill holes with rotary impact hammer drills per anchor manufacturer's instructions. Drill bits shall be of diameters as specified by the anchor manufacturer. Unless otherwise shown on the Drawings, all holes shall be drilled perpendicular to the concrete surface.
 - a. Cored Holes: Where anchors are permitted to be installed in cored holes, use core bits with matched tolerances as specified by the manufacturer. Properly clean cored hole per manufacturer's instructions.
 - b. Embedded Items: Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items. Notify the Engineer if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid damaging prestressing tendons, electrical and telecommunications conduit, and gas lines.
 - c. Base Material Strength: Unless otherwise specified, do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
- 2. Perform anchor installation in accordance with manufacturer instructions.
- 3. Wedge Anchors: Protect threads from damage during anchor installation. Set anchors to manufacturer's recommended torque, using a torque wrench. Following attainment of 10% of the specified torque, 100% of the specified torque shall be reached within 7 or fewer complete turns of the nut. If the specified torque is not achieved within the required number of turns, the anchor shall be removed and replaced unless otherwise directed by the Engineer.
- 4. Cartridge Injection Adhesive Anchors: Clean all holes per manufacturer instructions to remove loose material and drilling dust prior to installation of adhesive. Inject adhesive into holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive. Follow manufacturer recommendations to ensure proper mixing of adhesive components. Sufficient adhesive shall be injected in the hole to ensure that the annular gap is filled to the surface. Remove excess adhesive from the surface. Shim anchors with suitable device to center the anchor in the hole. Do not disturb or load anchors before manufacturer specified cure time has elapsed.
- 5. Observe manufacturer recommendations with respect to installation temperatures for cartridge injection adhesive anchors.

APRIL 2022

POST-INSTALLED CONCRETE ANCHORS

ATTACHMENT E - TECHNICALS

3.02 REPAIR OF DEFECTIVE WORK

A. Remove and replace misplaced or malfunctioning anchors. Fill empty anchor holes and patch failed anchor locations with high-strength non-shrink, nonmetallic grout. Anchors that fail to meet proof load or installation torque requirements shall be regarded as malfunctioning.

3.03 FIELD QUALITY CONTROL

- A. Testing shall be in accordance with the current ICC Report.
- B. Minimum anchor embedments, proof loads and torques shall be as shown on the Drawings.

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS POST-INSTALLED CONCRETE ANCHORS

SECTION 05 12 00 STRUCTURAL STEEL

PART 1 GENERAL

1.01 SUMMARY

- A. This Section includes structural steel.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 01 45 16.13 CONTRACTOR QUALITY CONTROL for independent testing agency procedures and administrative requirements.

1.02 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Product Data for each type of product specified.
- C. Shop Drawings detailing fabrication of structural steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
 - 3. Indicate type, size, and length of bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.
- D. Mill test reports signed by manufacturers certifying that their products, including the following, comply with requirements.
 - 1. Structural steel, including chemical and physical properties.
 - 2. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
 - 3. Direct-tension indicators.
 - 4. Shear stud connectors.
 - 5. Shop primers.
 - 6. Nonshrink grout.
- E. Provide electrode name, manufacturer and diameter. Provide manufacturer's recommendations, procedure qualification records (PQRs) and weld procedure specifications (WPSs).

APRIL 2022 STRUCTURAL STEEL

05 12 00 - 1

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.
- C. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
 - 2. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
 - 3. AISC's "Seismic Provisions for Structural Steel Buildings."
 - 4. ASTM A 6 "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use."
 - 5. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel."

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
 - 1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 2. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.05 SEQUENCING

A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

APRIL 2022 STRUCTURAL STEEL

ATTACHMENT E - TECHNICALS

PART 2 PRODUCTS

2.01 MATERIALS

- A. Structural Steel Shapes, Plates, and Bars: As follows:
 - 1. Carbon Steel: ASTM A 36.
 - 2. Standard Specification for Structural Steel Shapes: ASTM A 992 Grade 50
- B. Cold-Formed Structural Steel Tubing: ASTM A 500, Grade B.
- C. Hot-Formed Structural Steel Tubing: ASTM A 501.
- D. Steel Pipe: ASTM A 53, Type E or S, Grade B.
- E. Shear Connectors: ASTM A 108, Grade 1015 through 1020, headed-stud type, cold-finished carbon steel, AWS D1.1, Type B.
- F. Anchor Rods, Bolts, Nuts, and Washers: As follows:
 - 1. Unheaded Rods: ASTM A 36.
 - 2. Unheaded Rods: ASTM A 572, Grade 50.
 - 3. Unheaded Bolts: ASTM A 687, high strength.
 - 4. Headed Bolts: ASTM A 490, Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts.
 - 5. Washers: ASTM A 36.
- G. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers, uncoated.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 490, uncoated.
- H. Welding Electrodes: Comply with AWS requirements.

2.02 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds and repair painting galvanized steel, with dry film containing not less than 93 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.

2.03 GROUT

A. Nonmetallic, Non-Shrink Grout: Per Section 03 62 13.

APRIL 2022 ATTACHMENT E - TECHNICALS STRUCTURAL STEEL

05 12 00 - 3

2.04 FABRICATION

- A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in Shop Drawings.
 - 1. Camber structural steel members where indicated.
 - 2. Mark and match-mark materials for field assembly.
 - 3. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.
 - 4. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded.
- C. Finishing: Accurately mill ends of columns and other members transmitting loads in bearing.
- D. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's printed instructions.
- E. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on Shop Drawings.
 - 1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.
 - 2. Weld threaded nuts to framing and other specialty items as indicated to receive other work.

2.05 SHOP CONNECTIONS

- A. Shop install and tighten nonhigh-strength bolts, except where high-strength bolts are indicated.
- B. Shop install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.

2.06 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.

APRIL 2022 STRUCTURAL STEEL

ATTACHMENT E - TECHNICALS

280 I Page

- 2. Surfaces to be field welded.
- 3. Surfaces to be high-strength bolted with slip-critical connections.
- 4. Surfaces to receive sprayed-on fireproofing.
- 5. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces according to SSPC specifications.
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply 2 coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.
- D. Painting: Apply a 1-coat, nonasphaltic primer complying with SSPC to provide a dry film thickness of not less than 1.5 mils.

2.07 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel indicated for galvanizing according to ASTM A 123 and Section 05 05 14 HOT-DIP GALVANIZING

2.08 SOURCE QUALITY CONTROL

- A. City of San Diego to engage an independent testing and inspecting agency to perform shop inspections and tests and to prepare test reports.
 - 1. Testing agency will conduct and interpret tests and state in each report whether test specimens comply with or deviate from requirements.
 - 2. Provide testing agency with access to places where structural steel Work is being fabricated or produced so required inspection and testing can be accomplished.
- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- D. Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- E. In addition to visual inspection, shop-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option.
 - 1. Liquid Penetrant Inspection: ASTM E 165.

APRIL 2022 STRUCTURAL STEEL

ATTACHMENT E - TECHNICALS 05 12 00 - 5

- 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
- 3. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T."
- 4. Ultrasonic Inspection: ASTM E 164.
- F. In addition to visual inspection, shop-welded shear connectors will be inspected and tested according to requirements of AWS D1.1 for stud welding and as follows:
 - 1. Bend tests will be performed when visual inspections reveal either less than a continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Tests will be conducted on additional shear connectors when weld fracture occurs on shear connectors already tested, according to requirements of AWS D1.1.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Before erection proceeds, and with the steel erector present, verify elevations of concrete bearing surfaces and locations of anchorages for compliance with requirements.
- B. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.
- B. Do not remove temporary shoring supporting composite deck construction until cast-inplace concrete has attained its design compressive strength.

3.03 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.
- B. Base and Bearing Plates: Clean concrete and masonry bearing surfaces of bondreducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
 - 1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.

APRIL 2022 ATTACHMENT E - TECHNICALS STRUCTURAL STEEL

- 2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
- 3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection.
- G. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

3.04 FIELD CONNECTIONS

- A. Install and tighten nonhigh-strength bolts, except where high-strength bolts are indicated.
- B. Install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
 - 1. Bolts: ASTM A 490 (ASTM A 490M) high-strength bolts, unless otherwise indicated.
 - 2. Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.
 - 3. Connection Type: Slip-critical, direct-tension, or tensioned shear/bearing connections as indicated.
- C. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.
 - 1. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds
 - 2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without warp.

3.05 FIELD QUALITY CONTROL

- A. City of San Diego to engage an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports.
 - 1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.

APRIL 2022 STRUCTURAL STEEL

ATTACHMENT E - TECHNICALS

05 12 00 - 7

- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- D. Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- E. In addition to visual inspection, field-welded connections will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option.
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - 3. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T."
 - 4. Ultrasonic Inspection: ASTM E 164.
- F. In addition to visual inspection, field-welded shear connectors will be inspected and tested according to requirements of AWS D1.1 for stud welding and as follows:
 - 1. Bend tests will be performed when visual inspections reveal either less than a continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Tests will be conducted on additional shear connectors when weld fracture occurs on shear connectors already tested, according to requirements of AWS D1.1.

3.06 CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
 - 1. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils.
- B. Touchup Painting: Clean and touchup of field welds, bolted connections, and abraded areas of shop paint on structural steel.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint according to ASTM A 780. 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.

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS STRUCTURAL STEEL

05 12 00 - 8

SECTION 09 90 00 PAINTING AND COATING

PART 1 GENERAL

1.01 DESCRIPTION

- A. Scope: This Section specifies coating systems, surface preparations, and application requirements for coating systems.
- B. Definitions: Specific coating terminology used in this Section is in accordance with definitions contained in ASTM D16, ASTM D3960, and the following definitions.
 - 1. Definitions:
 - a. Abrasive: Material used for blast cleaning, such as sand, grit or shot.
 - b. Abrasive Blast Cleaning: Cleaning/surface preparation by abrasive propelled at high speed.
 - c. Anchor Pattern: Profile or texture of prepared surface(s).
 - d. ANSI: American National Standards Institute.
 - e. 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.
 - f. Coating/Paint/Lining Thickness: The total thickness of primer, intermediate and/or finish coats.
 - g. 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.
 - h. Coating System Manufacturer (CSM): Refers to the acceptable coating system manufacturer, abbreviated as the CSM.
 - i. 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.
 - j. Dew point: Temperature of a given air/water vapor mixture at which condensation starts.
 - k. Dry Film Thickness (DFT): Depth of cured film, usually expressed in mils (0.001 inch). Use this definition as opposed to existing definition.
 - I. Drying Time: Time interval between application and curing of material.
 - m. Dry to Recoat: Time interval between application of material and ability to receive next coat.
 - n. Dry to Touch: Time interval between application of material and ability to touch lightly without damage.
 - o. Feather Edging: Reducing the thickness of the edge of paint.
 - p. Feathering: Operation of tapering off the edge of a point with a comparatively dry brush.

APRIL 2022

SECTION PAINTING AND COATING

ATTACHMENT E - TECHNICALS

09 90 00 - 1

- q. Field Coat: The application or the completion of application of the coating system after installation of the surface at the site of the work.
- r. Hold Point: A defined point, specified in this Section, at which work shall be halted for inspection.
- s. Holiday: a discontinuity, skip, or void in coating or coating system film that exposes the substrate.
- t. Honeycomb: Segregated condition of hardened concrete due to non-consolidation.
- u. ICRI: International Concrete Repair Institute.
- v. 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.
- w. 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.
- x. Mil: 0.001 inch.
- y. NACE: National Association of Corrosion Engineers.
- z. Overspray: Dry spray, particularly such paint that failed to strike the intended surface.
- aa. 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.
- bb. Pot Life: Time interval after mixing of components during which the coating can be satisfactorily applied.
- cc. 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.
- dd. Shelf Life: Maximum storage time for which a material may be stored without losing its usefulness.
- ee. 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.
- ff. Spreading Rate: Area covered by a unit volume of paint at a specific thickness.
- gg. SSPC: The Society for Protective Coatings.
- hh. 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).
- ii. Surface Saturated Dry (SSD): Refers to concrete surface condition where the surface is saturated (damp) without the presence of standing water.
- jj. Tie Coat: An intermediate coat used to bond different types of paint coats. Coatings used to improve the adhesion of a succeeding coat.
- kk. 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.

APRIL 2022

SECTION PAINTING AND COATING

ATTACHMENT E - TECHNICALS

09 90 00 - 2

- II. TPC: Technical Practice Committee.
- mm. 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).
- nn. 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.
- oo. Weld Splatter: Beads of metal scattered near seam during welding.
- pp. 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.

1.02 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 Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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	Abrasive Blasting Operations – Ventilation and Safe Practice
Exhaust Systems	
ANSI/NSF 61	Drinking Water System Components Health Effects
ANSI B74.18	Grading of Certain Abrasive Grain on Coated Abrasive Material
ASTM D16	Standard Terminology for Paint, Related Coatings, Materials, and Applications
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

APRIL 2022 ATTACHMENT E - TECHNICALS SECTION PAINTING AND COATING

Reference	Title
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
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

Reference	Title
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
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. Standardization:

- 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 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 shall include information listed in paragraph 1.04, 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 09 90 00; type of facility in which it was used, generic type, and year coating was applied.

C. Quality Control Requirements:

- 1. 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.
- The Contractor's methods shall conform to requirements of this specification and the standards referenced in this Section. Changes in the coating system installation requirements will be allowed only with the written acceptance of the Construction Manager before work commences.
- 3. 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.
- 4. Contaminated, outdated, diluted materials, and/or materials from previously opened containers shall not be used.
- 5. For repairs, the Contractor shall provide the same products, or products recommended by the CSM, as used for the original coating.
- 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.
- 7. 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

APRIL 2022

SECTION PAINTING AND COATING

ATTACHMENT E - TECHNICALS

- the specifications or is otherwise not acceptable shall be corrected as specified.
- 8. The Contractor shall complete the Coating System Inspection Checklist, Form 09 90 00-A, included at the end of this Section 09 90 00, 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.
- 9. 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:

- 1. The Contractor shall conduct inspections at Hold Points during the coating system installation and record the results from those inspections on Form 09 90 00-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:
 - a. 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.
 - b. 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.
 - c. 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.
 - d. 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 09 90 00 and in the CSM's written instructions.
 - e. 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.

APRIL 2022 ATTACHMENT E - TECHNICALS SECTION PAINTING AND COATING

- f. 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.
- g. 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 09 90 00 and/or in the CSM's written instructions.
- h. 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.

1.03 DELIVERY AND STORAGE

A. General:

- 1. 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.
- 2. Labels on material containers shall show the following information:
 - a. Name or title of product.
 - b. CSM's batch number.
 - c. CSM's name.
 - d. Generic type of material.
 - e. Application and mixing instructions.
 - f. Hazardous material identification label.
 - g. Shelf life expiration date.
- 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.
- 4. Containers shall be clearly marked indicating personnel safety hazards associated with the use of or exposure to the materials.
- 5. Material Safety Data Sheets (MSDS) for each material shall be provided to the Construction Manager.
- 6. The Contractor shall store and dispose of hazardous waste according to federal, state and local requirements. This requirement specifically addresses waste solvents and coatings.

1.04 SUBMITTALS:

A. General: Provide in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

APRIL 2022

SECTION PAINTING AND COATING

ATTACHMENT E - TECHNICALS

- 1. A copy of this specification section, with addendum updates included, and referenced and applicable sections, with addendum updates included, with each paragraph checkmarked (□) 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. CSM's current printed recommendations and product data sheets for coating systems including:
 - a. Volatile organic compound (VOC) data.
 - b. Surface preparation recommendations.
 - c. Primer type, where required.
 - d. Maximum dry and wet-mil thickness per coat.
 - e. Minimum and maximum curing time between coats, including atmospheric conditions for each.
 - f. Curing time before submergence in liquid.
 - g. Thinner to be used with each coating.
 - h. Ventilation requirements.
 - i. Minimum atmospheric conditions during which the paint shall be applied.
 - i. Allowable application methods.
 - k. Maximum allowable moisture content.
 - I. Maximum shelf life.
- 3. 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.
- 4. Safety Data Sheets (SDS) for materials to be delivered to the job site, including coating system materials, solvents, and abrasive blast media.
- 5. List of cleaning and thinner solutions allowed by the CSMs.
- 6. Storage requirements including temperature, humidity, and ventilation for Coating System Materials as recommended by the CSMs.
- 7. 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.

APRIL 2022

SECTION PAINTING AND COATING

ATTACHMENT E - TECHNICALS

8. The Contractor and CSA shall provide project references each including contact name, address, and telephone number where similar coating work has been performed by their companies.

1.05 RESPONSIBILITIES OF THE CTR

- A. General: 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 09 90 00 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 Coating System Installation Training. for further details on these CTR requirements. This inspection is in addition to the inspection performed by the Contractor in accordance with this Section 09 90 00.
- B. Coating System Installation Training:
 - 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.

APRIL 2022 ATTACHMENT E - TECHNICALS SECTION PAINTING AND COATING

- 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 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 09 90 00 and the CSM's recommendations.

PART 2 PRODUCTS

2.01 MATERIALS

A. General:

- 1. Notwithstanding the listing of product names in this Section 09 90 00, 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.
- 2. 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.

APRIL 2022

SECTION PAINTING AND COATING

ATTACHMENT E - TECHNICALS

Epoxy Coatings E-1 E-1-G	PPG PMC Carboline International Paint/ICI* Sherwin Williams Tnemec PPG PMC Carboline	Amerlock 2/400 S Carboguard 890 Devran 224 HS Macropoxy 646 C Series V69 Amerlock 2/400 S	A	Amerlock 2/400 Series Carboguard 890 Devran 224 HS Macropoxy 646 CA Series V69
	Carboline International Paint/ICI* Sherwin Williams Tnemec PPG PMC	Carboguard 890 Devran 224 HS Macropoxy 646 C Series V69	A	Carboguard 890 Devran 224 HS Macropoxy 646 CA
 E-1-G	International Paint/ICI* Sherwin Williams Tnemec PPG PMC	Devran 224 HS Macropoxy 646 C Series V69		Devran 224 HS Macropoxy 646 CA
 E-1-G	Paint/ICI* Sherwin Williams Tnemec PPG PMC	Macropoxy 646 C Series V69		Macropoxy 646 CA
E-1-G	Tnemec PPG PMC	Series V69		<u>'</u>
E-1-G	PPG PMC		· · · · · · · · · · · · · · · · · · ·	Series V69
E-1-G		Amerlock 2/400 S	ariaa	
	Carboline		enes	Amerlock 2/400 Series
		Carboguard 890		Carboguard 890
	International Paint/ICI*	Devran 224 HS		Devran 224 HS
	Sherwin Williams	Macropoxy 646 C	A	Macropoxy 646 CA
	Tnemec	Series V69		Series V69
E7	PPG PMC			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
Epoxy Polyurethane				
	CSM	Primer Coat(s)	Intermediate Coat(s)	Finish Coat(s)
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
	Carboline	Carboguard 890		Carbothane 134 VOC
	Sherwin Williams	Macropoxy 646-1	00	VOC
				Hi Solids
	Tnemec	Series V69		Polyurethane 100
				Series 1075
High Heat		I		
HH-1	High Temperature Coatings, Inc.	Hi Temp 1027		1000 VS (any color)

Material Requirements for Coating Systems: All California Except SCAQMD					
Coating System	CSM	First Coat(s)	Finish Coat(s)		
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		

^{*}See CSM's Product Data Sheets for acceptable thinners for VOC compliance or do not thin.

2.02 PRODUCT DATA

A. General:

- 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 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.
- 2. Submit reports specified in paragraph 1.02 Quality Control Requirements and 1.05 Coating System Inspection when the work is underway.
- 3. Submit the Coating System Inspection Checklists, using Form 09 90 00-A, included in this Section 09 90 00, for the coating work.
- 4. CTR final report in accordance with paragraph 1.05 Final Report.

PART 3 EXECUTION

3.01 COATINGS

A. General:

- 1. Coating products shall not be used until the Construction Manager has accepted the affidavits specified in paragraphs 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.
- 2. Erect and maintain protective enclosures as stipulated per SSPC-Guide 6 Guide for Containing Debris Generated During Paint Removal Operations.

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 3.01 Adhesion Confirmation. Damaged, deteriorated and poorly applied shop coatings that do not meet the requirements of this Section 09 90 00 shall be removed and the surfaces recoated. If the shop primer coat meets the requirements of this Section 09 90 00, 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.

APRIL 2022

SECTION PAINTING AND COATING

ATTACHMENT E - TECHNICALS

- 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: 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.

3.02 EQUIPMENT, IMMERSED: (NOT USED) 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

APRIL 2022 ATTACHMENT E - TECHNICALS SECTION PAINTING AND COATING

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. Used or spent blast abrasive shall not be reused on this project.
 - 2. 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.
 - 3. 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 above.
 - 4. Regulators, gauges, filters, and separators shall be in use on compressor air lines to blasting nozzles times during this work.
 - 5. 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.
 - 6. 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.
 - 7. 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.
 - 8. 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.
 - 9. 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:

- 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

APRIL 2022

SECTION PAINTING AND COATING

ATTACHMENT E - TECHNICALS

- system in this Section 09 90 00. 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. 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.
 - c. 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.
 - d. 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.
 - e. 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: (Not Used)

F. Masonry Surfaces: (Not Used)

G. Fiberglass Reinforced Plastic (FRP) Surfaces: (Not Used)

3.03 APPLICATION

A. Workmanship:

Coated surfaces shall be free from runs, drips, ridges, waves, laps, and brush marks.
 Coats shall be applied to produce an even film of uniform thickness completely coating corners and crevices.

APRIL 2022

SECTION PAINTING AND COATING

ATTACHMENT E - TECHNICALS

- 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.
- B. 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.
- 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,

SECTION PAINTING AND COATING

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: (Not Used)
- 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:

- 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.
- 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 26 and 40 shall be coated as specified in paragraph 3.03 Electrical and Instrumentation Equipment and Materials.
- 3. 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.

G. 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.

APRIL 2022 ATTACHMENT E - TECHNICALS SECTION PAINTING AND COATING

- 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.
- H. Special Requirements: Before erection, the Contractor shall apply all but the final finish coat to interior surfaces of pipe hangers, piping in contact with hangers, and contact surfaces that are inaccessible after assembly. The final coat shall be applied 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.
- I. Electrical and Instrumentation Equipment and Materials:
 - 1. Electrical and instrumentation equipment and materials shall be coated by the equipment manufacturer as specified below.
 - a. Finish: 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.
 - 1) Unless otherwise specified, instrumentation panels shall be coated with system E-1 for indoor mounting and system EU-1 for outdoor mounting.
 - 2) 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.
 - b. Color: 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.
 - 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.

SECTION PAINTING AND COATING

3.04 CLEANUP

A. General: 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.

3.05 COATING SYSTEM SPECIFICATION SHEETS (COATSPEC)

A. General:

- 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 3.06. In case of conflict
 between the schedule and the COATSPECS, the requirements of the schedule shall
 prevail.
- 2. Coating Specification Sheets included in Table A are included this paragraph 3.05.

Table A Coating Specification Sheets					
Coating System ID	Coating Material	Surface	Service Condition		
E-1	Ероху	Metal	Interior; exterior, covered, not exposed to direct sunlight, non-corrosive exposure.		
E-1-G	Ероху	Galvanized Steel	Interior; exterior, covered non-corrosive exposure. Do not use in immersion service.		
E-2	Ероху	Metal	Immersed, nonpotable; non-immersed, moderately corrosive environment, color required.		
E-7	Ероху	Plastic	Interior; exterior covered, not exposed to direct sunlight.		
HH-1	Proprietary Primer Plus Silicone Topcoat	Metal	Temperature to 750 degrees F.		
L-2	Latex	PVC and CPVC pipe	Exterior, direct sunlight exposure.		
EU-1	Zinc-epoxy-polyurethane system	Ferrous Metal	Exterior, exposed to direct sunlight, moderately corrosive non-immersed.		

APRIL 2022 ATTACHMENT E - TECHNICALS SECTION PAINTING AND COATING

۱.	Coating System Identification: E-1						
	1.	Coating Material:	Ероху				
	2.	Surface:	Metal				
	3.	Service Condition:	Interior; exterior, covered, not exposed to direct sunlight, non-corrosive exposure.				
	4.	Surface Preparation:					
		a. 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 requir light abrasive and vacuum cleaning blasting prior to receiving finish coats.				
		b. 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 3.02 Metallic Surfaces.				
		c. 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.				
	5.	Application:	Field				
		a. 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.				
		b. 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.				
		c. 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).				
	6.	System Thickness:	10 mils dry film.				
	7.	Coatings:					
		a. Primer:	One coat at CSM's recommended dry film thickness.				
		b. Finish:	One or more coats at CSM's recommended dry film thickness per coat to achieve the specified system thickness.				
	Coa	ting System Identification: E-1-G					
	1.	Coating Material:	Ероху				
	2.	Surface:	Galvanized Steel				
	3.	Service Condition:	Interior; exterior, covered, non-corrosive exposure. Do not use in immersion servic				

4.	Surface Preparation:					
	a. General:	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-milprofile and spot primed with the primer specified.				
	b. Galvanized Metal:	Nonferrous and galvanized metal shall be prepared in accordance with SSPC SP-7 (Brush-off Blast Cleaning) impart a 1- to 2-milprofile 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.				
5.	Application:	Field				
	a. 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.				
	b. 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).				
6.	System Thickness:	5 to 8 mils dry film.				
7.	Coatings:					
	a. Primer:	One coat at CSM's recommended dry film thickness.				
	b. Finish:	One or more coats at CSM's recommended dry film thickness per coat to the specified system thickness.				
		If the coated galvanized steel is to be exposed to ultraviolet light, apply one polyurethane top coat from coating system EU-1 over the second coat of the two epoxy coats specified.				
C. Co	Coating System Identification: E-2					
1.	Coating Material:	Ероху				
2.	Surface:	Metal				
3.	Service Condition:	Immersed, nonpotable; non-immersed, moderately corrosive environment, color required.				
4.	Surface Preparation:					
	a. 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 3.02 Metallic Surfaces.				

		b.	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.
	5.	Арр	lication:	Field
		a.	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.
		b.	Ferrous Metal:	Prime coat shall be an epoxy primer compatible with the specified finish coats.
		C.	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.
	6.	Syst	tem Thickness:	16 mils dry film.
	7.	Coa	tings:	
		a.	Primer:	One coat at CSM's recommended dry film thickness.
		b.	Finish:	Two or more coats at CSM's recommended dry film thickness per coat to the specified system thickness.
D.	Coa	ting S	ystem Identification: E-7	
	1.	Coa	ting Material:	Ероху
	2.	Surf	ace:	Plastic
	3.	Serv	vice Condition:	Interior; exterior covered, not exposed to direct sunlight.
	4.	Surf	ace 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.
	5.	Application:		Field
	6.	Syst	tem Thickness:	5 mils dry film.
	7.	Coa	tings:	One or more coats at CSM's recommended dry film thickness per coat to the specified system thickness.
E.	Coa	ting S	ystem Identification: EU-1	
	1.	Coa	ting Material:	Zinc-Epoxy-Polyurethane System
	2.	Surf	ace:	Ferrous Metal
	3.	Serv	vice Condition:	Exterior, exposed to direct sunlight, moderately corrosive, non-immersed.
	4.	Surf	ace Preparation:	
		a.	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.

	b. 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 3.02 Metallic Surfaces.
		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.
	c. 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.
5.	Application:	Field
	a. 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.
	b. 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.
6.	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.
7.	Coatings:	
	a. Primer:	One coat at CSM's recommended dry film thickness.
	b. Intermediate:	One coat at CSM's recommended dry film thickness.
	c. Finish:	One coat at CSM's recommended dry film thickness per coat to meet the specified system thickness.
Coa	ating System Identification: HH-1	
1.	Coating Material:	Proprietary Primer plus Silicone Topcoat
2.	Surface:	Metal
3.	Service Condition:	Temperature to 750 degrees F.
4.	Surface Preparation:	Metal surfaces shall be prepared in accordance with SSPC SP-10 (Near White Metal Blast Cleaning) to achieve a uniform surface profile of 2.0 to 2.5 mils.

SECTION PAINTING AND COATING

Coating	System Specification Sheets	(COATSPEC)		
5.	Application:	Field		
		Curing as required by CSM.		
6.	System Thickness:	6.5 to 8.0 mils dry film		
7.	Coating:	Primer at 5 to 6 mils DFT plus one topcoat at 1.5 to 2.0 mils DFT.		
i. Coa	ating System Identification: L-2			
1.	Coating Material:	Latex		
2.	Surface:	PVC and CPVC pipe.		
3.	Service Condition:	Exterior, direct sunlight exposure.		
4.	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.		
5.	Application:	Field		
6.	System Thickness:	3 mils dry film.		
7.	Coatings:			
	a. Primer:	One coat at CSM's recommended dry film thickness.		
	b. Finish:	One or more coats at CSM's recommended dry film thickness per coat to the specified system thickness.		

3.06 COATING SYSTEMS SCHEDULE (FINISH SCHEDULE)

A. General: 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. Final color selection shall be by the Owner.

Co	Coating Systems Schedule (Finish Schedule)					
Lo	Location/Surface			Coating System Identification	Standard Color	
A.	General: All Surfaces not Specified by Area or Structure					
	1.	Equ	ipment and Metal Appurtenances			
		a.	Equipment, non immersed, unless otherwise specified			
			1) Indoors	E-1	FS 25051 Blue	
			2) Outdoors	EU-1	FS 20040	
					Brown	
		b.	High temperature equipment operable at			
			1) 200 to 750 degrees F	factory coating		
		C.	Stainless steel equipment	Uncoated		
		d.	Existing equipment			

APRIL 2022 ATTACHMENT E - TECHNICALS

Coating Sys	tems Schedule (Finish Schedule)		
Location/Su	rface	Coating System Identification	Standard Color
	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 3.02)	Match existing color
	b) Outdoors	EU-1 without primer (see paragraph 3.02)	Match existing color
е.	Electrical switchgear panels, unit substations, motor control centers, power transformers, distribution centers, and relay panels; indoors and outdoors	See paragraph 3.03 Electrical and Instrumentation Equipment and Materials	ANSI 61 Grey (outside) FS 27880 White (inside)
f.	Instrumentation panels, graphic indicating panels, indicating and transmitting field panels, unless otherwise specified		
	1) Indoors	See paragraph 3.03 Electrical and Instrumentation Equipment and Materials	FS 26306 Grey (outside) FS 27880 White (inside)
	2) Outdoors	See paragraph 3.03 Electrical and Instrumentation Equipment and Materials	FS 27722 White (outside) FS 27880 White (inside)
2. Co	nduit, Piping and Ductwork		
a.	Ferrous, non-ferrous and galvanized piping, and appurtenant hangers and supports, non-immersed, unless otherwise specified.		
	1) Indoors – noncorrosive	E-1	FS 25051 Blue
	2) Outdoors – noncorrosive	EU-1	FS 20040 Brown
b.	Stainless steel piping	Uncoated	
С.	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	FS 25051 Blue
	2) Outdoors	EU-1	FS 20040 Brown

SECTION PAINTING AND COATING

ation	n/Surl	ace	Coating System Identification	Standard Color
	d.	Existing conduit, outlet and junction boxes, lighting transformers, lighting communication and small power panels, control stations, piping, lagged ductwork, appurtenant hangers, clamps, and supports		
		Not damaged nor modified by work in this contract	Uncoated	
		2) Damaged, exposed, or modified by work in this contract		
		a) Indoors	E-1	Match existing color
		b) Outdoors	EU-1 without primer	Match existing color
	e.	Racked conduits and cable trays	Uncoated	
	f.	Insulated pipe jacketing	Uncoated	
	g.	Plastic, fiberglass and flexible conduit and piping		
		1) Unless otherwise specified	Uncoated	
		2) PVC and CPVC Piping	L-2	FS 25051 Blue
		a) Exposed to direct sunlight	L-2	FS 25051 Blue
		b) Not exposed to direct sunlight	E-7	FS 25051 Blue
	h.	High temperature piping operable at		
		200 to 750 degrees F, including compressor discharge piping	HH-1	FS 26306 Grey
		2)		
3.	Cor	crete, Grout, Masonry and Plaster		
	а.	Immersed tank and channel walls and bottoms unless otherwise specified	Uncoated	
	b.	Concrete equipment bases unless otherwise specified	Uncoated	
	C.	Floors unless otherwise specified	Uncoated	
4.	Har	drails, Gratings, Floor Plates, Manhole Covers, and Hatches		
	a.	Unless otherwise specified	Uncoated	
	b.	Existing		
		Not damaged by work in this contract	Uncoated	
		2) Damaged, exposed, or modified by work in this contract		
		a) Indoors	E-1	Match existing color

Location/Surface	Coating System Identification	Standard Color
b) Outdoors	EU-1 without primer	Match existing color
5. Aluminum Flashing, Light Standards, Supports, and Louvers		
a. Indoors and outdoors, unless otherwise specified	Uncoated	
6. Precast Concrete Metalwork		
a. Fasteners, anchors, supports, etc.	EU-1	Match wall

3.07 INSPECTION AND TESTING BY OWNER

A. General:

- 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.
- 2. 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 09 90 00. These inspections may include the following:
 - a. Inspect materials upon receipt to ensure that are supplied by the CSM.
 - b. Inspect to verify that specified storage conditions for the coating system materials, solvents and abrasives are provided.
 - c. Inspect and record findings for the degree of cleanliness of substrates.
 - d. Inspect and record the pH of concrete and metal substrates.
 - e. Inspect and record substrate profile (anchor pattern)
 - f. Measure and record ambient air and substrate temperature.
 - g. Measure and record relative humidity.
 - h. Check for the presence of substrate moisture in the concrete.
 - i. Inspect to verify that correct mixing of coating system materials is performed in accordance with CSM's instructions.
 - j. 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.
 - k. Perform adhesion testing.
 - I. Measure and record the thickness of the coating system.
 - m. Inspect to verify proper curing of the coating system in accordance with the CSM's instructions.
 - n. Perform holiday or continuity testing for coatings that will be immersed or coatings that will be exposed to aggressively corrosive conditions.

APRIL 2022 ATTACHMENT E - TECHNICALS SECTION PAINTING AND COATING

3.08 FINAL INSPECTION

A. General

- 1. Contractor shall conduct a final inspection to determine whether coating system work meets the requirements of the specifications.
- 2. 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.
- 3. Any rework required shall be marked. Such areas shall be recleaned and repaired as specified at no additional cost to the Owner.

APRIL 2022 ATTACHMENT E - TECHNICALS SECTION PAINTING AND COATING

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS

09 90 00-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 (eg E-1)	Coating Type (eg Epoxy, etc.)	

Coating System Inspection Checklist

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			

APRIL 2022 SECTION PAINTING AND COATING

ATTACHMENT E - TECHNICALS 09 90 0 - 31

Step	Description		Name	Signature	Date
6	Completion of Concrete Repairs If Required and Related	GC QC			
	Surface Preparation Rework Prior to Coating System	CSM QC			
	Application.	CSA QC			
7	Completion of Concrete Filler/ Surface Application to	GC QC			
	Concrete.	CSM QC			
		CSA QC			
	Completion of First Finish Coat Application and of Detail	GC QC			
	Treatment at Transitions or Terminations.	CSM QC			
		CSA QC			
	Completion of Second Finish Coat Application and of Detail	GC QC			
	Treatment at Transitions and Terminations.	CSM QC			
		CSA QC			
)	Completion of Full and Proper Cure of Coating System.	GC QC			
		CSM QC			
		CSA QC			
	Completion of Testing of Cured Coating System including Adhesion, Holiday (Continuity) Testing and Dry Film	GC QC			
		CSM QC			
	Thickness.	CSA QC			
<u>-</u>	Completion of Localized Repairs to Coating System Following	GC QC			
	Testing.	CSM QC			
		CSA QC			
	Final Acceptance of Coating System Installation Including	GC QC			
	Final Clean-Up Complying with Specification Requirements	CSM QC			
	and the CSM's Quality Requirements.	CSA QC			

END OF SECTION

APRIL 2022

ATTACHMENT E - TECHNICALS

SECTION PAINTING AND COATING

09 90 0 - 32

SECTION 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.01 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.

B. Definitions:

- 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.
- 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: 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.
 - a. 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.
 - b. 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

APRIL 2022

COMMON WORK RESULTS FOR ELECTRICAL

ATTACHMENT E - TECHNICALS

- 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.

1.02 QUALITY ASSURANCE

A. References:

- 1. This section contains references to the following documents in 1.02.A.2. 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 Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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:

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.

APRIL 2022

COMMON WORK RESULTS FOR ELECTRICAL

ATTACHMENT E - TECHNICALS

- 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.

1.03 SUBMITTALS

- A. The following submittals shall be provided:
 - 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. 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.
 - 3. 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.
 - 4. 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.
 - 5. 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.
 - 6. Interconnection diagram: The Contractor shall prepare interconnection diagrams depicting all cable requirements together with their actual terminations as specified in paragraph 1.01 Definitions.
 - 7. 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 3.01 Conduits in Concrete Construction.
 - b. For layouts that do not conform to paragraph 3.01 Conduits in Concrete Construction, provide engineering design and calculations signed and

APRIL 2022

COMMON WORK RESULTS FOR ELECTRICAL

ATTACHMENT E - TECHNICALS

- 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.
- 8. Safety disconnect switch list including legend with equipment tag, equipment description, and power feeder circuit source and location information.

1.04 DRAWINGS

- A. Where the Contractor is required to provide information on drawings as part of the specified work, such drawings shall be prepared on 24-inch by 36-inch heavy weight bond 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.

1.05 PROJECT/SITE CONDITIONS

- A. General: Unless otherwise specified, equipment and materials shall be sized and derated for the ambient conditions specified in Section 01 61 00 COMMON PRODUCT REQUIREMENTS, but not less than an ambient temperature of 40 degrees C at an elevation ranging from sea level to 3000 feet without exceeding the manufacturer's stated tolerances.
- B. Corrosive Areas: The following areas are designated as corrosive:
 - 1. Level D1 and D2
- C. Hazardous (Classified) Areas: Any electrical equipment as called for in scope of work shall be installed outside of hazardous area boundaries. The following areas are designated as hazardous (classified) in accordance with the NEC:

Area	Hazardous Classification	
Level A, B, C	Name	
Level D1, D2	None	
Kika Court Vault	Class I Div 2	

D. Seismic: Electrical equipment, supports, and anchorage shall be designed and installed in accordance with the seismic design requirements specified in Section 01 73 24 DESIGN REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS AND NON-BUILDING STRUCTURES.

1.06 STORAGE OF MATERIALS AND EQUIPMENT

A. Materials and equipment shall be stored as specified in Section 01 61 00 COMMON PRODUCT REQUIREMENTS. Equipment and materials to be located indoors shall be stored indoors and sealed with plastic film wrap.

APRIL 2022

COMMON WORK RESULTS FOR ELECTRICAL

ATTACHMENT E - TECHNICALS

1.07 ELECTRICAL NUMBERING SYSTEMS

A. Raceway Numbers:

1. Raceways shall be tagged at all terminations. Contractor shall assign raceway numbers in accordance with the following system where raceway numbers have not been assigned:

Raceway Prefix	Type of Function
С	Control or power - 120V or less
H	Power above 600V
N	Pneumatic tubing
Р	Power 208V to 600V
S	Signal - data communication or instrumentation
X	Spare

- 2. Prefixes shall be followed by a 4-digit number. Add a letter suffix to distinguish the raceways where more than one raceway is routed to a piece of equipment. Example: Raceway number = P3109A where:
 - a. P = conduit contains power
 - b. 3109 = unique 4-digit number
 - c. A = letter to distinguish raceways to same equipment

B. Conductor Numbers:

- 1. Conductors shall be identified with numbers at both ends. Conductor tag numbers shall consist of the equipment number followed by a dash followed by the conductor number specified on the control diagram. Example:
 - a. Equipment Tag number = 1900 L1 where:
 - b. 1900 = cable number
 - c. L1 = conductor number
- 2. Conductors in parallel or in series between equipment shall have the same conductor number. Neutral conductors shall have the same conductor number. Wherever possible, the conductor number shall be the same as the equipment terminal to which it connects.
- 3. Where factory-wired equipment has terminal numbers different than the conductor numbers shown on the control diagrams:
 - a. Both shall be shown on the interconnection diagram
 - b. Include a copy of the interconnection diagram inside of the equipment cabinet.

1.08 INDICATING LAMP COLORS

A. Refer to Section 26 09 16 ELECTRICAL CONTROLS AND RELAYS for indicating lights colors for process and electrical equipment.

APRIL 2022

COMMON WORK RESULTS FOR ELECTRICAL

ATTACHMENT E - TECHNICALS

1.09 ARC FLASH MITIGATION METHODS

- A. The following mitigation method requirements shall apply to all power distribution and utilization equipment supplied for any products supplied on the project and applies to all equipment divisions in the Contract Documents. Refer to the NFPA-70 (NEC), and NFPA-70E (NESC) for equipment labeling requirements.
- B. Equipment Labels: Equipment labels shall be installed on the outside of the electrical equipment enclosure, cabinet, and panels to avoid opening the equipment to access the manufacturer's data or the equipment ratings.
- C. Insulated Power Bus and Insulated Cable Boots:
 - 1. Provide insulated power bus in power distribution equipment where accessible to installers or maintenance workers.
 - 2. Provide cable boots for power conductor connections to insulate the exposed power conductor connections.
- D. Power and Control Equipment Separation:
 - 1. Provide separation between power equipment within an enclosure, cabinet, or panel by the uses of barriers, separate access doors, or by other means.
 - 2. Provide separation barriers between main breaker feeders coming into equipment and other termination points or bussing on the load side of the main breaker.

PART 2 PRODUCTS

2.01 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 09 90 00 PAINTING AND COATING.
- C. Galvanizing: Where specified, galvanizing shall be in accordance with Section 05 05 14 HOT-DIP GALVANIZING.

2.02 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 size 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.

APRIL 2022

COMMON WORK RESULTS FOR ELECTRICAL

ATTACHMENT E - TECHNICALS

- B. Conductors shall be identified in accordance with paragraph 1.07 Conductor Numbers. 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 Manufacturer:
 - 1. TMS Thermofit Marker System by Raychem Co
 - 2. Sleeve style wire marking system by W. H. Brady Co.
 - 3. or equal.

2.03 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.

2.04 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.

2.05 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)
 - 2. Rated not less than the conductor current rating
 - 3. Rated less than 600 volts AC.
 - 4. Terminal blocks for C-circuits and S-circuits:
 - 5. Rated not less than 20 amperes
 - 6. Rated less than 600 volts AC.
 - 7. Terminals shall be tin-plated.
 - 8. Insulating material shall be nylon.

APRIL 2022

COMMON WORK RESULTS FOR ELECTRICAL

ATTACHMENT E - TECHNICALS

2.06 PRODUCT DATA

- A. The following information and product data specified under individual specification sections shall be provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.
 - Applicable operation and maintenance information on an item-by-item basis in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA. Operation and maintenance information shall be provided at the time of equipment, device, or material site delivery, or at a certain stage of project completion as required by Section 01 78 23 OPERATION AND MAINTENANCE DATA, whichever is the earlier. Full-size drawings shall be reduced to 11 x 17 inches.
 - Test results for motors and electrical systems on the forms contained in Section 01 99 90 REFERENCE FORMS. A file of the original test results shall be maintained by the Contractor. Prior to acceptance of work, the resulting file shall be provided to the Construction Manager.
 - Description of functional checkout procedures specified under paragraph 3.02 Pre-Functional Test Checkout shall be provided 30 days prior to performing functional checkout tests.
 - 4. Record documents specified in Section 01 77 00 CLOSEOUT PROCEDURES and paragraph 3.03.

PART 3 EXECUTION

3.01 GENERAL

A. Construction:

- 1. The work under Division 26 shall be performed in accordance with these specifications.
- 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

APRIL 2022

COMMON WORK RESULTS FOR ELECTRICAL

ATTACHMENT E - TECHNICALS

- 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:
 - a. Concrete strength shall not be impaired significantly by the embedment of conduits in or through structural sections.
 - b. Conduit layout shall conform to the requirements of ACI 318, Sections 3.3
 Aggregates and 6.3 Conduits and Pipes Embedded in Concrete.
 - c. Conduits shall be treated similarly to reinforcing steel for purposes of clearance. In general, code sections require conduit spacing the greater of:
 - d. 1.33 times the maximum concrete aggregate size, clear
 - 1) Three diameters center to center
 - 2) Alternate spacing and layout shall be as reviewed and accepted by the Engineer.
- 2. 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,
 - c. shall be detailed and constructed to prevent liquid and moisture penetration through the wall or slab section for each conduit.

C. Housekeeping:

- 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 Section 09 90 00 PAINTING AND COATING, 3.03 Special Requirements.
- Electrical equipment temporarily exposed to weather, debris, liquids, or damage during construction shall be protected as specified in Section 01 61 00 COMMON PRODUCT REQUIREMENTS.

D. Electrical Equipment Labeling:

- 1. 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. Electrical equipment shall have NFPA 70E labels installed stating the results of the Arc Flash analysis specified in Section 26 05 74 ARC FLASH

APRIL 2022

COMMON WORK RESULTS FOR ELECTRICAL

ATTACHMENT E - TECHNICALS

- ANALYSIS, SHORT CIRCUIT STUDY, AND PROTECTIVE DEVICE COORDINATION REPORT.
- 3. Electrical distribution equipment and utilization equipment shall have 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.

E. 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.
- 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.
- F. 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.
- G. Conductor Installation: 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.

3.02 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 1.03.
- B. Insulation Resistance Measurements:

APRIL 2022

COMMON WORK RESULTS FOR ELECTRICAL

ATTACHMENT E - TECHNICALS

- General: 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.
- 2. Insulation resistance measurements shall be recorded in Form 26 05 00-A, contained in Section 01 99 90 REFERENCE FORMS. Insulation with resistance of less than 10 megaohms is not acceptable.
- 3. 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.
- 4. Motor Tests: The Installed Motor Test Form 26 05 00-B, contained in Section 01 99 90 REFERENCE FORMS, shall be completed for each motor after installation.
- 5. 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 megaohms are not acceptable.

C. Pre-Functional Test Checkout:

- Functional testing shall be performed in accordance with the requirements of Section 26 08 00 COMMISSIONING OF ELECTRICAL SYSTEMS. Prior to functional testing, all protective devices shall be adjusted and made operative.
- 2. Submit a description of the proposed functional test procedures prior to the performance of functional checkout.
- 3. Prior to energization of equipment, perform a functional checkout of the control circuit.
 - a. 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.
- 4. 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.

3.03 RECORD DOCUMENTS

A. Contract documents shall be maintained and annotated by the Contractor during construction, including the record drawings specified in Section 01 77 00 CLOSEOUT PROCEDURES and the following additional schedules, lists, and drawings:

APRIL 2022

COMMON WORK RESULTS FOR ELECTRICAL

ATTACHMENT E - TECHNICALS

1. Original Submittal Drawings (Section 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL).

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS COMMON WORK RESULTS FOR ELECTRICAL

SECTION 26 05 19 LOW-VOLTAGE ELECTRICAL CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 DESCRIPTION

A. This section specifies stranded copper cables, conductors, and wire rated 600 volts insulation used for power; lighting, analog, digital, or pulse signals and control circuits.

1.02 REFERENCES

- 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 Advertisement for bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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

1.03 SUBMITTALS

- A. The following information shall be provided in accordance with Section 01 33 00.
 - Submittals specified in Section 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL.
 - 2. Complete catalog cuts for all conductors, wire, and cable.

LOW-VOLTAGE ELECTRICAL CONDUCTORS AND CABLES

APRIL 2022

ATTACHMENT E - TECHNICALS

PART 2 PRODUCTS

2.01 GENERAL

- A. Unscheduled Conductors and Cables: 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. Unscheduled conductor with insulation shall be provided in accordance with the following:
 - 1. CABLESPEC "THWN"
- B. Cable Specification Sheets (CABLESPEC): General requirements for conductors and cables specified in this Section are listed on CABLESPEC sheets in paragraph 3.06.

2.02 COLOR CODING

A. 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

B. Power Conductors: 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

C. 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.

LOW-VOLTAGE ELECTRICAL CONDUCTORS AND CABLES

D. 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.

2.03 POWER AND CONTROL CONDUCTORS AND CABLE, 600 VOLT

- A. 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.
- B. Multiconductor Cable: Provide multiconductor power cable and multiconductor control cable where identified on the drawings. Provide stranded conductors for all cable or wires.

2.04 SIGNAL CABLES

A. General:

- 1. Factory cable between manufactured instrument system components shall be provided in compliance with the instrument manufacturer's recommendations.
- 2. 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:
 - a. CABLESPEC "SIC":
 - 1) Cable designation: 1PR#16S shielded twisted pair (STP)
 - 2) Cable designation: 1TR#16S triad (STT)
 - b. 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.
- B. Communication, Paging, and Security System Cables: Voice communication, paging, and security system cables shall be specified in their respective specification sections.

2.05 PORTABLE CORD

A. Portable cord shall be provided in accordance with CABLESPEC "CORD," unless otherwise specified. Cords shall contain an equipment grounding conductor.

2.06 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 Section 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL.

LOW-VOLTAGE ELECTRICAL CONDUCTORS AND CABLES

APRIL 2022

ATTACHMENT E - TECHNICALS

- 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 43 05 21 COMMON MOTOR REQUIREMENTS FOR CENTRIFUGAL PUMPS.

2.07 CORD GRIPS

A. 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.

PART 3 EXECUTION

3.01 GENERAL

- A. Conductors shall be identified at each connection terminal and at splice points. The identification marking system shall comply with Section 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL.
- B. 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.
- C. 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.

LOW-VOLTAGE ELECTRICAL CONDUCTORS AND CABLES

APRIL 2022

ATTACHMENT E - TECHNICALS

D. 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.

3.02 600 VOLT CONDUCTOR AND CABLE

- A. 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.
- B. 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.
- C. 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.
- D. Raceway fill limitations shall be as defined by NEC and the following:
 - 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.
 - 2. Power conductors derived from uninterruptible power supply systems shall not be installed in raceways with conductors of other systems. Install in separate raceways.
 - 3. Slices and terminations are subject to inspection by the Construction Manager prior to and after insulating.
 - 4. Motor terminations at 460-volt motors shall be made by bolt-connecting the lugged connectors.
 - 5. 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 outdoor or wet locations shall be insulated using Scotch-cast epoxy resin or Raychem splicing kits. Outdoor splices shall be above grade.
 - 6. 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.
 - 7. 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

LOW-VOLTAGE ELECTRICAL CONDUCTORS AND CABLES

APRIL 2022

ATTACHMENT E - TECHNICALS

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.

3.03 SIGNAL CABLE

- A. 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.
- B. Circuits shall not be made using conductors from different pairs or triads. Triads shall be used wherever 3-wire circuits are required.
- C. 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.
- D. 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.
- E. 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.
- F. 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 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL.
- G. Cable for paging, security, voice communication, and telephone systems shall be installed and terminated in compliance with the manufacturers and the Utilities recommendations.

3.04 PORTABLE CORD

A. 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.

3.05 TESTING

A. The Contractor shall test conductors, wire, and cable in accordance with Section 26 08 00 COMMISSIONING OF ELECTRICAL SYSTEMS.

LOW-VOLTAGE ELECTRICAL CONDUCTORS AND CABLES

APRIL 2022

ATTACHMENT E - TECHNICALS

3.06 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:

Туре	Volt	Product	Purpose
RHW	600	RUBBER INSULATED OUTDOOR INDUSTRIAL GRADE SINGLE CONDUCTOR	POWER
THWN	600	PVC INSULATED WITH NYLON JACKET BUILDING GRADE CONDUCTOR	CONTROL, LIGHTS & RECEPTACLES
MXLPE / S / PVC	1000	MULTICONDUCTOR SHIELDED MOTOR CABLE WITH PVC JACKET	FLEXIBLE 3/C CABLE WITH NEC GROUND CONDUCTOR. MOTOR FEEDER RANGE: 16 AWG - 500KCMIL
SIC	600	P-OS: 1-PR#18 or 16SH or 1-TR#18 or 16SH	CABLE TRAY RATED INSTRUMENT CABLE

3.07 CABLE SPECIFICATION SHEETS (CABLESPEC) – RHW

- A. Cable System Identification: RHW
- B. Description: Single conductor power cable; Sizes: 12 AWG through 1000 kcmil as shown
- C. Voltage: 600 volts
- D. Conductor Material: Bare annealed copper; Class-B stranded per ASTM B8
- E. Insulation: RHW-2 75 degree C wet; RHH 90 degree C dry; Composite of ethylene propylene rubber (EPR) per ICEA, UL 44 and NEMA WC-7.
- F. Jacket: Chlorosulfonated polyethylene; Trade Name Example: Hypalon
- G. Flame Resistance: IEEE 383 & 1202: 70,000 BTU per hour
- H. Manufacturer(s):
 - 1. Okonite: Okonite-Okolon, series 112-11-XXXX; Cablec: Durasheath EP; or Rome equal; or BICC equal.
- I. Execution:
 - 1. Installation: Install in accordance with paragraph 3.02.
 - 2. Testing: Test in accordance with paragraph 3.05.

LOW-VOLTAGE ELECTRICAL CONDUCTORS AND CABLES

APRIL 2022

ATTACHMENT E - TECHNICALS

3.08 CABLE SPECIFICATION SHEETS (CABLESPEC) - THWN

- A. Cable System Identification: THWN
- B. Description:
 - 1. Single conductor control; 14 AWG
 - 2. Single conductor lighting and receptacle type; 12 AWG.
- C. Voltage:
 - 1. 600 volts
- D. Conductor Material:
 - 1. Bare annealed copper; stranded per ASTM B8
- E. Insulation:
 - THWN/THHN, 90 degree C dry, 75 degree C wet, Polyvinyl Chloride (PVC) per UL 83.
- F. Jacket:
 - 1. Nylon
- G. Flame Resistance:
 - 1. UL 83
- H. Manufacturer(s):
 - 1. Okonite, Okoseal-N, series 116-67-XXXX; or equal.
- I. Uses Permitted:
 - 1. Control, lighting, receptacle and appliance circuits
- J. Execution:
 - 1. Installation: Install in accordance with paragraph 3.02.
 - Testing: Test in accordance with Section 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL and Section 26 08 00 COMMISSIONING OF ELECTRICAL SYSTEMS.
- 3.09 CABLE SPECIFICATION SHEETS (CABLESPEC) MXLPE / S / PVC
 - A. Cable System Identification: MXLPE / S / PVC
 - B. Description:
 - 1. 1000 Volt Rated Flexible Motor Supply Shielded Cable
 - C. Power Cable:
 - Multi-conductor shielded motor feeder cable with PVC jacket:
 3/C cable conductor minimum size is #12-AWG with grounding conductor.

LOW-VOLTAGE ELECTRICAL CONDUCTORS AND CABLES

APRIL 2022

ATTACHMENT E - TECHNICALS

- D. Ground Conductor Size:
 - 1. Sized per NEC 250
- E. Application:
 - 1. Feeder cable between VFD motor controller and motor.
- F. Conductor Material:
 - 1. Flexible copper with high strand count.
- G. Insulation:
 - Thermoset Crosslinked Polyethylene (XLPE): 90 degree C dry, 75 degree C wet, per UL 44.
- H. Jacket:
 - PVC over assembly; jacket thickness per UL 1277 Cable Tray rated UL 1277 Type TC.
- I. Shield:
 - 1. Tinned copper braid and foil.
- J. Flame Resistance: IEEE 383 Fire Test (70,000 BTU)

IEEE 1202: Limited Smoke rated and labeled on cable

jacket

UL 1685: Vertical Tray Flame Exposure Test

K. Manufacturer(s): Anixter B2095XX series

Belden 295XX series

LAPPUSA OLFLEX VFD Symmetrical: 1AWG - 500kcmil LAPPUSA OLFLEX Servo 2YSLCY-JB flexible

cable

- L. Execution:
 - Installation: Install in accordance with paragraph 3.02. Install in conduit or cable tray. Not to be used for open wiring installation. Ground shields at both ends. Shield terminating gland may be used at the motor to ensure grounding the shield.
 - 2. Testing: Test in accordance with paragraph 3.05 and Section 26 08 00.
- 3.10 CABLE SPECIFICATION SHEETS (CABLESPEC) SIC
 - A. Cable System Identification:
 - 1. SIC
 - B. Description:

LOW-VOLTAGE ELECTRICAL CONDUCTORS AND CABLES

APRIL 2022

ATTACHMENT E - TECHNICALS

- 1. Single twisted, shielded pair or triad, 18 or 16 AWG, instrumentation and signal cable; UL listed; Cable Tray rated
- C. Voltage:
 - 1. 600 volts
- D. Conductor Material: Bare annealed copper; stranded per ASTM B8
- E. Insulation:
 - 1. 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
- F. Lay:
 - 1. Twisted on a 2-inch lay
- G. Shield:
 - 1. 100 percent, 1.35 mil aluminum-Mylar tape with a 7-strand tinned copper drain wire
- H. Jacket:
 - 1. 45 mil Polyvinyl Chloride (PVC)
- I. Flame Resistance:
 - 1. UL 1685
- J. 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
- K. Execution:
 - 1. Use:
 - a. Analog signal cable and RTD device Triad extension cable.
 - 2. Installation:
 - a. Install in accordance with paragraph 3.03.
 - 3. Testing:
 - a. Test in accordance with paragraph 3.05.

END OF SECTION

LOW-VOLTAGE ELECTRICAL CONDUCTORS AND CABLES

SECTION 26 05 33 RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SCOPE

A. This section covers the furnishing and installation of electrical conduits, wireways, fittings and supports. Raceways shall be provided for lighting, receptacles, power, control, instrumentation, signaling and grounding systems.

1.02 REFERENCES

- A. This section contains references to the following documents in 1.02.B. 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 Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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
FEDSPEC WW-C-581E	Conduit, Metal, Rigid and Intermediate; and Coupling, Elbow, and Nipple, Electrical Conduit; Zinc Coated
JIC EMP-1	Electrical Standards for Mass Production Equipment
NEMA ICS 6	Industrial Control and Systems Enclosures
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

Reference	Title
UL 360	Liquid Tight Flexible Electrical Conduit
UL 870	Wireways, Auxiliary Gutters, and Associated Fittings
UL 886	Outlet Boxes and Fittings for Hazardous (Classified) Locations

1.03 SUBMITTALS

- A. The following information shall be provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
 - 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.
 - 2. A check mark (✓) shall denote full compliance with a paragraph. 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.
 - 3. Manufacturer's descriptive literature for materials.
 - 4. Certification that Contractor has been trained to work on PVC-coated conduit systems.

PART 2 PRODUCTS

2.01 RACEWAYS AND FITTINGS

A. 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.

2.02 BOXES, GUTTERS, TERMINAL CABINETS, MANHOLES, AND HANDHOLES

A. 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. Provide applicable products for Class 1 Div 2 areas.

B. Table A specifies the electrical enclosure material and rating for the location and application.

Table A		
Location	Electrical Enclosure Material and NEMA Rating	
Indoor: Non Corrosive Areas	HDG	
Indoor: Corrosive Areas	NEMA 4X: Stainless Steel	
Outdoor: All Areas except Vaults	NEMA 4X: Stainless Steel	
Vaults	NEMA Class 7: Cast Ferrous	

HDG = Hot Dip Galvanized Finish

- C. 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.
- D. 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 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL.
- E. Ground Bus: Provide a ground bus in concrete manholes, handholes, and electrical pullboxes with dimension of 3-foot width x 3-foot length x 3-foot depth and larger. Provide a NEMA threaded 4-hole grounding plate for connecting two to four-1-hole ground connectors that enter the enclosure from two to four duct banks.
 - 1. Products: Burndy, T&B, or equal.

2.03 RACEWAY SUPPORTS

A. 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.

- B. 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.
- C. Suspended Raceway Supports and Racks:
 - 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.
 - 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 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL.
- D. 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: Non Corrosive Areas	HDG	HDG HDG
Indoor: Corrosive Areas	PGRS	PGRS Stainless steel
Outdoor: Corrosive Areas	PGRS	PGRS Stainless steel
Vaults	PGRS	PGRS Cast Ferrous

HDG = Hot Dip Galvanized Finish PGRS = PVC Coated GRS

2.04 HAZARDOUS AREA AND CORROSIVE AREA CONDUIT SEALS

- A. 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.
- B. Sealing compound shall be hard type installed in UL listed for explosion-proof sealing fittings after the conductors are installed, tested, and accepted.
- C. 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.

2.05 PULLING LINE

A. 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.

2.06 CONDUIT THREAD LUBRICANT

A. 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.

PART 3 EXECUTION

3.01 GENERAL

A. 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: Non Corrosive	Exposed	GRS
Indoor: Corrosive	Exposed	PGRS
Outdoor: All areas	Exposed (other)	PGRS
Vaults	Exposed	PGRS
Outdoor	Direct Buried	PVC4

3.02 CONDUIT

- A. General: The conduit systems, installation, and hazardous location fittings are specified herein.
- B. Indoor and Outdoor Conduit Systems:
 - 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
 - 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 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL 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.
- 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.
- I. 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. Provide O-Z Gedney "Type DX" or Crouse-Hinds "Type XD" bonded, weathertight expansion and deflection fitting for the conduit size where conduit crosses structural joints that allows structural movement.

3.03 RACEWAY SPECIFICATION SHEETS (RACESPEC) – FLEX

A. Raceway Identification: FLEX

B. Description: Flexible Steel Conduit

C. Application: Final connection to equipment subject to vibration or adjustment.

D. Compliance: UL 1

- E. Construction: Spirally wound galvanized steel strip with successive convolutions securely interlocked.
- F. Minimum size: 1/2 inch
- G. Fittings: Compression type.
- H. Other: FLEX shall be provided with an internal ground wire.

3.04 RACEWAY SPECIFICATION SHEETS (RACESPEC) – GRS

- A. Raceway Identification: GRS
- B. Description: Galvanized Rigid Steel Conduit (GRS)
- C. Compliance: ANSI and UL
- D. Finish: Hot-dip galvanized after fabrication, inside and outside. Smooth finished surfaces.
- E. Manufacturers: Allied Tube and Conduit Corp., Wheatland Tube Co., or equal.
- F. Minimum size: Unless otherwise specified, 3/4 inch for exposed, 1 inch for embedded, encased, or otherwise inaccessible.

G. 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
- 2. Unions: Electro-galvanized ferrous alloy type Appleton UNF or UNY, Crouse-Hinds UNF or UNY, or equal. Threadless fittings are not acceptable.
- 3. 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.

H. Boxes:

- 1. Indoor: Type FD cast ferrous for all device boxes and for junction boxes less than 6 inches square.
- 2. Outdoor: Type FD cast ferrous for all device boxes and for junction boxes less than 6 inches square.
- 3. Corrosive: NEMA 4X stainless steel or nonmetallic, as specified.
- 4. Hazardous: NEMA Class 7 cast ferrous.

I. Elbows:

- 1. 3/4" thru 1-1/2" Factory fabricated or field bent.
- 2. 2" thru 6" Factory fabricated only.

- J. Conduit Bodies (Oversized):
 - 1. 3/4" thru 4" Malleable iron, hot-dip galvanized, unless otherwise noted. Neoprene gaskets for all access plates. Tapered threads for conduit entrances.
 - 2. 5" and 6" Electro-galvanized iron or cast iron box.
- K. 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.
- L. Manufacturers: Appleton, Crouse-Hinds, Hubbell, O. Z. Gedney, or equal.
- M. 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.
 - 2. Conduit entering boxes shall be terminated with a threaded hub with a grounding bushing.
 - 3. Exposed male threads on rigid steel conduit shall be coated with zinc-rich paint.

3.05 RACEWAY SPECIFICATION SHEETS (RACESPEC) – LFS

- A. Raceway Identification: LFS
- B. Description: Liquidtight Flexible Steel Conduit
- C. Application: Final connection to equipment subject to vibration or adjustment.
- D. Compliance: UL 360
- E. Construction: Spirally wound galvanized steel strip with successive convolutions securely interlocked and jacketed with liquidtight plastic cover.
- F. Minimum Size: 3/4 inch
- G. Fittings:
 - 1. Cadmium-plated malleable iron body and gland nut with cast-in lug, brass grounding ferrule threaded to engage conduit spiral.
 - 2. O-ring seals around the conduit and box connection and insulated throat.
 - 3. Provide forty-five and ninety degree fittings where applicable.
 - 4. Provide PVC coated flexible conduit and fittings where the conduit system is PVC coated.

H. 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.

3.06 RACEWAY SPECIFICATION SHEETS (RACESPEC) – PGRS

- A. Raceway Identification: PGRS
- B. Description:
 - 1. Hot-Dip Galvanized Rigid Steel Conduit, Corrosion-Resistant, Polyvinyl Chloride (PVC) Coated.
 - 2. Provide factory made and coated elbows.
- C. 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".
- D. Finish:

PGRS shall be hot-dip galvanized rigid steel conduit as specified in 3.04 RACEWAY SPECIFICATION SHEETS (RACESPEC) – 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.

- 1. 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.
- E. Minimum Size: 3/4 inch
- F. 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.
- G. Covers: PVC coated covers shall have V-groove seal and stainless steel hardware.
- H. Hubs:
 - 1. Hubs for connection of conduit to junction, device, or terminal boxes shall be threaded cast ferrous alloy.
 - 2. 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.
- I. Boxes:
 - 1. Nonhazardous: NEMA Class 4X stainless steel or nonmetallic.

- 2. Hazardous: NEMA Class 7 cast ferrous.
- J. Manufacturers: PVC coated conduit that bears the ETL Verified PVC-001 label by Robroy Industries, Plasti-Bond, Perma-Cote, KorKap or equal.

K. Installation:

- 1. Plastic coated conduit shall be made up tight, threaded, and installed using tools approved by the PVC-coated conduit manufacturer.
- 2. Exposed conduit threads shall be covered by a plastic overlap coated and sealed per manufacturer's recommendations.
- 3. 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.
- 4. PVC coated conduit shall be supported away from the structure using PVC coated conduit wall hangers or PVC coated conduit mounting hardware.
- 5. Damaged work shall be replaced
- L. Training: Installers shall be trained and certified in the proper installation techniques provided by the PVC-coated conduit system manufacturer. Proof of certification shall be provided under paragraph 1.03.

3.07 RACEWAY SPECIFICATION SHEETS (RACESPEC) – PVC4

- A. Raceway Identification:
 - PVC4
- B. Description:
 - 1. Rigid Nonmetallic Conduit.
- C. Application:
 - 1. Heavy wall thickness for direct bury, concrete encasement or surface mounting where not subject to physical damage.
- D. Compliance:
 - 1. NEMA TC2, UL 651
- E. Construction:
 - 1. Schedule 40, high-impact, polyvinylchloride (PVC)
- F. Minimum size:
 - 1. 3/4 inch exposed; 1 inch embedded or encased
- G. Fittings:
 - 1. PVC solvent weld type
- H. Boxes:

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

APRIL 2022

ATTACHMENT E - TECHNICALS 26 05 33 - 10

- 1. Indoor:
 - a. NEMA Class 4, nonmetallic
- 2. Outdoor and corrosive:
 - a. NEMA Class 4X, nonmetallic

Installation:

- 1. 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.
- 2. Joints shall be made with standard PVC couplings.
- 3. PVC conduit shall have bell ends where terminated at walls and boxes.

END OF SECTION

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE INTENTIONALLY LEFT BLANK

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

ATTACHMENT E - TECHNICALS

26 05 33 - 12

APRIL 2022

SECTION 26 05 74

ARC FLASH ANALYSIS, SHORT CIRCUIT STUDY, AND PROTECTIVE DEVICE COORDINATION REPORT

PART 1 GENERAL

1.01 DESCRIPTION

- A. General: This section specifies that the Contractor subcontract an independent full member NETA Engineering and Study Firm / Testing Firm to prepare:
 - 1. Electrical equipment short circuit study (SCS) for all facility new and existing equipment.
 - 2. Existing equipment includes:
 - a. 01-MS-01 (existing)
 - b. 01-MS-02 (existing)
 - c. 01-DS-01 (existing)
 - d. 01-MCC-01 (existing)
 - e. PANEL "A" (existing)
 - f. PANEL "B" (existing)
 - g. PANEL "C" (existing)
 - h. PANEL 01-PP-01 (existing)
 - i. 02-PP-01 (existing)
 - i. PANEL "M" (existing)
 - 3. Protective device coordination study (PDCS) report for all equipment in the facility electrical distribution power system.
 - 4. Arc flash analysis (AFA) and labeling for all equipment.
- B. The Testing Firm shall be as described in Section 26 08 00 COMMISSIONING OF ELECTRICAL SYSTEMS and shall also be responsible for the electrical testing described therein.

C. Scope:

- The Short Circuit and Protective Device Coordination Report shall include analysis including Utility Company equipment that affect the installed equipment's short circuit ratings, protective device ratings and protective device settings.
- 2. Report shall also include analysis of the equipment's short circuit ratings, protective device ratings and protective device settings affected by the installed equipment.
- 3. Report shall include the results of the arc flash hazard analysis study for energized electrical equipment in accordance with the methods outlined in IEEE Standard 1584 and stated hereinafter

ARC FLASH ANALYSIS, SHORT CIRCUIT STUDY AND PROTECTIVE DEVICE COORDINATION REPORT

APRIL 2022

ATTACHMENT E - TECHNICALS

26 05 74 - 1

4. Work shall include the fabrication of signs with the arc flash hazard study results and the installation of the signs on the equipment in accordance with NFPA 70E Table 3-3.9.3 that includes the personnel protective equipment (PPE) risk category, the energy available, and the clothing recommendation.

1.02 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 Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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 141	Recommended Practice for Electric Power Distribution for Industrial Plants
IEEE 242	Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
NETA ATS	Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems, 1999

1.03 SCHEDULE

- A. The report shall be completed, submitted to the Construction Manager for acceptance and reworked to include the Construction Manager comments and corrections, as required. The report shall be approved by the Construction Manager prior to purchase and fabrication of electrical equipment including switchgear.
- B. A copy of the Construction Manager accepted report shall be sent by the Contractor to all affected manufacturers prior to fabrication.

1.04 SUBMITTALS

A. The report specified in this Section shall be provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

ARC FLASH ANALYSIS, SHORT CIRCUIT STUDY AND PROTECTIVE DEVICE COORDINATION REPORT

APRIL 2022

ATTACHMENT E - TECHNICALS

26 05 74 - 2

PART 2 PRODUCTS

2.01 REPORT

- A. The product shall be a certified report summarizing the short circuit and coordination study and conclusions or recommendations which may affect the integrity of the electric power distribution system. As a minimum, the report shall include the following:
 - 1. The equipment manufacturer's information used to prepare the study.
 - 2. Power Utility Company system information applicable to the project.
 - 3. Short circuit calculations listing short circuit levels at each bus. Provide a sketch of the bus and use both the project term and the bus-code-name to identify the bus, branches, sources, loads. Base the system on the Project One-Line diagram.
 - 4. Coordination study time-current curves including the instrument transformer ratios, model numbers of the protective relays, and the relay settings associated with each breaker.
 - 5. Comparison of short circuit duties of each bus to the interrupting capacity of the equipment protecting that bus.
 - 6. Data used as input to the report that includes cable impedances, source impedances, equipment ratings for the equipment being purchased for the project, etc.
 - 7. Assumptions made during the study.

PART 3 EXECUTION

3.01 GENERAL

- A. Provide a short circuit and coordination study on the electrical power distribution system as specified and as described in Section 6.1 of NETA ATS. The studies shall be performed in accordance with IEEE Standards 141 and 242 and shall utilize the ANSI method of short circuit analysis in accordance with ANSI C37.010.
- B. The studies shall be performed using actual equipment data for both existing and new equipment. The coordination study shall use the data from the same manufacturer of protective relay devices as being provided by the switchgear manufacturer.
- C. For new equipment, the Contractor shall provide copies of final reviewed equipment submittals upon request by the Study Firm.
- D. For existing equipment, the study firm shall provide two separate one man-day trips of onsite investigation to identify loads and power distribution equipment data.

ARC FLASH ANALYSIS, SHORT CIRCUIT STUDY AND PROTECTIVE DEVICE COORDINATION REPORT

APRIL 2022

ATTACHMENT E - TECHNICALS

E. Any power distribution equipment outages shall be scheduled in advance and coordinated with the Owner to limit process outages as required per plant process capacities, refer to Section 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL.

3.02 QUALIFICATIONS

A. The short circuit and coordination report shall be performed by the Testing Firm as described in Section 26 08 00 COMMISSIONING OF ELECTRICAL SYSTEMS. The studies shall be signed by the professional electrical engineer responsible for the studies and registered to practice engineering in the state in which the project is located.

3.03 SHORT CIRCUIT STUDY

- A. The Contractor shall be responsible to obtain and verify all data needed to perform the study. As a minimum, the short circuit study shall include the following:
 - 1. One-Line Diagram:
 - a. Location and function of each protective device in the system, such as relays, direct-acting trips, fuses, etc.
 - b. Type designation, current rating, range or adjustment, manufacturer's style and catalog number for all protective devices.
 - c. Power, voltage ratings, impedance, primary and secondary connections of all transformers.
 - d. Type, manufacturer, and ratio of all instrument transformers energizing each relay.
 - e. Nameplate ratings of all motors and generators with their subtransient reactances. Transient reactances of synchronous motors and generators and synchronous reactances of all generators.
 - f. Sources of short circuit currents such as utility ties, generators, synchronous motors, and induction motors.
 - g. Circuit elements such as transformers, cables, breakers, fuses, reactors, etc.
 - h. Emergency as well as normal switching conditions, as applicable.
 - i. The time-current setting of existing adjustable relays and direct-acting trips, as applicable.
 - j. In addition, short circuit levels at disconnects, control panels/cabinets, and starter panels.
 - 2. Impedance Diagram:
 - a. Available MVA, voltage, and impedance from the power utility company.
 - b. Local generated capacity impedance.
 - c. Bus impedance.
 - d. Transformer and/or reactor impedances.
 - e. Cable impedances.

ARC FLASH ANALYSIS, SHORT CIRCUIT STUDY AND PROTECTIVE DEVICE COORDINATION REPORT

APRIL 2022

ATTACHMENT E - TECHNICALS

26 05 74 - 4

- f. Equipment impedances.
- g. System voltages.
- h. Grounding scheme for the project: Resistance grounding, solid grounding, or no grounding.

3. Calculations

- a. Determine the paths and situations where short circuit currents are the greatest.
- b. Study shall address bolted faults and calculate the 3-phase and line-to-ground short circuits of each case.
- c. Calculate the maximum and minimum fault currents.

3.04 ARC FLASH ANALYSIS

- A. The Contractor shall be responsible to obtain and verify all data needed to perform the study. The arc flash analysis study shall include the following IEEE Standard 1584 nine step analysis process:
 - 1. Collect system and installation data.
 - 2. Determine modes of operation.
 - 3. Determine bolted fault current.
 - 4. Determine arc fault current.
 - 5. Determine protective device characteristic and arc fault duration.
 - 6. Document system voltages and equipment class.
 - 7. Select working distances.
 - 8. Calculate incident energy.
 - 9. Calculate the arc flash protection boundary.

3.05 PROTECTIVE DEVICE COORDINATION STUDY

- A. As a minimum, the coordination study for the power distribution system shall include the following on 5-cycle, log-log graph paper:
 - 1. Time-current for each protective relay or fuse showing graphically that the settings will provide protection and selectivity within industry standards. Each curve shall be identified, and the tap and time dial settings shall be specified.
 - Time-current curves for each device shall be positioned to provide for maximum selectivity to minimize system disturbances during fault clearing. Where selectivity cannot be achieved, the Construction Manager shall be notified as to the cause.
 - 3. Time-current curves and points for cable and equipment damage.
 - 4. Circuit interrupting device operating and interrupting times.
 - 5. Indicate maximum fault values on the graph.
 - 6. Sketch of bus and breaker arrangement.

ARC FLASH ANALYSIS, SHORT CIRCUIT STUDY AND PROTECTIVE DEVICE COORDINATION REPORT

APRIL 2022

ATTACHMENT E - TECHNICALS

3.06 IMPLEMENTING PDCS SETTINGS AND ARC FLASH SIGN INSTALLATION

- A. The Testing Firm shall implement the protective device coordination study settings on new and existing equipment as required in Section 26 08 00, based on the Engineers accepted Protective Device Coordination Report specified herein and submit a final amended report of the Record As-Built electrical equipment protective device settings subsequent to start-up and testing.
- B. The Testing Firm shall work with the Contractor and the Study Firm for implementing the Arc Flash Hazard sign installation requirements for electrical equipment as specified in NEC Article 110.16 Flash Protection and NFPA 70E.

END OF SECTION

ARC FLASH ANALYSIS, SHORT CIRCUIT STUDY AND PROTECTIVE DEVICE COORDINATION REPORT

APRIL 2022

ATTACHMENT E - TECHNICALS

26 05 74 - 6

SECTION 26 08 00 COMMISSIONING OF ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 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.

B. Scope:

- 1. The electrical equipment and conductors to be tested are specified herein and shown on the electrical drawings of the Contract Documents.
- 2. The Contractor shall retain an independent InterNational Electrical Testing Association (NETA) member Engineering and Testing Firm (Testing Firm) for specified on-site acceptance testing of the project electrical power distribution system and utilization equipment covered by this contract.
- 3. The Testing Firm shall be responsible for the Short Circuit and Protective Device Coordination Report as specified in Section 26 05 74. The Testing Firm shall verify the protective device settings are implemented in accordance with Section 26 05 74. The Testing Firm work includes the ARC-Fault equipment labeling work as specified in Section 26 05 74.
- 4. Tests performed by the Testing Firm shall be witnessed by the Owner's Representative. Provide the Construction Manager 30-day advanced notice for Testing Firm tests. Insulation tests by the Contractor typically will not be witnessed. Critical equipment witness testing may be requested by the Construction Manager.
- 5. The manufacturer of the electrical equipment supplied for the project shall complete their on-site factory inspection, testing, and setup prior to the Testing Firm's Acceptance Testing and subsequent Protective Device setting verification work. The power monitors shall be set up by the factory representatives and power monitor readings and settings verified by the Testing Firm. Manufacturer work is specified in the respective equipment sections.
- 6. The Installation Contractor shall test motors, conductors, and equipment as specified and shown. Contractor shall provide the labor, tools, material, including quality power sources required by the Testing Firm equipment, and other services necessary to provide specified tests and retesting.
- 7. Submit proposed electrical test procedures for tests to be performed by the Installing Contractor, other than insulation resistance testing, and proposed test procedures for tests to be performed by the Testing Firm.

APRIL 2022

COMMISSOINING OF ELECTRICAL SYSTEMS

ATTACHMENT E - TECHNICALS

26 08 00 - 1

1.02 REFERENCES:

- A. This section contains references to the following documents in 1.02.B. 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 Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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)

1.03 SUBMITTALS

A. Functional testing and checkout procedures and schedule shall be provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

PART 2 PRODUCTS

2.01 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	
26 05 00-A	Wire and Cable Resistance Test Data Form	
26 05 00-B	Installed Motor Test Data Form	
26 05 00-C	Dry Transformer Test Data Form	
40 61 13-A	Loop Wiring and Insulation Resistance Test Data Form	
40 61 13-B	Control Circuit Piping Leak Test Form	
40 61 13-C	Controller Calibration Test Data Form	
40 61 13-J	Individual Loop Test Data Form	

APRIL 2022

COMMISSOINING OF ELECTRICAL SYSTEMS

ATTACHMENT E - TECHNICALS

26 08 00 - 2

40 61 13-K

Loop Commissioning Test Data Form

2.02 PRODUCT DATA

A. In accordance with Section 01 33 00 SUBMITTAL PROCEDURES, the Contractor shall submit the completed test report Section 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL, Forms A and B as specified in Part 3 herein.

PART 3 EXECUTION

3.01 TESTING

A. General:

- 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:

- 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 26 05 00-A contained in Section 01 99 90 REFERENCE FORMS, and submitted for acceptance. Insulation with resistance of less than 10 megaohms is not acceptable.
- 3. Motor Tests: The Installed Motor Test Form, Form 26 05 00-B, contained in Section 01 99 90 REFERENCE FORMS shall be completed for each motor after installation and submitted for acceptance. All motors shall have their insulation resistance measured before they are connected.
- 4. 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 megaohms are not acceptable.
- 5. 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.

APRIL 2022

COMMISSOINING OF ELECTRICAL SYSTEMS

ATTACHMENT E - TECHNICALS

26 08 00 - 3

- 6. Power Distribution Equipment: Transformers, panelboards, and other power distribution equipment shall have their insulation resistance measured phase-to-phase and phase-to-ground.
- 7. Power Utilization Equipment: Test receptacles and power outlets using a device to verify polarity, grounding, and the correct wiring connections.

C. Functional Testing:

- 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. 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

APRIL 2022

COMMISSOINING OF ELECTRICAL SYSTEMS

ATTACHMENT E - TECHNICALS

26 08 00 - 4

SECTION 26 09 16 ELECTRICAL CONTROLS AND RELAYS

PART 1 GENERAL

1.01 DESCRIPTION

- A. The vendor, manufacturer, and custom control panels shall provide enclosures, selector switches, pushbuttons, indicators, terminal strips, surge devices, nameplates, testing procedures, wiring method, wiring color coding, wire labeling, separation between power, controls, and instruments, hardwired logic relays or PLC logic products as specified herein.
- B. This section specifies electrical control and monitoring devices:
 - 1. Control Devices:
 - a. Pushbuttons
 - b. Selector Switches
 - c. Indicating Lights
 - d. Control Station Enclosures
 - e. Horns
 - f. Beacons
 - 2. Control Relays:
 - a. Load-Switching
 - b. Logic Level Switching
 - c. Timers and Time Switch
 - d. Alternators
- C. This section specifies power devices:
 - 1. Magnetic Contactors:
 - a. Lighting Contactors
 - b. Motor Contactors
 - 2. Safety Disconnect Switches
 - 3. Manual starters per Section 26 29 13 ENCLOSED CONTROLLERS
 - 4. Field Instrument and Field Analyzer: Key-Switch in control station with surge devices
 - 5. Overcurrent Protection: Circuit breakers
 - 6. Elapsed Time Indicators
 - 7. Current transformers and transducers
 - 8. Time Switch
 - 9. Motor Driven Timers On Delay and Off Delay
 - 10. Intrusion Switches and Override Key Switches
 - 11. Thermostats

APRIL 2022

ELECTRICAL CONTROLS AND RELAYS

ATTACHMENT E - TECHNICALS

- 12. Static Ground Indicator and Interlock System
- D. Request clarification where conflicts occur with this section and other sections.

1.02 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 Advertisement for Bids or Invitation to Bid or on the effective date of the Agreement if there were no Bids.
- C. 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.
- D. 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
NEMA 250	Enclosures for Electrical Equipment (1000 volts maximum)
NEMA ICS-1	General Standards For Industrial Controls and Systems
NEMA ICS-2	Industrial Control Devices, Controllers, and Assemblies
NEMA KS 1	Enclosed Switches

1.03 SUBMITTALS

- A. The following submittals shall be provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
 - 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.

APRIL 2022

ELECTRICAL CONTROLS AND RELAYS

ATTACHMENT E - TECHNICALS

- 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. Arrangement drawings of the panel enclosure indicating the front door and panel equipment arrangement and dimensions, and enclosure type.
- 3. Nameplate legend with engraving and sizes.
- 4. Internal layout drawings showing all components.
- 5. List of materials and components with the layout drawings.
- 6. Elementary / schematic diagrams
- 7. Internal wiring connection diagrams.
- 8. External wiring interconnection diagrams including interlocks.
- 9. Power and control single line diagrams, where motor controllers are included.
- 10. Manufacturer's catalog data for all material provided under this section shall be assembled in a folder with each page clearly marked with the item model number and reference number to the specification.

PART 2 PRODUCTS

2.01 CONTROL DEVICES

A. Pushbuttons:

- 1. Pushbuttons shall be flush head, heavy-duty, with NEMA rating to match enclosure type. Operators shall be green for start function, red for stop functions, and black for all other functions. The escutcheon legend shall be as specified on the drawings.
 - a. UL Listed.
 - b. Dielectric Strength: 1300 Volts for one minute for Logic Reed contacts, 2200 Volts for one minute for other contacts.
 - c. 30.5mm mounting hole.
 - d. Temperature operating range –10 degree C. to +55 degree C.
 - e. Momentary contact type
 - f. When switching circuits are monitored by programmable controllers or other solid state circuits, furnish hermetically-sealed, logic-reed type contacts rated not less than 0.15 amperes at 150 Vac and 0.06 amperes at 30 Vdc.
 - g. When switching circuits are not monitored by programmable controllers or other solid state circuits, furnish contacts with NEMA Utilization Category rating A600 rated not less than 10 amperes continuous and 6 amperes break at 120 Vac.
- 2. Manufacturer: Allen-Bradley 800T/800H series or equal.

APRIL 2022

ELECTRICAL CONTROLS AND RELAYS

ATTACHMENT E - TECHNICALS

B. Selector Switches:

- Selector switches shall be heavy-duty with NEMA rating to match enclosure type. Selector switches shall have maintained position contacts. Switches shall be provided with contact blocks and number of positions as required performing the specified or indicated operations.
- 2. The escutcheon legend shall be as specified on the drawings. Provide:
 - a. UL Listed.
 - b. Dielectric Strength: 1300 Volts for one minute for Logic Reed contacts, 2200 Volts for one minute for other contacts.
 - c. 30.5mm mounting hole.
 - d. Temperature operating range –10 degree C. to +55 degree C.
 - e. Standard knob operator (not lever type nor wing lever type)
 - f. Number of positions and contact configuration as shown on Drawings.
 - g. When switching circuits are monitored by programmable controllers or other solid state circuits, furnish hermetically-sealed, logic-reed type contacts rated not less than 0.15 amperes at 150 Vac and 0.06 amperes at 30 Vdc.
 - h. When switching circuits are not monitored by programmable controllers or other solid state circuits, furnish contacts with NEMA Utilization Category rating A600 rated not less than 10 amperes continuous and 6 amperes break at 120 Vac.
- 3. Manufacturer: Allen-Bradley 800T/800H series or equal.
- 4. Field instruments and field analyzers specified shall have a lock-out style selector switch for locking on or locking off the 120Vac power source. The selector switch shall use a control station in NEMA-12, 4, 4X, or 7 as required by the area classification. Provide O-Z/Gedney Class 441 with two position key-operated maintained contact switch. Provide surge protection device that matches the enclosure type of the power disconnect type control station, field instrument, or field analyzer: Telematic TP48 transmitter surge protection device or equal.

C. Indicating Lights:

- Red, amber, green, and blue indicating lights shall be heavy-duty full voltage 120Vac or 24Vdc push-to-test LED type with NEMA rating to match enclosure type for installation in a 30.5mm hole. Furnish with 28 chip high visibility LED. The escutcheon and lens color shall be as shown on Drawings or scheduled.
- 2. White indicating lights shall be as above, incandescent type lamp.
- 3. Manufacturer:
 - a. Allen-Bradley 800H-QRTH10 series or equal for 120Vac applications with colors other than white.
 - b. Allen-Bradley 800H-QRTH24 series or equal for 24Vdc applications with colors other than white.
 - c. Allen-Bradley 800H-QRT10 series or equal for 120Vac applications with white.

APRIL 2022

ELECTRICAL CONTROLS AND RELAYS

ATTACHMENT E - TECHNICALS

d. Allen-Bradley 800H-QRT24 series or equal for 24Vdc applications with white.

4. Indicating Light Lens Color:

Lens Color	Typical Function	Example
Green	Danger, running, open	Equipment operating, motor running, valve open, power voltage applied, cycle in automatic
Amber	Fault condition, attention	Equipment failure, status abnormal
Red	Off, closed, ready	End of cycle; unit or head returned; motors stopped; motion stopped; contactors open, valve closed
White or Clear	Normal condition	Normal pressure of air, water, lubrication, control power on, status okay
Blue	Advisory	Control mode not in automatic

D. Control Station Enclosures:

- 1. Enclosures locations and ratings:
 - a. Indoors conditioned space: NEMA 12
 - b. Outdoors, process and Corrosive areas: NEMA 4X stainless steel
 - c. NEC 500 Hazardous Areas: NEMA-7.

E. Control Power Transformers:

- 1. Sized for the panel devices and products.
- 2. Dual primary and single secondary fusing.

2.02 CONTROL RELAYS

A. Load-Switching Control Relays:

- 1. Control relays used for switching loads such as solenoids, actuators, contactors, motor starter coils, remote interlocking, etc. shall be heavy-duty machine tool type.
- 2. Contacts shall be 4-pole and be field interchangeable to either normally-open or normally- closed. Relay shall be capable of accepting a 4-pole adder.
- AC relays shall have NEMA A600 contact ratings and electrical clearances for 600 volts. DC relays shall have NEMA P300 contact ratings and electrical clearances for 250 volts.
- 4. Manufacturer: Allen Bradley Bulletin-700, Square D Class 8501, or equal.

B. Logic Level Switching Control Relays:

- 1. Control relays for signal circuits shall have a minimum of three SPDT, gold-flashed, fine silver contacts rated 10-ampere resistive at 120V AC or 28Vdc.
- 2. Control relays shall be plug-in type with heavy-duty, barrier-protected screw terminal sockets and clear polycarbonate dust cover with clip fastener.
- 3. AC models shall have neon lamp indicator wired in parallel with coil. DC models shall have LED lamp indicator wired in parallel with coil.

APRIL 2022

ELECTRICAL CONTROLS AND RELAYS

ATTACHMENT E - TECHNICALS

4. Manufacturer: Potter Brumfield series KUP; IDEC Series RH; or equal

C. Timers:

- 1. Multi-function, micro-controller based, socket mounted timing relay.
- 2. Single functions:
 - a. Delay on Make
 - b. Delay on Break
 - c. Recycle (on time first, equal recycle delays)
 - d. Single shot
 - e. Interval
 - f. Trailing edge single shot
 - g. Inverted single shot
 - h. Inverted delay on break
 - i. Accumulative delay on make
 - j. Re-triggerable single shot
- 3. Dual functions:
 - a. Delay on make/delay on break
 - b. Delay on make/recycle (on time first, equal recycle delays.)
 - c. Delay on make/interval
 - d. Delay on make/single shot
 - e. Interval/recycle (on time first, equal recycle delays)
 - f. Delay on break/recycle (on time first, equal recycle delays)
 - g. Single shot/recycle (on time first, equal recycle delays)
 - h. Recycle both times adjustable (on time first)
 - i. Recycle both times adjustable (off time first)
 - j. Interval/delay on make
 - k. Accumulative delay on make/interval
- 4. Time delay range, switch selectable:
 - a. Single function 0.1 second to 1,705 hours in 8 ranges.
 - b. Dual function 0.1 second to 3,100 minutes in 8 ranges.
 - c. Setting accuracy +/- 1 percent or 50 milliseconds, whichever is greater.
 - d. Repeat accuracy +/- 0.1 percent or 16 milliseconds, whichever is greater.
- 5. Output:
 - a. Two Form-C electromechanical isolated contacts rated 10-amperes resistive at 240Vac
 - b. Rated 1/3-horsepower at 120 or 240Vac
 - c. Double-pole double-throw: DPDT.
 - d. Mechanical life: 10,000,000 operations
- 6. Electrical life: 1,000,000 operations at full load.
- 7. Mounting: Magnal Plug 11-pin socket
- 8. Environment: -20 to +65 degree C.

APRIL 2022

ELECTRICAL CONTROLS AND RELAYS

ATTACHMENT E - TECHNICALS

9. Manufacturer: ABB/SSAC's multifunction type TRDU time delay relay with dipswitch function setting with 12Vdc, 24Vac, 120Vac, 240Vac inputs as required or indicated or equal.

D. Time Switch

Provide an electronic time switch with full-year control in a NEMA 1 enclosure.
 The switch shall incorporate a non-volatile memory that maintains programmed switching times for the life of the time switch and provide a factory installed field replaceable lithium or alkaline battery for time keeping and calendar information for a minimum of 8 years. Furnish with one single-pole, double-throw output switch rated 20-ampere at 240Vac. Furnish with manual override control.

2. Manufacturer:

- a. Intermatic Model ET70115CR or equal.
- b. Paragon Electric Company, Inc. EC71ST or equal.

E. Alternating Relay

- 1. Alternate assignment between "Duty" and "Stand-by" at the end of each run cycle.
- 2. Double-pole, double-throw output relay rated for 7-amps inductive at 120-volts AC. Isolation not less than 1,500-volt RMS input to output. Life of 1,000,000 operations at full electrical load.
- 3. Switch to select alteration or continuous operation of either load.
- 4. Mount in Magnal 11-pin socket.
- 5. Operating temperature range of –20 to +60-degree C.
- 6. Manufacturer: ABB-SSAC type ARP series or Engineer accepted substitute.

F. Motor Driven Timers- On Delay And Off-Delay

- 1. Time Delay Relay Upon Energization (TDE) or Upon De-Energization (TDDE): TDE driven by a 120 Vac synchronous motor that starts timing when initiated by an external signal via closing a dry contact. Turn a knob on the front of the dial for time settings. TDE device will reset upon power failure. TDDE device will not reset upon power failure. Special configuration where specified: will not reset upon power failure.
- 2. Provide a pilot light visible from the front of the timer to indicate when the timer motor is energized. Provide visual indication by a cycle progress pointer that advances to zero from the setting then back to zero as time progresses.
- 3. Provide two of "instantaneous" NEMA Form-C output contacts that actuate when the timing is initiated. Provide two "delayed" NEMA Form-C contacts that actuate when the unit has timed out or de-energized. The timer automatically resets, when the timing cycle is completed. Contact ratings: 10-ampere at 120 Vac and 5-ampere at 240 Vac.
- 4. Permanently mount and setup the timer with the initial settings shown or specified. Timer range with 16 configurations from 5-seconds to 60-hours. Range and timer setpoints shown on drawings.

APRIL 2022

ELECTRICAL CONTROLS AND RELAYS

ATTACHMENT E - TECHNICALS

5. Timer Manufacturer: Eagle Cycl-Flex Automatic or Manual Reset Timer: HP5 series or HP5E series; Automatic Timing Controls, Series 305D Motor Driven Analog Reset; or equal.

2.03 HORNS AND BEACONS

- A. The alarm beacon shall be a 75-watt sealed-beam lamp with motor driven rotating reflector; Beacon shall be for 120-volt AC service and shall be Federal Signal Model 191XL or equal.
- B. The horn shall be a surface mount 120-volt AC enclosed buzzer and shall be Federal Signal Model WB350 (NEMA 4X); Model 31X (NEMA 7) or equal.
- C. The above equipment shall be NEMA 4 and or NEMA 7 to meet the respective area classification.
- D. Each horn and beacon located standalone shall include a 6 x 10 inch Red with white letter lamacoid nameplate with the specific warning such as the following:
 - DANGER GAS
 - 2. VENTILATION SYSTEM FAILURE
 - 3. As needed for each application.

2.04 MAGNETIC CONTACTORS

A. Lighting Contactor:

- 1. Lighting contactors shall be 100 percent rated for ballast and tungsten lighting, resistance and other non-motor loads.
- 2. Contactor shall be rated 600Vac, 60-Hertz with the ampere rating and number of poles as indicated on the drawings. Provide a minimum of two poles per NEMA ICS 2-211B for industrial-duty applications.
- 3. The following options shall be available and shall be provided as indicated on the drawings:
 - a. Auxiliary contacts rated 5-amperes at 600Vac.
 - b. Timer or time clock attachment.
 - c. Transient suppression module for 120Vac control circuits.
 - d. Electrically or mechanically held as specified.
- 4. Contactors shall be provided with disconnecting means and overcurrent protection mounted in the same enclosure.
- 5. Manufacturers:
 - a. Allen Bradley Bulletin 500L or 500LP
 - b. Square D Class 8903
 - c. ASCO 918 Remote Control with control module
 - d. or equal.

B. Motor Contactors:

APRIL 2022

ELECTRICAL CONTROLS AND RELAYS

ATTACHMENT E - TECHNICALS

- Motor contactors shall be designed for continuous operation of induction motors at 600Vac or less at 60-Hertz and shall comply with NEMA ICS 2-210. Unless otherwise specified or indicated, minimum contactor size shall be NEMA Size-1.
- 2. Motor contactors shall be supplied with a normally open auxiliary contact for use as a hold-in-contact and status contacts with a minimum of two additional Form-C contacts. Provide 120Vac coil voltage and 60-Hertz frequency with the number of poles and auxiliary contacts as indicated.
 - a. Manufacturer: GE, ABB, Allen Bradley, Square D, Eaton-Cutler Hammer or equal.
- Provide solid-state overloads relays with one alarm contact. Where specified and shown as E-SSOL, provide the electronic SSOL relay: Automatic Timing and Controls (ATC) Motor Guardian for alarming and tripping on under-current, over-current, single-phase, ground-fault, motor-jam conditions. Provide ATC current transformers and voltage connections.
 - a. Manufacturer: ATC Lancaster, PA. Model: Motor Performance Analyzer; or equal.

2.05 SAFETY DISCONNECT SWITCHES

- A. Safety disconnect switches shall be heavy-duty, 30-400-ampere ratings as indicated, non-fused as indicated, stainless steel operator, safety type rated 600 volts AC.
- B. Provide fusible disconnect switches with ratings as indicated with built-in fuse pullers. Provide LPS, LPN, or LPJ 200KAIC current limiting fuses as appropriate for the circuit type and the circuit voltage.
- C. Enclosure locations and ratings:
 - 1. Indoor enclosures: NEMA 12
 - 2. Outdoor or corrosive areas: NEMA 4X
 - 3. Hazardous areas: NEMA 7
 - 4. Classified areas: Suitable for the specified classification.
- D. The operating handle shall be capable of being padlocked in the "off" position. The operator shall be a positive, quick-make, quick-break mechanism. Provide bolt-on hubs. Provide door lock. Provide nameplates with the equipment tag number, equipment description, and power source as indicated on the drawings. Submit nameplate list.
- E. Switches shall be horsepower rated for motors and shall comply with NEMA KS-1. Switches shall be provided with defeatable door interlocks that prevent the door from opening when the operating handle is in the "on" position. Switches shall have line terminal shields.
 - 1. Manufacturer: ABB, Cutler-Hammer, General Electric, Square-D, or equal.

APRIL 2022

ELECTRICAL CONTROLS AND RELAYS

ATTACHMENT E - TECHNICALS

2.06 OVERCURRENT PROTECTION

A. CIRCUIT BREAKERS: Circuit breakers shall be thermal magnetic, molded case type with the ampere rating as specified. Unless otherwise specified or indicated, circuit breaker interrupting rating shall be 65,000 amperes symmetrical.

2.07 ELAPSED TIME INDICATORS

A. Elapsed time indicators shall be panel mounted, non-resettable, 5.5-digit, hour indicator, rated 120Vac, 60-Hertz.

2.08 CURRENT TRANSFORMERS AND TRANSDUCERS

- A. Provide monitoring current transformers with 600Vac insulation and primary ampere rating as indicated with 5-ampere output.
- B. Provide AC current transducer for any one of the phase conductors of the power circuit to be installed through onboard toroid. Provide a loop-powered transducer with input rated from 0 to 50-ampere with 4-20madc analog output scaled for the primary current of the current transformer. Provide zero and span adjustments.
 - 1. Manufacturer: ABB AC current transducer TCSA Series Loop Powered and mounting accessories, or equal.
- C. Provide a DIN rail or back plate mounted AC current transducer that is a loop-powered transducer with input rated from 0 to 5-ampere and with 4-20madc analog output scaled for the primary current of the current transformer.
 - 1. Manufacturer: ABB AC current transducer DCSA Series Loop Powered and mounting accessories, or equal.

2.09 TERMINAL STRIPS, BLOCKS, AND DEVICES

- A. Power Wiring: Provide back plate mounted terminal strips rated at 600 Vac.
- B. Control Wiring: Provide a DIN rail with spring powered contact rated at 300 Vac 24 ampere with pluggable terminals.
- C. Terminal identification standard to the product provided.
- D. Manufacturer:
 - 1. Standard: Allen Bradley or equal.
 - 2. Standard: DIN rail: Phoenix Contact or Weidmuller Z-Series.

2.10 INTRUSION DEVICES

A. The intrusion switch shall be wide-gap industrial grade magnetic door switch with maximum gap 2.5 inches between the sensing elements. The magnet element shall be mounted on the moving part of the door. The sensor switch shall close when the door is closed. The sensor switch shall open when the door is opened. Provide with appropriate mounting bracket for the entrance doors.

APRIL 2022

ELECTRICAL CONTROLS AND RELAYS

ATTACHMENT E - TECHNICALS

- 1. Manufacturer: George Risk Industries Series 4400 (800-445-5218), http://www.grisk.com/images/product_pdfs/commercial/4400_industrial_surface_mount.pdf or equal.
- B. The intrusion override key switches shall be access control type with mortise cylinder and 24 Vdc single pole double throw (SPDT) maintained contacts.
 - 1. Manufacturer: Von Duprin SS-900 series.

2.11 THERMOSTATS

- A. Thermostats shall be line voltage type with motor current rated contact and 70-degree to 140-degree Fahrenheit setpoint range.
 - 1. Manufacturer: Honeywell T631A-1022 or equal.

2.12 STATIC GROUND INDICATOR

- A. Provide a static ground indicator and interlock system for verification of static ground connection to plant equipment, tanker trucks, drums, containers with flammable liquids or powders that are transferred and requiring effective grounding and bonding.
- B. Provide an explosion proof controller that meets NFPA 77 requirements with an intrinsically safe monitoring circuit that verifies a low resistant ground connection and dissipation path to ground. Product shall include an indicator light and interlock enabling product transfer and shall be rated for 120Vac power circuit.
 - 1. Manufacturer: Earth-Rite Plus with Hytrel Cable and Ground Clamp or equal.

2.13 NAMEPLATES

A. Nameplates for all control stations, relays, timers, motor contactors and disconnect switches shall be provided in accordance with the requirements of Section 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL.

2.14 PRODUCT DATA

A. Operation and maintenance data as specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA including approved submittal manufacturer's catalog data, as-built drawings, and instructions for all configurable or programmable components.

PART 3 EXECUTION

3.01 INSTALLATION

A. Control stations, contactors and safety disconnect switches shall be mounted 48 inches above the floor, ground, or slab to center of device.

APRIL 2022

ELECTRICAL CONTROLS AND RELAYS

ATTACHMENT E - TECHNICALS

B. Miscellaneous electrical devices shall be tested in accordance with Section 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL and Section 26 08 00 COMMISSIONING OF ELECTRICAL SYSTEMS.

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS ELECTRICAL CONTROLS AND RELAYS

SECTION 26 24 13 SWITCHBOARDS

PART 1 GENERAL

1.01 DESCRIPTION

- A. This section specifies indoor, front accessible, deadfront power distribution switchboards rated 600 volts, 3 phase, 60 Hertz.
- B. Provide metal oxide varistor (MOV) surge protective device (SPD) integral within each panelboard that indicates the status and condition of the SPD, tested per NEMA LS-1, rated IEEE C3 Combined Wave of 20kV and 10kA with 200kAIC internal fusing and listed / labeled per UL 1449.

1.02 QUALITY ASSURANCE

A. References:

- 1. This section contains references to the following documents in 1.02.B. 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 Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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 C57.13	Requirements for Instrument Transformers
IEEE	Institute of Electrical and Electronic Engineers
NEMA PB 2	National Electrical Manufacturer Association Deadfront Distribution Switchboards
UL 891	Underwriters Laboratory - Deadfront Switchboards

- B. Listed Products: Electrical equipment and materials shall be listed for the purpose per Section 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL.
- C. Factory Tests:

APRIL 2022

ATTACHMENT E - TECHNICALS

SWITCHBOARDS

- Switchboards shall be tested for operation at the specified voltage and current ratings after assembly. The main circuits shall be given a dielectric test of 2200 volts for 1 minute between live parts and ground, and between opposite polarities. The wiring and control circuits shall be given a dielectric test of 1500 volts for 1 minute between live parts and ground.
- 2. Instrument transformers shall have ratio and phase angle tests made in conformance with ANSI C57.13.

1.03 SUBMITTALS

- A. The following information shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
 - 1. Catalog data on all electrical devices and components mounted on or within the switchboard.
 - 2. Manufacturer's data indicating interrupting, withstand, and continuous current ratings of all relevant equipment and components.
 - 3. Arrangement and layout drawings of the switchboard enclosures indicating equipment and bus arrangement and dimensions including areas of permissible cable entries. A list of material and components shall accompany the layout drawings. Include weight and shipping split data.
 - 4. Manufacturer's certification that equipment meets the seismic requirements.

1.04 PROJECT/SITE CONDITIONS

A. Ambient and seismic conditions shall be as specified in Section 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Switchboards shall be provided in accordance with UL 891, NEMA PB 2, and as specified. Provide Arc Flash mitigation products that are offered in the manufacturer's literature.
- B. The Owner and Construction Manager believe 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:
 - 1. Eaton Cutler-Hammer "Pow-R-Line" with Magnum DS breakers
 - General Electric Co. "AV Line" with "Power Break" breakers
 - 3. ABB equal
 - 4. Siemens equal
 - 5. Schneider Square D equal
 - 6. or equal

APRIL 2022 SWITCHBOARDS

ATTACHMENT E - TECHNICALS

2.02 CONSTRUCTION

A. Arrangement:

- 1. Switchboards shall be new, deadfront, indoor type, metal enclosed, self-supporting, and suitable for 600 volts, 3 phase, 3 wire service. Suitable for mounting against a wall without back access.
- 2. Switchboards shall be provided with vertical sections bolted together to form rigid units with switching and protective devices of the number, rating, and type specified.
- 3. Interconnections, instrumentation, and control wiring shall be completed in the factory so that site work is limited to bolting shipping sections and connecting cable assemblies.
- B. Structure: Structural members shall be universal frame die formed type, bolted and braced using self-tapping bolts. Cover plates shall be steel having formed edges. Front plates shall be sectionalized and removable. Lifting eyes shall be provided and switchboards shall be capable of being rolled or moved into position and bolted directly to the floor without the use of floor sills. Switchboard enclosure rating shall be NEMA-12.
- C. Finish: The finish shall comply with Section 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL.

2.03 COMPONENTS

A. Bus Bars:

- 1. Buses shall be tin-plated copper of sufficient size to limit the temperature rise to 65 degrees C, based on UL 891.
- 2. Unless otherwise specified, buses shall be braced to withstand short circuit stresses up to 65,000 RMS amperes. Main horizontal bus shall be mounted on glass polyester insulators and shall have the continuous capacity specified.
- 3. A ground bus having a momentary rating at least equal to the highest momentary rating of any circuit breaker in the assembly shall extend the full length of the switchboard. Ends of the ground bus shall be provided with clamptype terminals for No. 4/0 AWG bare copper grounding conductors.

B. Circuit Breakers:

- 1. General: Circuit breakers shall be stored energy type mechanism to provide quick-make, quick-break, trip-free operation:
 - a. Insulated case UL listed 100 percent continuous current capacity.
 - b. Molded case UL listed 80 percent continuous current capacity.
 - c. Ground fault protection shall be provided as specified or indicated.
- Circuit breakers shall provide manual switching operation by means of a low-torque handle or pushbutton on the front of the unit. Automatic operation during overload and short circuit conditions shall be provided by solid state or thermal magnetic tripping devices located in the circuit breaker frame as specified on the drawings.

APRIL 2022 SWITCHBOARDS

ATTACHMENT E - TECHNICALS

- 3. Circuit breakers shall be front accessible, stationary, individually mounted, and shall have short circuit capabilities equal to or greater than the system in which they are installed.
- 4. Circuit breakers shall have a minimum interrupting current of 65,000 amperes symmetrical RMS at 480 Vac.
- 5. Static Tripping Devices: Solid state static tripping devices shall consist of current sensors, logic assembly, magnetic latch release, and required interconnecting wiring. Tripping devices shall be automatic and self-contained within the breaker frame and shall not require any external relaying or power supplies.
 - a. Tripping functions shall be field adjustable and contain the following tripping characteristics:
 - 1) Overload tripping:
 - a) Adjustable ampere setting
 - b) Adjustable long-time delay
 - 2) Short circuit tripping:
 - a) Adjustable short-time pickup
 - b) Adjustable short-time delay
 - c) Adjustable instantaneous pickup
 - 3) Ground fault tripping:
 - a) Adjustable ground fault pickup
 - b) Adjustable ground fault delay
- C. Panel Instruments and Accessories: Provide the manufacturer's standard metering with associated potential and current transformers with accessories.
- D. Nameplates: In addition to the manufacturer's identification, switchboards shall be provided with phenolic nameplates indicating switchboard, main breaker, and feeder breaker designations as specified. Nameplates shall comply with Section 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL and the NEC for uniquely labeling the power loads and using equipment Tag Numbers and Tag Descriptions where shown on the drawings or schedules.
- E. Conductor Markers: Conductor markers shall comply with Section 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL.
- F. Wiring: Internal switchboard wiring shall consist of single conductor SIS 90 degree C copper wire and UL listed for panel wiring. The wire shall be sized to suit load requirements. Minimum size shall be No. 14 AWG.

2.04 ARC FLASH MITIGATION METHODS

A. The following mitigation method requirements shall apply to all power distribution and utilization equipment supplied for any products supplied on the project and applies to all equipment divisions in the Contract Documents. Refer to the NFPA-70 (NEC), and NFPA-70E (NESC) for equipment labeling requirements.

APRIL 2022 SWITCHBOARDS

ATTACHMENT E - TECHNICALS

- B. Equipment Labels: Equipment labels shall be installed on the outside of the electrical equipment enclosure, cabinet, and panels to avoid opening the equipment to access the manufacture's data or the equipment ratings.
- C. Hinged Doors: Power distribution equipment shall have hinged rear doors where back access is shown.
- D. Remote Racking Devices: Power distribution equipment shall have remote racking devices for Operators to insert or remove rack-mounted breakers, rack-mounted devices, or auxiliary equipment drawers into the associated equipment location.
- E. Insulated Power Bus and Insulated Cable Boots:
 - 1. Provide insulated power bus in power distribution equipment where accessible to installers or maintenance workers.
 - 2. Provide cable boots for power conductor connections to insulate the exposed power conductor connections.
- F. View Windows for Monitoring: Provide protected view windows into cabinets that allow infra-red analyzers, monitors, or cameras to monitor hot temperature for unusual heat generated by deteriorating connections. The view windows shall have a method to move the window protector and hold-in-place during the monitoring operation.
- G. Power and Control Equipment Separation:
 - 1. Provide separation between power equipment within an enclosure, cabinet, or panel by the uses of barriers, separate access doors, or by other means.
 - 2. Provide separation barriers between main breaker feeders coming into equipment and other termination points or bussing on the load side of the main breaker.
- H. Automatic Shutters: Provide automatic shutters, where possible, to close the access to the power bus when a power device is not engaged.

2.05 PRODUCT DATA

- A. The following information shall be provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
 - 1. Results of breaker setting tests as specified in paragraph 3.02.
 - 2. Operation and maintenance information as specified in Section 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL, including final reviewed submittal.

PART 3 EXECUTION

3.01 PROTECTIVE DEVICE SETTING

A. The protective relays and static tripping devices shall be adjusted to the settings specified in the protective device coordination study in Section 26 05 74 ARC

APRIL 2022 SWITCHBOARDS

ATTACHMENT E - TECHNICALS

- FLASH ANALYSIS SHORT CIRCUIT STUDY, AND PROTECTIVE DEVICE COORDINATION REPORT prior to energizing the switchboard.
- B. The instrument transformer ratios and protective devices shown on the drawings are preliminary and are subject to confirmation with the coordination study in Section 26 05 74 ARC FLASH ANALYSIS SHORT CIRCUIT STUDY, AND PROTECTIVE DEVICE COORDINATION REPORT.

3.02 FIELD TEST

A. Each switchboard breaker shall be tested in accordance with Section 26 08 00, COMMISSIONING OF ELECTRICAL SYSTEMS.

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS **SWITCHBOARDS**

SECTION 26 24 16 PANELBOARDS

PART 1 GENERAL

1.01 DESCRIPTION

- A. Three phase, four wire 208Y/120 or 480Y/277 volt, dead front, circuit breaker type panelboard with current rating of 600-amperes or less.
- B. Provide metal oxide varistor (MOV) surge protective device (SPD) integral within each panelboard that indicates the status and condition of the SPD, tested per NEMA LS-1, rated IEEE C3 Combined Wave of 20kV and 10kA with 200kAIC internal fusing and listed / labeled per UL 1449.

1.02 REFERENCES

- A. This section contains references to the documents in 1.02.B. 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 Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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	Institute of Electrical and Electronic Engineers
NEMA	National Electrical Manufacturing Association
NFPA 70	National Electrical Code (NEC)
UL 50	Cabinets and Boxes
UL 67	Underwriters Laboratories, Electric Panelboards
UL 489	Molded-Case Circuit Breakers and Circuit Breaker Enclosures
UL 1449	Surge Suppression Devices

APRIL 2022 ATTACHMENT E - TECHNICALS PANELBOARDS

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. The Owner and Construction Manager believe 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:
 - 1. Eaton / Cutler-Hammer:
 - a. PRL1a and PRL3a Clipper Power Visor Surge Protective Device series
 - 2. General Electric:
 - a. AQ and AD with internal Surge Protective Devices
 - 3. Siemens:
 - a. S1, SE, and S3 with internal Surge Protective Devices
 - 4. Square D:
 - a. NQOD and NF with internal Surge Protective Devices
 - 5. or equal

2.02 ARRANGEMENT AND CONSTRUCTION

- A. The front of the panel shall have concealed trim clamps and hinges. The locks shall be flush with cylinder tumbler-type with spring loaded door pulls. The fronts shall not be removable with doors in the locked position. Panelboard locks shall be keyed alike.
- B. Gutter space shall be provided on all sides of the breaker assembly to neatly connect and arrange incoming wiring.
- C. Panelboard shall be composed of individually mounted circuit breakers designed to be removable without disturbing other breakers.
- D. A directory holder with clear plastic plate and metal frame shall be mounted on the inside of the door.

2.03 BUS

- A. Bus shall be tin-plated copper and shall have current ratings as shown on the panelboard schedules, sized in accordance with UL 67. Ratings shall be determined by temperature rise test.
- B. The minimum bus size shall be 100 amperes. Panel fault withstand rating shall be not less than the interrupting rating of the smallest circuit breaker in the panel. Series rating is prohibited.

APRIL 2022 PANELBOARDS

ATTACHMENT E - TECHNICALS 26 24 16 - 2

C. Panelboards shall be provided with a separate ground bus and, where specified, with a full capacity neutral bus. The neutral bus shall be mounted on insulated stand-offs.

2.04 CIRCUIT BREAKERS

- A. Circuit breakers shall be molded-case type provided for the current ratings and pole configurations specified on the panelboard schedule. Circuit breakers shall be bolt-on type. Circuit breakers shall be listed in accordance with UL 489 for the service specified. Load terminals of circuit breakers shall be solderless connectors.
- B. Circuit breakers rated 120/208 volt alternating current shall have a minimum interrupting current rating of 18,000 amperes symmetrical at 240 volt AC.
- C. Provide circuit breakers with special features such as ground fault interrupting (GFI), heating air conditioning and refrigeration (HACR) rating, or locking capability as shown on the Drawings or Schedules.

2.05 FINISH

A. Panelboard cabinet shall be fabricated from hot-dip galvanized steel in accordance with UL 50. Panelboard fronts shall have a gray, baked enamel finish.

2.06 NAMEPLATES

A. Nameplates shall be provided in accordance with the requirements of Section 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL.

2.07 PRODUCT DATA

- A. The following information shall be provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
 - 1. Manufacturer's certification that bus bracing is capable of withstanding the specified short circuit condition.
 - 2. Operation and maintenance information as specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA.
 - 3. Quantity and rating of circuit breakers provided with each panelboard.

PART 3 EXECUTION

3.01 GENERAL

A. The Contractor shall type in the circuit description on the circuit directory as shown on the final record drawings or panelboard schedule.

APRIL 2022 PANELBOARDS

ATTACHMENT E - TECHNICALS

26 24 16 - 3

B. Provide "Circuit Directory and Circuit Identification" in accordance with NEC 408.4. Each circuit shall be of sufficient detail to allow each circuit to be distinguished from other circuits. Circuit identification shall include load location and provide equipment or instrument Tag Number and Tag Description, where shown on the drawings.

3.02 TESTING

A. Panelboards shall be tested for proper operation and function.

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS **PANELBOARDS**

26 24 16 - 4

SECTION 26 27 26 WIRING DEVICES

PART 1 GENERAL

1.01 DESCRIPTION

A. This Section specifies wiring devices consisting of receptacles, plugs, switches and appurtenances.

1.02 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 Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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
NEMA 250	Enclosures for Electrical Equipment (1000 volts maximum)
NEMA WD-1	General Requirements for Wiring Devices
NFPA 70	National Electrical Code (NEC)

PART 2 PRODUCTS

2.01 GENERAL

- A. Wiring devices shall be UL approved for the current and voltage specified and shall comply with NEMA WD-1. Devices shall contain provisions for back wiring and side wiring with captive binding screws.
- B. Provide devices colored to conform to manufacturer's or industry standard for special use such as orange for isolated ground receptacles, blue for surge suppression receptacles, and red for emergency power receptacles. Unless

APRIL 2022 WIRING DEVICES

ATTACHMENT E - TECHNICALS

shown otherwise on the Drawings or Schedules, normal use devices shall be brown, except those located in finished areas shall be ivory.

2.02 RECEPTACLES AND PLUGS

- A. General: Receptacles shall be grounding type.
- B. 120V Receptacles:
 - 1. Indoor, Clean Areas:
 - a. Unless shown otherwise on the Drawings or Schedules, receptacles shall be duplex 20 amp, NEMA 5-20R, and shall accept NEMA 5-15P and 5-20P plugs. Where the manufacturer of cord connected equipment requires an isolated ground, a receptacle with isolated ground shall be provided.
 - 1) Manufactures: Hubbell 5362, 5362-Al or equal.
 - 2. Outdoor, Process or Corrosive Areas:
 - a. Receptacle shall be duplex, 20 ampere, NEMA 5-20R, weather rated and shall accept NEMA 5-15P and 5-20P plugs. Receptacle and plug shall be corrosion resistant, marine duty with yellow polycarbonate weatherproof lift covers. Receptacle covers shall be extra duty, weatherproof while in use.
 - 1) Manufacturers: Hubbell 53CM62/53CM21, 15W33W/O BOX, or equal.
- C. Plug Caps: Male plug caps for 120 volt and 250 volt receptacles shall be of the cord grip armored type with heavy phenolic housing, of the same manufacture as the receptacle. Plug caps shall be rated 15 amps. One plug cap shall be provided for every four receptacles furnished, with a minimum of two plug caps being provided. Plug caps shall be delivered to the Construction Manager.

2.03 SWITCHES

- A. General Purpose (Indoor, Clean Areas): General purpose switches shall be quiet AC type, specification grade, back and side wired, and shall be provided in accordance with rated capacities as required or as indicated on Drawings or Schedules. Switches shall match receptacles in color.
- B. Manufacturers: General Electric, Hubbell, or Construction Manager accepted substitute, as follows:

	15A, 120-277V		20A, 120-277V	
	G.E. Co.	Hubbell	G.E. Co.	Hubbell
Single:	PS 15AC1	HBL1201	PS 20AC1	HBL1221
Three-way:	PS 15AC3	HBL1203	PS 20AC3	HBL1223
Four-way:	PS 15AC4	HBL1204	PS 20AC4	HBL1224
SPST momentary:	# 7842	-		-
Three position center off momentary:	# 1250	HBL1556		HBL1557

APRIL 2022

WIRING DEVICES

ATTACHMENT E - TECHNICALS

2.04 DEVICE PLATES

- A. Device plates shall be provided with switches. In non-corrosive indoor areas, receptacle device plates shall be made of sheet steel, zinc electroplated with chrome finish as manufactured by Crouse-Hinds, Appleton, or equal.
- B. Device plates in corrosive or outdoor areas shall be corrosion-resistant/marineduty type. Device plates for explosion-proof equipment shall be factory provided with the equipment.
- C. Device plates shall be provided with engraved laminated phenolic nameplates with 1/8-inch white characters on black background.
- D. Nameplates for switches shall identify panel and circuit number and area served. Nameplates for receptacles shall identify circuit and voltage if other than 120 volts, single phase.

2.05 PRODUCT DATA

A. In accordance with Section 01 33 00 SUBMITTAL PROCEDURES, the Contractor shall provide catalog cuts for all materials provided under this section.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Boxes shall be independently supported by galvanized brackets, expansion bolts, toggle bolts, or machine or wood screws as appropriate. Wooden plugs inserted in masonry or concrete shall not be used as a base to secure boxes, nor shall welding or brazing be used for attachment.
- B. Receptacles and switches installed in sheet steel boxes shall be flush mounted. Flush mounted receptacles shall be located 18 inches above the floor unless otherwise indicated. Switch boxes shall be mounted 48 inches above the floor. Receptacles installed in cast device boxes shall be located 48 inches above the floor.
- C. Wiring devices shall be tested for correct connections.

END OF SECTION

APRIL 2022 WIRING DEVICES

ATTACHMENT E - TECHNICALS

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS WIRING DEVICES

SECTION 26 29 13 ENCLOSED CONTROLLERS

PART 1 GENERAL

1.01 DESCRIPTION

A. This section specifies individual motor starters and motor controllers installed in enclosures other than motor control centers. Refer to drawings for product, device, and circuit requirements.

1.02 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 Advertisement for Bids or Invitation to Bid or on the effective date of the Agreement if there were no Bids.
- C. 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.
- D. 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
NEMA ICS 1	General Standards For Industrial Control and Systems
NEMA 250	Enclosures for Electrical Equipment (1000-Volt Maximum)

1.03 SUBMITTALS

- A. The following submittals shall be provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
 - 1. Verification of fault withstand ratings, as applicable, and interrupting ratings
 - 2. The bill-of-material, schematic diagram, and wiring diagrams

APRIL 2022 ATTACHMENT E - TECHNICALS **ENCLOSED CONTROLLERS**

PART 2 PRODUCTS

2.01 ENCLOSURE

- A. The door to the motor starter enclosure shall be interlocked with an externally operated disconnect handle. Disconnect handle shall be arranged to indicate disconnect position. The disconnect operator handle shall have provisions to accept up to three 3/8-inch shackle padlocks to lock the disconnect in the open position.
- B. Enclosures shall be:
 - 1. NEMA 12 for indoor areas.
 - 2. NEMA 4X for outdoor and process locations.
 - 3. NEMA 7 cast metal for hazardous areas.

2.02 MOTOR BRANCH CIRCUIT PROTECTION

- A. General: Motor branch circuit protection shall be provided by fused disconnect switches or molded case motor circuit protectors as specified or as indicated.
- B. Fused Disconnect Switches: Fused disconnect switches shall be provided with visible knife blades, shielded line terminals and quick-make, quick-break switch operator. Fuse clips shall be Class R rejection type and sized for UL Class RK, one-time, time-delay fuses. Fuse assembly shall have a minimum short circuit capacity of 50,000 amps symmetrical.

2.03 MOTOR STARTERS

- A. The basic full voltage, non-reversing motor starter (FVNR) shall consist of a 3 pole, 600 volt AC contactor, transient surge suppressor, and solid-state overload relay, NEMA Size-1 minimum. Reversing (FVR) and multispeed (2S2W) starters shall have additional contactors, overload relays and auxiliary relays as required for the specified functions.
- B. The contactors shall comply with NEMA ICS and NEMA rated for the horsepower as specified.
- C. Overload relays shall be adjustable solid-state with protection for each of the poles. An overload condition shall cause the overload relay to latch in the open position. Reset shall be accomplished with a reset button located on the unit door exterior. Trip setting shall be adjustable from 85 to 115 percent of rating. Provide 2 Form C 2-ampere auxiliary contact for remote monitoring of the overload alarm condition.

2.04 SOLID STATE STARTERS

A. The solid state reduced voltage motor starter shall consist of a self-contained unit for the control of 3-pole, 460-volt, 60-Hertz electric motors. The starter shall use solid-state components to limit current during motor starting and stopping. The

APRIL 2022

ENCLOSED CONTROLLERS

ATTACHMENT E - TECHNICALS

- starter shall include built-in bypass contacts operating closed when the motor is running at speed.
- B. Controls shall permit selection among soft-start with selectable kickstart, current limiting with starting that is programmable 50 to 600 percent of full load current and field set as required. Full voltage start with ramp time less than 0.25 second, dual ramp start, or a start profile designed to reduce fluid surges when starting pumps. Controls shall permit field selection among ramp to stop, coast to stop, or stop profile designed for use with pumps.
- C. Provide an alphanumeric, backlit LCD display. Example: four-line 16-character, for controller set-up, diagnostics, status and monitoring. Provide a keypad for parameter adjustment.
- D. Provide motor overload protection with selectable trip classes of 10, 15, 20 and 30 utilizing three-phase current sensing, initially field set at 20 and field adjusted as required for the application by the Factory Engineer.
- E. Provide a minimum of four 2-ampere, 240 Vac rated auxiliary contacts for customer use. Configure output contacts for:
 - 1. "Auto-Mode" status, "Ready" status, "Full-speed-Bypass" status, and "Fault" alarm. Provide for remote start command. Provide for remote stop command.
- F. Provide the following monitoring functions indicated through the LCD display:
 - 1. Three-phase current
 - 2. Three-phase voltage
 - 3. Power in kW
 - 4. Power usage in kWh
 - 5. Power factor
 - 6. Elapsed time.
- G. Provided as standard:
 - 1. Pre-start line fault alarm
 - 2. Running line fault advising power loss
 - 3. Shorted or missing load connection
 - 4. Pre-start power loss with phase indication
 - 5. Over-temperature
 - 6. Fault alarm with phase problem indication.
- H. Provide the following defeatable protection as standard:
 - 1. Under-load
 - 2. Under-voltage
 - 3. Over-load
 - 4. Over-voltage
 - 5. Voltage Unbalance
 - 6. Excessive Starts Per Hour

APRIL 2022

ENCLOSED CONTROLLERS

ATTACHMENT E - TECHNICALS

- 7. Phase Reversal
- 8. Stall
- 9. Jam.
- I. When fault conditions are detected, the controller shall inhibit starting or shut down. Fault diagnostics shall be indicated in descriptive text on the LCD display. The exclusive use of fault codes is unacceptable. Provide an auxiliary contact that is programmable for fault indication.
- J. Manufacturer and model:
 - 1. ABB
 - 2. Allen-Bradley Bulletin 150 SMC Flex
 - 3. GE
 - 4. Eaton Cutler Hammer
 - 5. Siemens
 - 6. Square D
 - 7. or equal

2.05 TERMINAL BLOCKS

- A. Terminal blocks shall be heavy duty, rated at 20 amperes, 600 volts, and shall contain integral marking strips.
- B. Terminal blocks shall be provided for external control connections. Spare terminals shall be provided as specified. Terminals shall be permanently identified with the numbers specified.

2.06 CONTROL DEVICES

A. Combination starters shall be provided with door-mounted control devices as shown on the diagrams. Control devices shall be as specified in Section 26 09 16.

2.07 TRANSIENT SURGE SUPPRESSORS

A. Transient surge suppressors shall be provided in each starter. Suppressors shall be encapsulated, three component, solid-state circuit, in a module suitable for mounting directly to the starter coil. Additional space for suppressors shall not be required. Suppressors shall be rated 120 volts AC/DC.

2.08 CONTROL CIRCUIT TRANSFORMERS

A. Each combination motor control unit shall be provided with a control circuit transformer rated for 480 x 240-120V, single phase, 60 Hertz. Unless otherwise specified, transformers shall have a minimum volt-ampere rating as follows:

APRIL 2022

ENCLOSED CONTROLLERS

ATTACHMENT E - TECHNICALS

Starter	CPT Minimum Volt-Ampere Rating
Size 1	100
Size 2	150
Size 3	200
Size 4	300

B. The transformer size shall be increased if the devices applied will cause a control transformer overload or secondary terminal voltage to drop to or below 95 percent of rated secondary control voltage when rated primary voltage is applied. Each control transformer shall be mounted within the enclosure along with its associated circuit breaker and starter.

2.09 CONTROL CIRCUIT FUSING

- A. Two primary fuses, rated to interrupt 200,000 amperes at 600 volts, shall be provided on all motor starters.
- B. Each control circuit transformer shall be provided with one control circuit secondary fuse. The secondary fuse shall have an interrupting rating of 10,000 amperes at 250 volts. The secondary fuse shall be sized at 125 percent of full load current. Fuses shall have time delay characteristics as required to prevent false tripping due to coil in-rush currents.
- C. Fuse holders shall be lamp indicating type for blown fuse indication and shall contain neon lamp, clear transparent knob, and solder terminals.

2.10 WIRING

A. Conductors shall be 90-degree C switchboard type. Conductors shall be identified with tag numbers as specified in Section 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL.

2.11 MANUAL STARTERS

A. Manual starters shall comprise a horsepower rated quick-make, quick-break, toggle mechanism together with overloads in all phase conductors.

2.12 NAMEPLATES

A. Nameplates shall be provided in accordance with the requirements of Section 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL.

2.13 PRODUCT DATA

- A. The following product data shall be provided in accordance with Section 01 33 00 SUBMITTALPROCEDURES:
 - Operating and maintenance as specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA.

APRIL 2022

ENCLOSED CONTROLLERS

ATTACHMENT E - TECHNICALS

- 2. Manufacturer's catalog data for all material provided under this section. The catalog data shall be assembled in a folder with each page clearly marked with the item and reference number to the specification.
- 3. MCP and solid-state overload rating selection data.
- 4. Product calibration and setup information.
- 5. A copy of the electrical diagrams in a plastic folder in the units.

PART 3 EXECUTION

3.01 DEVICE CALIBRATION AND TESTING

- A. The Contractor shall size the overload relay heater elements or adjust the solidstate overload device to the actual nameplate full load amperes of the motor connected to the starter.
- B. The Contractor shall adjust motor circuit protector to the lowest setting not causing false tripping.
- C. The Contractor shall record the settings on each motor controller and record the settings as part of the Record As-Built drawing submittal.

3.02 MOUNTING HEIGHT

A. The Contractor shall mount local motor starters at 48 inches above the floor.

3.03 TESTING

A. Local motor starters and circuits shall be tested in accordance with Section 26 08 00 COMMISSIONING OF ELECTRICAL SYSTEMS.

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS **ENCLOSED CONTROLLERS**

SECTION 26 29 23 VARIABLE FREQUENCY MOTOR CONTROLLERS

PART 1 **GENERAL**

1.01 DESCRIPTION

A. Scope:

- This section specifies 480 Vac rated adjustable frequency drive motor controller systems using insulated gate bipolar transistors (IGBT) for pulse width modulation technology (PWM).
- 2. The AFDs specified in this section shall be the product of a single vendor and mounted in the specified cabinet enclosure.
- 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.

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 pump torque requirement. Verify the pump type and select variable torque (VT) or constant torque (CT) as specified in the AFD Schedule. Select 6-Pulse units for small pump motors and 18-Pulse units for large pump motors.

C. AFD Schedule:

Equipment Name & Tag Number	Drive Number	Drive Horse Power	Driven Equipment Specification	AFD Type	AFD Enclosure & Mounting	Distance (ft) from AFD to Driven Equipment Motor
SIDE STREAM PUMP	VFD-0012-1	150	43-05-21 MOTORS	18P or Active Front End (AFE)	Mounted within Side Stream Pump Control Cabinet installed outside of the classified area	As shown measured by contractor on drawings.

APRIL 2022

VARIABLE FREQUENCY MOTOR CONTROLLERS

ATTACHMENT E - TECHNICALS

26 29 23 - 1

D. Seismic:

 Freestanding AFDs shall be braced per Section 01 73 24 DESIGN REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS AND NON-BUILDING STRUCTURES.

1.02 QUALITY ASSURANCE

A. References:

- 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 Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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:

1. 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:

1. The Contractor shall assign unit responsibility for the adjustable frequency drives in this section as specified in Section 43 05 11 GENERAL REQUIREMENTS FOR EQUIPMENT. 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

APRIL 2022

VARIABLE FREQUENCY MOTOR CONTROLLERS

ATTACHMENT E - TECHNICALS

26 29 23 - 2

motor sizes required, regardless of deviations from the scheduled "nominal horsepower."

1.03 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.

1.04 SUBMITTALS

- A. The following information shall be provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
 - 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 Section 43 05 11GENERAL REQUIREMENTS FOR EQUIPMENT. No other submittal material will be reviewed until the certificate has been received and found to be in conformance with these requirements.
 - 2. Catalog and technical data including outline dimensions, shipping section dimensions, weight, and foundation requirements for all assemblies.
 - 3. Schematic diagrams and wiring connection diagram showing functions and identification of terminals.
 - 4. 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

2.01 MANUFACTURERS

- A. The Owner and Construction Manager believe 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 ACQ-580
 - 2. Toshiba Series:
 - a. W7 18-Pulse for centrifugal fan and pump 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. Siemens-Robicon
 - 8. Allen Bradley

APRIL 2022

VARIABLE FREQUENCY MOTOR CONTROLLERS

ATTACHMENT E - TECHNICALS

9. Or equal

2.02 ENCLOSURES

A. Provide AFD in NEMA enclosures with fan cooling and conformal coating protection on circuit boards for corrosive atmosphere protection.

1. General:

- a. 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.
- b. 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.
- c. 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.
- d. 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.

2. Finish and Coatings:

- a. 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.
- 3. Side Stream Pump Control Cabinet:
 - a. AFD can be combined with Side Stream Pump Control Cabinet meeting the above enclosure requirements.

2.03 AFD ASSEMBLIES

A. General:

- 1. AFDs shall include the following assemblies:
 - a. Power disconnect using a thermal magnetic circuit breaker or fused disconnect sized for the specific application by the manufacturer.
 - b. Line input harmonic filter, as required, for harmonic mitigation.
 - c. A load reactor for dV/dT mitigation or motor terminator units for addressing dv/dt effects at the motor
 - d. Rectifier, direct current bus filter, and inverter.
 - e. Control circuitry interface with Operator Interface Unit
 - f. Output protection including phase overload

APRIL 2022

VARIABLE FREQUENCY MOTOR CONTROLLERS

ATTACHMENT E - TECHNICALS

B. AFD Features:

- 1. Provided with the following features:
 - a. Fused control circuit transformer and microprocessor for system logic sequencing functions. Provide fuses with blown fuse indicator lamps.
 - b. Accept 4 to 20 mAdc or digital command input speed reference signal as per skid design.
 - c. A 4 to 20 mAdc or digital output signal proportional to inverter output frequency for the speed range specified as per skid design.
 - d. Adjustable minimum/maximum frequency limits:
 - 1) Minimum frequency shall be adjustable from 6 to 40 Hertz.
 - 2) Maximum frequency shall be adjustable from 48 to 90 Hertz.
 - e. Adjustable and independent timed linear acceleration and deceleration functions, adjustable from 6 to 20 seconds.
 - f. Current limiting.
 - g. Automatic restart.
 - h. Control Wiring:
 - 1) 600 volt stranded copper
 - 2) 90 degrees C color-coded insulation
 - 3) No. 16 AWG
 - i. Wiring Identification and Termination:
 - 1) Crimp type wire lugs with sleeve type markers at each termination point and numbered terminal blocks for external connections.
 - j. Electrically isolated discrete output contacts or Digital signal output for ready, running, remote mode status and trouble alarm as per skid design.
 - k. Conformal coated terminal blocks for control and signal wires entering and leaving the controller.
 - I. Control Power:
 - 1) 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.
 - m. Provide 120 Vac or 24 Vdc as required for Operator Interface Unit.

C. Functional Requirements:

- 1. Supply Power:
 - a. 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
- 3. Load:

APRIL 2022

VARIABLE FREQUENCY MOTOR CONTROLLERS

ATTACHMENT E - TECHNICALS

- a. Capable of driving the specified maximum motor load continuously and under the following conditions:
 - 1) Deliver 110 percent of the specified load for up to 60 seconds in variable torque applications.
 - 2) Deliver 150 percent of the specified load for up to 60 seconds in constant torque applications.

4. Efficiency:

- a. 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:
 - a. 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:
 - a. 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. 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.
 - 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:
 - a. 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.
 - 1) Where motor terminator units are provided, they shall be rated for the environment in which they are located. Motor terminator units shall be:
 - a) Allen Bradley 1204 Motor Terminator for AFD with the maximum carrier frequency of 6 kilohertz,
 - b) Cutler Hammer Reflected Wave Trap (RWT) with the maximum carrier frequency of 12 kilohertz,
 - c) Or Equal product
- D. Protection and Annunciation:
 - 1. Overcurrent Protection:
 - a. Electronic current limit at 150 percent of motor nameplate current and provide motor running overcurrent protection in compliance with NFPA 70.

APRIL 2022

VARIABLE FREQUENCY MOTOR CONTROLLERS

ATTACHMENT E - TECHNICALS

2. Short Circuit Protection:

a. 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:

a. Protected against high and low line voltage on one or more phases.

4. Internal Faults:

a. Internal fault monitoring system to detect malfunctions to protect from transient and sustained faults and to limit damage that may be caused.

5. Motor Over Temperature:

a. Interface to motor over temperature device 2-ampere output contact to shut down and alarm if the motor becomes overheated.

Fault Alarm:

- a. 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:
 - 1) Motor over-temperature
 - 2) Motor overcurrent
 - 3) Incoming power line over/under/unbalanced-voltage
 - 4) AFD over-temperature
 - 5) AFD over-voltage
 - 6) AFD control failure

7. Safety Features:

- a. The AFD shall include:
 - 1) Padlock main disconnect handle in the "Off" position.
 - 2) Mechanical interlock to prevent opening enclosure door with disconnect in the "On" position while the unit door is open.
 - 3) Auxiliary contact on main disconnect to isolate 120Vac control power when fed from external source.
 - 4) Barriers and warning signs on terminals that are energized with the power disconnect "OFF".
 - 5) Separation and insulated barriers between the power and control and instrument products.
 - 6) External emergency stop input

8. Reverse Direction Protection:

- a. Provide protection from inadvertent operation in reverse where reverse rotation can damage the driven equipment.
- 9. Critical Speed Bypass:
 - a. Provide capability to program speed bypass for minimum two critical speed points.
- 10. Transient Voltage Protection:
 - a. Provide solid state transient voltage protection to meet or exceed ANSI C37.90.

APRIL 2022

VARIABLE FREQUENCY MOTOR CONTROLLERS

ATTACHMENT E - TECHNICALS

2.04 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 or OIU function as per skid design.

B. 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.
- 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:
 - 1) Increase or decrease output frequency or data values.
 - b. Monitor Key:
 - 1) Selection of control mode.
 - c. Run and Stop Keys:
 - 1) Starting and stopping in the manual mode.
 - d. Fault Clear / Enter Keys:
 - 1) Reset fault conditions and enter change
 - e. Program Key:
 - 1) Enter the program mode and adjust parameters.
 - f. Remote / Local Location Keys:
 - 1) Operation location and local speed control.
 - g. Auto / Manual Mode Keys:
 - 1) Program mode.
 - h. Number Keys:
 - 1) 0 through 9 keys to access specific parameters.
 - i. Keypad Digital Illustrations:
 - 1) English and display the last 5 faults.
 - j. Frequency / Motor Speed Indication:
 - 1) Calibrated in Hertz and RPM.
 - k. Run Status Indication.
 - I. Ready Status Indication.
 - m. Fault Alarm Indication.
- C. Control and Monitoring Communication

APRIL 2022

VARIABLE FREQUENCY MOTOR CONTROLLERS

ATTACHMENT E - TECHNICALS

1. EtherNet Communication Card (CAT 6)

2.05 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:
 - a. Three set points selectable from 0 to maximum frequency with set points adjustable from 0-30 Hertz.

2.06 ARC FLASH MITIGATION METHODS

A. The following arc flash and mitigation method requirements shall apply. Refer to specification section 26 05 74 ARC FLASH ANALYSIS, SHORT CIRCUIT STUDY, AND PROTECTIVE DEVICE COORDINATION REPORT, NFPA-70 (NEC) for arc mitigation requirements, and NFPA-70E (Standard for Electrical Safety in the Workplace) for equipment labeling requirements.

B. Equipment Labels:

- 1. Equipment labels shall be installed on the outside of the electrical equipment enclosure, cabinet, and panels to avoid opening the equipment to access the manufacture's data or the equipment ratings.
- C. Insulated Power Bus and Insulated Cable Boots:
 - 1. Provide insulated power bus in power distribution equipment where accessible to installers or maintenance workers.
 - 2. Provide cable boots for power conductor connections to insulate the exposed power conductor connections.
- D. Power and Control Equipment Separation-for purpose of arc flash rating:
 - 1. Provide separation between power equipment and controls within an enclosure, cabinet, or panel by the uses of barriers, separate access doors, or by other means.
 - 2. Provide separation barriers between main breaker feeders coming into equipment and other termination points or bussing on the load side of the main breaker.

2.07 NAMEPLATES

A. Nameplates shall be provided in accordance with the requirements of Section 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL, Common Work Results for

APRIL 2022

VARIABLE FREQUENCY MOTOR CONTROLLERS

ATTACHMENT E - TECHNICALS

Electrical. Nameplates shall be provided for all drive enclosures. Provide equipment tag numbers and descriptions as shown on the drawings.

2.08 SPARE PARTS

- A. The following spare parts shall be supplied with each type or frame size AFD:
 - 1. Three sets of all replaceable fuses.

2.09 PRODUCT DATA

- A. The following information shall be provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
 - 1. Operation and maintenance information as specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA, including:
 - a. Final reviewed submittal.
 - b. As-built drive configuration settings.

PART 3 EXECUTION

3.01 FIELD INSTALLATION

- A. Each adjustable speed controller shall be installed and tested by the Contractor with the assistance of factory-trained pump manufacturer engineer/technician and AFD engineer/technician in accordance with the manufacturer's specifications and this Section 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 43 05 11-A specified in Section 01 99 90 REFERENCE FORMS.
 - 1. Adjust drive and perform "start-up" tests as recommended by manufacturer. Set parameters and carrier frequency for existing motors to avoid insulation damage.
 - 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.

APRIL 2022

VARIABLE FREQUENCY MOTOR CONTROLLERS

ATTACHMENT E - TECHNICALS

- 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.

3.02 HARMONIC TESTING

- A. The Testing Firm specified in Section 26 08 00 COMMISSIONING OF ELECTRICAL SYSTEMS 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 defined point of common connection when running from Power Utility power source with a BMI-Dranetz or equal harmonic test set that provides a hard-copy record of the test results.
- B. The test shall also be run with power sourced from the standby generator where such a power source is being used at the project site. THD shall be limited to a maximum level of 8 percent voltage THD on standby generator operation.
- C. Submit the test performance to the Construction Manager per latest version NETA ATS Acceptance Testing Specifications. Refer to the electrical testing specification Section 26 08 00 COMMISSIONING OF ELECTRICAL SYSTEMS.

3.03 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 43 05 11-B specified in Section 01 99 90 REFERENCE FORMS.

END OF SECTION

APRIL 2022

VARIABLE FREQUENCY MOTOR CONTROLLERS

ATTACHMENT E - TECHNICALS

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE INTENTIONALLY LEFT BLANK

APRIL 2022

VARIABLE FREQUENCY MOTOR CONTROLLERS

SECTION 40 05 01 PIPING SYSTEMS

PART 1 GENERAL

1.01 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 40. This section shall be used in conjunction with those sections. This section requires provision of a Design Professional to provide the design of piping supports and other items as specified herein.
- B. Definitions: Pressure terms used in this section and elsewhere in Division 40 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.

1.02 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 Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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)

APRIL 2022
ATTACHMENT E - TECHNICALS

PIPING SYSTEMS

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	
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	

APRIL 2022 ATTACHMENT E - TECHNICALS PIPING SYSTEMS 40 05 01 - 2

Reference	Title	
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 Pipe4 In. and LargerShop Applied	
AWWA C206	Field Welding of Steel Water Pipe	
AWWA C207	Steel Pipe Flanges for Waterworks ServicesSizes 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 PipeSteel Cylinder Type, Pretensioned, for Water and Other Liquids	
AWWA C600	Installation of Ductile-Iron Water Mains and Their Appurtenances	
AWWA C651	Disinfecting Water Mains	

APRIL 2022 ATTACHMENT E - TECHNICALS PIPING SYSTEMS 40 05 01 - 3

Reference	Title
AWWA C900	Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inches Through 12 Inches, for Water
AWWA M11	Steel PipeA Guide for Design and Installation
CISPI 301	Specification Data for Hubless Cast Iron Sanitary System with No-Hub Pipe and Fittings
CGA G-4.1	Cleaning Equipment for Oxygen Service
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.

1.03 PIPING SYSTEM DESIGN

A. Design Professional:

- 1. Provide professional engineering services ("Design Professional") for the design and inspection of piping systems work. The Design Professional must have verifiable experience in the type of piping support, seismic restraint, and expansion control design work required for this project.
- 2. The Design Profession shall be a professional engineer currently licensed to practice in the State of California.
- 3. The Design Professional must obtain and maintain professional liability insurance in the amount of \$1,000,000 aggregate, to be in effect for the duration of this project plus one year.

B. Piping System Design and Inspection:

 The Design Professional shall provide the design, inspection, and certification for piping supports (hangers, guides, anchors, structural attachments, etc.), expansion control and seismic restraints as specified in this Section and referenced Sections. This includes layout drawings, support and hanger design, seismic bracing, and expansion and control.

APRIL 2022 PIPING SYSTEMS

40 05 01 - 4

ATTACHMENT E - TECHNICALS

- 2. The work of the Design Professional is complementary to the design elements specified in the Contract Documents and intended to provide complete piping system designs. The Design Professional's inspection responsibilities also complement inspections by the Construction Manager. Acceptable types of supports, guides, saddles, flexible couplings, hangers and structure attachments for general piping support are specified in Section 40 05 07 HANGERS AND SUPPORTS FOR PROCESS PIPING. Seismic restraints are specified in Section 40 05 07.13 SEISMIC RESTRAINTS FOR PIPING. Incorporate these specific elements into the design prepared by the Design Professional.
- Pipe support and seismic restraint placement is subordinate to the function of anchorage, flexibility, and expansion control provisions. Do not interfere with the function of anchorage, flexibility, and expansion control provisions specified on the drawings.
- 4. Where pipe anchors are specified, they have been designed for longitudinal (axial) seismic loading, in addition to other longitudinal forces associated with expansion control, and pipe thrust for the associated piping. Rely on the specified anchors for longitudinal seismic bracing of the pipe in these instances.
- 5. There may be situations where the Construction Manager wants to control where certain anchors are located, the level of forces that can be transmitted to structures, the direction that expansion growth is allowed, or requires use of particular piping elements. In such cases these elements will be specified on the drawings and incorporated into the Design Professional's design. Mandatory anchorage locations identified on the drawings and maximum limitations, if any, for structure loads from the anchor will be as indicated on the drawings, identifying location and the maximum force that can be imposed on the structure. Where structural load would be exceeded, provide piping flexibility or expansion joints to reduce the maximum loading imposed on the structure.
- 6. For general understanding of intent and bidding purposes, general support locations, arrangements, types and means of attachment may be shown on the drawings. Some of the elements may be specifically designed and detailed. If a particular type of support, anchor, seismic restraint or expansion element is detailed on the drawings, then incorporate those elements into the Contractor's design. Include all elements of the piping system in Piping submittals by the Contractor, including those portions directed by the Construction Manager and complete piping runs.
- Calculate the structural reaction loads for all fixed supports and indicate the calculated reaction loads on the submitted layout drawings. Notify the Construction Manager if any elements specified on the Drawings are incompatible with the overall piping system and its function.
- 8. Include consideration of and provisions for:
 - a. Support and restrain pipe independent of support or restraint provided by equipment or without equipment supported loads exceeding equipment manufacturer's nozzle loading recommendations. Obtain maximum nozzle loads from the equipment manufacturer.

APRIL 2022 PIPING SYSTEMS

ATTACHMENT E - TECHNICALS

- b. Routing of pipe to provide access aisles free of obstruction and worker hazards. Unless otherwise specified or approved by the Construction Manager, the minimum clear space between equipment is 36 inches horizontally. Minimum vertical clearance is 7 ft above the floor or local grade at pedestrian access aisles and egress paths.
- c. Electrical bonding for all gas, fuel, and pneumatic conveyance systems.
- d. Dielectric separation, as specified.
- 9. Include all elements of piping systems required for fabrication and construction in the piping layout submittals. Depict couplings, support, restraint, anchorage, expansion control measures and other elements of the piping system.
- 10. Depict fitting angles and vertical and horizontal pipe locations, as determined by the Contractor, on piping layout drawings.
- 11. Do not interfere with maintenance functions and access around equipment, including monorails and hoists.

PART 2 PRODUCTS

2.01 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 40.

2.02 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:

APRIL 2022 PIPING SYSTEMS

ATTACHMENT E - TECHNICALS

Outside Pipe Diameter, ¹ 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

¹ 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)

2.03 VALVES

A. Valves of the same size and service shall be provided by a single valve manufacturer. Packing shall be non-asbestos 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. Valve operators are specified in Section 40 05 57.13 SEISMIC RESTRAINTS FOR PIPING and Section 46 51 50 OXYGENATION SYSTEM.

2.04 BONDING JUMPERS

A. Provide plated, flexible copper braid jumpers with unplated copper ferrules for attachment to pipe flanges, rated for a 100 amp minimum. Provide Burndy Electrical, Type B series, or Approved Equal, and sufficient conductive, anti-oxidant compound (Burndy Electrical Penetrox series or Approved Equal) to protect ferrules.

2.05 SUBMITTALS

A. Qualifications of the Design Professional charged with inspection and certification of pipe hangers and supports and related scope of work; provide educational background, proof of registration, and proof of insurance and previous experience in performing this type of work. No further submittals under this or any related section will be considered until the Design Professional's qualifications have been reviewed and accepted by the Construction Manager.

APRIL 2022 PIPING SYSTEMS

ATTACHMENT E - TECHNICALS

B. Submit piping layout drawings by plant area for all piping systems. Indicate assembly details, location and placement of field welds, unions and flanges, fittings, valves, flushing connections, drains, sample taps, cathodic protection if required, seismic restraint system, expansion joints, guides, anchors, hangers, supports, and the provisions for thrust restraint if needed, as well as any other pertinent details and appurtenances for all piping, including wall and floor penetrations, where applicable, in that area. Indicate location and clearances from structures and other utilities (ductwork, conduit, electrical tray, etc.). Include details of connections to new and existing equipment, piping and structures. Submit original layouts by the Contractor; photocopies of Contract Drawings are not acceptable. Identify the elevation of pipe at elevation changes.

2.06 PRODUCT DATA

A. Product data on piping materials shall be provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES where specified.

PART 3 EXECUTION

3.01 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 indicated in Section 40 05 07 HANGERS AND SUPPORTS FOR PROCESS PIPING and Section 40 05 07.13 SEISMIC RESTRAINTS FOR PIPING or as 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 direction. Pipe supports shall be hot-dip or mechanically galvanized. Unless otherwise specified, existing pipes and supports shall not be used to support new piping.
 - 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.

APRIL 2022 PIPING SYSTEMS

ATTACHMENT E - TECHNICALS

Bolts shall not be forced into mating flange bolt holes and shall be capable of 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: All plugs, caps, tees and bends in buried pressure piping systems shall be anchored by means of reaction backing or restrained joints as specified.
- E. Bedding and Backfill: (Not Used)
- F. Equipment Connection Fittings: Where shown, equipment connection fittings as specified in Section 40 05 06.16 PIPING CONNECTIONS shall be provided between field piping systems and equipment inlet and outlet connections.
- G. Flexibility: Unless otherwise specified, piping passing from concrete to earth shall be provided with two pipe couplings or flexible joints as specified in Section 40 05 06.16 PIPING CONNECTIONS.

3.02 BONDING

- A. Bonding shall be provided for all gas, fuel, and pneumatic conveyance systems to control static electricity. Provide bonding jumpers to the following piping systems:
 - 1. OXG
- B. Construct electrically continuous piping for the process services listed above and connect directly or indirectly to earth ground.
- C. Provide bonding jumpers where sections of pipe are interrupted with non-conducting sections, fully lined valves that are not through-bolted or other interruption in continuity.
- D. Remove any coatings, dirt, grease or other contaminants from flanges where jumpers are to be installed. Apply sufficient conductive, anti-oxidant compound to protect the entire ferrule from galvanic action and hydrogen sulfide attack.

3.03 PIPING IDENTIFICATION

- A. Pipe Coding: After application of the specified coating and insulation systems, exposed piping, interior and exterior, shall be identified with plastic markers as specified in paragraph 2.02 Piping Identification. 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)

APRIL 2022 PIPING SYSTEMS

ATTACHMENT E - TECHNICALS

3.04 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.

3.05 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 gauges and calibrated volumetric measuring equipment to determine leakage rates. Each test gauge shall be selected so that the specified test pressure falls within the upper half of the gauge'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. Gas, Air, and Vapor Systems:
- 4. The Contractor shall test steam lines hydrostatically in accordance with the ASME procedure for testing pressure piping.
- 5. 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

- 6. The allowable leakage rate for hazardous gas systems, and systems tested with water shall be zero at the specified test pressure throughout the specified test period. Hazardous gas systems shall include oxygen and natural gas systems.
- 7. 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.

APRIL 2022
ATTACHMENT E - TECHNICALS

PIPING SYSTEMS

- B. 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.
- C. Chlorine and Sulfur Dioxide Systems: (Not Used)
- D. Hydraulic and Lube Oil Systems: Upon completion of cleaning, all field connections shall be completed and the system tested at the specified pressure. Pressure loss shall be zero for the specified test period. For fluid power systems, the manufacturer shall supervise the installation and testing of all system components including all field piping.
- E. Drains: Drain systems, other than pumped drain systems, shall be tested in accordance with UPC.

3.06 **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 his 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. 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. Sludge gas, natural gas, oxygen, and propane systems shall be purged with nitrogen and a nitrogen pad maintained at 10 psi until put in service.
- C. Oxygen systems: All Oxygen Service piping and equipment shall be cleaned in accordance with CGA G-4.1
- 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. Potable Water Systems: Potable water piping systems shall be flushed and disinfected in accordance with AWWA C651.

APRIL 2022 PIPING SYSTEMS ATTACHMENT E - TECHNICALS

3.07 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). Refer to Section 40 05 02 PIPING SYSTEM SCHEDULES. Piping services are grouped according to the chemical and physical properties of the fluid conveyed and/or by the temperature or pressure requirements. Piping services specified in the PIPESPECS and on the drawings are alphabetically arranged by designated service symbols as specified in Section 40 05 02 PIPING SYSTEM SCHEDULES.

END OF SECTION

APRIL 2022 PIPING SYSTEMS
ATTACHMENT E - TECHNICALS 40 05 01 - 12

SECTION 40 05 02 PIPING SYSTEM SCHEDULES

PART 1 GENERAL

1.01 SUMMARY

- A. This section specifies a Piping System Schedule for each Process Service. Each Piping System Schedule specifies piping system materials for groups of similar process piping services.
- B. The table in paragraph 1.01C lists process services and the corresponding Piping System Schedule that specifies piping system material requirements for the associated process piping service. See Part 4 for Piping System Schedules that define materials for piping services.
- C. Piping System Schedule assignments are listed in the following table:

Process Service Identifier	Process Service	Piping System Schedule	Fluid Category	Pipe Marker Background Color
CA	Compressed Air (for Oxygen Generation)	40 05 02.05	Compressed Air	Blue
OXG	Oxygen Gas (for Odor Control)	40 05 02.11	Oxygen	Blue
RS	Raw Sewage	40 05 02.43	Wastewater	Green
RS/OXG	Raw Sewage with Dissolved Oxygen	40 05 02.43	Wastewater	Green
D	Drain	40 05 02.89	Drain/Vent	Green
V	Vent	40 05 02.05	Drain/Vent	Green

1.02 QUALITY ASSURANCE

A. References: 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 prevail.

Reference	Title
ASME B1.20.1	Pipe Threads, General Purpose
ASME B16.1	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, and 250
ASME B16.3	Malleable Iron Threaded Fittings Class 150 and 300
ASME B16.5	Pipe Flanges and Flanged Fittings
ASME B16.9	Factory-Made Wrought Steel Butt Welding Fittings
ASME B16.11	Forged Steel Fittings, Socket Welding and Threaded

APRIL 2022

PIPING SYSTEM SCHEDULES

ATTACHMENT E - TECHNICALS

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

Reference	Title
ASME B16.12	Cast Iron Threaded Drainage Fittings
ASME B16.18	Cast Copper Alloy Solder Joint Pressure Fittings
ASME B16.22	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.26	Cast Copper Alloy Fittings for Flared Copper Tubes
ASME B31.1	Power Piping
ASME B31.3	Process Piping
ASME B31.9	Building Services Piping
ASME B32	Solder Metal
ASME B36.10	Welded and Seamless Wrought Steel Pipe
ASME B36.19	Stainless Steel Pipe
ASME B1.1	Unified Inch Screw Threads
ASME Section IX	Boiler and Pressure Vessel Code; Welding and Brazing Requirements
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	Grey-Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A135	Electric-Resistance-Welded Steel Pipe
ASTM A139	Electric-Fusion (ARC)-Welded Steel Pipe (NPS 4 and Over)
ASTM A167	Stainless Steel and Heat-Resisting Chromium-Nickel Steel Plate
ASTM A181/181M	Forgings, Carbon Steel, for General Purpose Piping
ASTM A182/182M	Forged or Alloy Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
ASTM A193/193M	Alloy Steel and Stainless Steel Bolting Materials for High Temperature Service High Pressure Service and Other Special Purpose Applications
ASTM A194/194M	Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service or High Temperature Service, or Both
ASTM A197	Cupola Malleable Iron
ASTM A234/A234M	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM A240	Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels
ASTM A269	Seamless and Welded Austenitic Stainless Steel Tubing for General Service
ASTM A276	Stainless and Heat-Resisting Steel Bars and Shapes
ASTM A307	Carbon Steel Bolts and Studs, 60 000 psi Tensile Strength
ASTM A312/312M	Seamless and Welded Austenitic Stainless Steel Pipe

APRIL 2022 ATTACHMENT E - TECHNICALS PIPING SYSTEM SCHEDULES

Reference	Title	
ASTM A320/320M	Alloy Steel Bolting Materials for Low-Temperature Service	
ASTM A403/A403M	Wrought Austenitic Stainless Steel Piping Fittings	
ASTM A409/A409M	Welded Large Diameter Austenitic Steel Pipe for Corrosive or High Temperature Service	
ASTM A480/A480M	General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip	
ASTM A480/A480M	General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip	
ASTM A536	Ductile Iron Castings	
ASTM A563	Carbon and Alloy Steel Nuts	
ASTM A774/A774M	As-Welded Wrought Austenitic Stainless Steel Fittings for General Corrosive Service at Low and Moderate Temperatures	
ASTM A778	Welded, Unannealed Austenitic Stainless Steel Tubular Products	
ASTM A1011/A1011M	Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High- Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength	
ASTM B75	Seamless Copper Tube	
ASTM B88	Seamless Copper Water Tube	
ASTM B584	Copper Alloy Sand Castings for General Applications	
ASTM C76	Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe	
ASTM C564	Rubber Gaskets for Cast Iron Soil Pipe and Fittings	
ASTM C361	Reinforced Concrete Low-Head Pressure Pipe	
ASTM C443	Joints for Concrete Pipe and Manholes, Using Rubber Gaskets	
ASTM C478	Circular Precast Reinforced Concrete Manhole Sections	
ASTM D638	Test Method for Tensile Properties of Plastics	
ASTM D792	Test Method for Specific Gravity and Density of Plastics by Displacement	
ASTM D1248	Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable	
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 D2466	Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40	
ASTM D2467	Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80	
ASTM D2513	Thermoplastic Gas Pressure Pipe, Tubing, and Fittings	
ASTM D2564	Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe 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	Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings	

APRIL 2022 ATTACHMENT E - TECHNICALS PIPING SYSTEM SCHEDULES

Reference	Title	
ASTM D3212	Joints for Drain and Sewer Plastic Pipes using Flexible Elastomeric Seals	
ASTM D3261	Butt Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Fittings	
ASTM D3350	Polyethylene Plastics Pipe and Fittings Materials	
ASTM D4101	Propylene Plastic Injection and Extrusion Materials	
ASTM D4174	Cleaning, Flushing, and Purification of Petroleum Fluid Hydraulic Systems	
ASTM D4894	Standard Specification for Polytetrafluoroethylene (PTFE) Granular Molding and Ram Extrusion Materials	
ASTM D4895	Standard Specification for Polytetrafluoroethylene (PTFE) Resin Produced from Dispersion	
ASTM F441	Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80	
ASTM F894	Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe	
AWWA C104	Cement–Mortar Lining for Ductile-Iron Pipe and Fittings	
AWWA C105	Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids	
AWWA C110	Ductile-Iron and Grey-Iron Fittings, 3 Inch Through 48 Inch, for Water and Other Liquids	
AWWA C111	Rubber-Gasket Joints for Ductile-Iron and Grey-Iron Pipe and Fittings	
AWWA C115	Flanged Ductile-Iron and Grey-Iron Pipe with Threaded Flanges	
AWWA C150	Thickness Design of Ductile-Iron Pipe	
AWWA C151	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water and Other Liquids	
AWWA C153	Ductile-Iron Compact Fittings	
AWWA C200	Steel Water Pipe, 6 Inches and Larger	
AWWA C203	Coal Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot Applied	
AWWA C205	Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4 Inches through 144 Inches	
AWWA C206	Field Welding of Steel Water Pipe	
AWWA C207	Steel Pipe Flanges for Waterworks Services - Sizes 4 Inch Through 144 Inch	
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	Coal-Tar Epoxy Coating System for the Interior and Exterior of Steel Water Pipe	
AWWA C214	Tape Coating Systems for the Exterior of Steel Water Pipelines	
AWWA C222	Polyurethane Coatings for the Interior and Exterior of Steel Water Pipe and Fittings	

APRIL 2022 ATTACHMENT E - TECHNICALS PIPING SYSTEM SCHEDULES

Reference	Title
AWWA C301	Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
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 C606	Grooved and Shouldered Joints
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
EJMA STDS	Standards of Expansion Joint Manufacturers' Association, Edition No. 6
FSA	Fluid Sealing Association Technical Handbook, Rubber Expansion Joint Division
FEDSPEC, L-C- 530B(1)	Coating, Pipe, Thermoplastic Resin or Thermosetting Epoxy
MIL-H-13528B	Hydrochloric Acid, Inhibited, Rust Removing
MIL-S-8660C	Silicone Compound
MIL-STD-810C	Environmental Test Methods
MSS SP-25	Standard Marking System for Valves, Fittings, Flanges and Unions
MSS SP-43	Wrought Stainless Steel Butt Welding Fittings
MSS SP-97	Integrally Reinforced Forged Branch Outlet Fittings – Socket Welding, Threaded, and Buttwelding Ends
MSS SP-114	Corrosion Resistant Pipe Fittings Threaded and Socket Welding Class 150 and 1000
NSF/ANSI 61:	Drinking Water System Components – Health Effects
SSPC	Society for Protective Coatings
SAE J1227	Assessing Cleanliness of Hydraulic Fluid Power Components and Systems
CCR, Title 24, Part 5	California Plumbing Code

1.03 DEFINITIONS

- A. Terminology used in this Section conforms to the following definitions:
- B. Pipe Connections and Joints:
 - 1. BABS Bell and Ball Spigot
 - 2. BAS Bell and Spigot
 - 3. BFW Butt Fusion Weld
 - 4. BSS Bolted Split Sleeve Coupling
 - 5. BW Butt Weld

APRIL 2022

PIPING SYSTEM SCHEDULES

ATTACHMENT E - TECHNICALS

- 6. BSW Butt-Strap Weld
- 7. CGRV Cut (or Cast) Grooved End Coupling
- 8. CPLG Coupling
- 9. CPO Compression Type Push-On
- 10. CPRSN Compression
- 11. DLW Double Lap Weld (Bell and Spigot)
- 12. EFSW Electro-Fusion Socket Weld
- 13. FLG Flanged
- 14. FLRD Flared
- 15. FP Full Penetration
- 16. FSW Fusion Socket Weld
- 17. HAS Hub and Spigot, Compression (Cast Iron Soil Pipe)
- 18. HBLS Shielded Hubless (Cast Iron Soil Pipe)
- 19. HGRV HDPE Groove Coupling
- 20. HLF CPLG Half Coupling
- 21. HPEG HDPE Plain End with Gripping Teeth
- 22. HXGT HDPE by Grooved End Transition
- 23. LR ELL Long Radius Elbow
- 24. MJ Mechanical Joint
- 25. PGRV Proprietary Groove Coupling
- 26. PO Push-on
- 27. RBAS Restrained (Lap Welded) Bell and Spigot with O-ring rubber gasket
- 28. RGRV Rolled Grooved End Coupling
- 29. RJC Ring Joint Coupling
- 30. RMJ Restrained Mechanical Joint
- 31. RPO Restrained Push-On joint
- 32. SLV Solvent Weld
- 33. SLDR Solder or Brazing
- 34. SLW Single Lap Weld (Bell and Spigot)
- 35. SR ELL Short Radius Elbow
- 36. SW Socket Weld
- 37. THD Threaded
- 38. UN Union

C. Flanges:

- 1. FF Full Face
- 2. LF Loose Flange
- 3. LJ Lap Joint
- 4. LWN Long Weld Neck
- 5. RF Raised Face
- 6. SO Slip-On

APRIL 2022

PIPING SYSTEM SCHEDULES

ATTACHMENT E - TECHNICALS

- 7. THD Threaded
- 8. WN Weld Neck

D. Materials:

- 1. DI Ductile Iron
- 2. RCP Reinforced Concrete Pipe
- 3. RCP-LHP Reinforced Concrete Low Head Pressure Pipe
- 4. SS Stainless Steel
- 5. SV Service (Cast Iron Soil Pipe available with SV rating or XH, extra heavy, rating)

E. Welding:

- 1. FP Full Penetration
- 2. SML Seamless
- 3. WLD Welded

F. Other:

- 1. CFT Cured Film Thickness
- 2. DFT Dry Film Thickness
- 3. Dim Dimensions
- 4. M or E Pipe Matches or exceeds rating of connecting pipe
- 5. Thk Thickness
- 6. Sch Schedule
- 7. Std Standard
- 8. STD Standard Weight or Standard

PART 2 PRODUCTS

2.01 MATERIALS

- A. Pipe size (nominal diameter) and the Process Service Identifier for the contents of the pipeline are specified in pipe line labels on the drawings.
- B. Provide piping system materials and components per the Piping System Schedule assigned for the specified process service and pipe size.
- C. The Rating column in the Piping System Schedule specifies the minimum acceptable pressure rating or wall thickness for the component of the piping system.

APRIL 2022

PIPING SYSTEM SCHEDULES

ATTACHMENT E - TECHNICALS

PART 3 EXECUTION (NOT USED)

PART 4 SCHEDULES

- 4.01 PIPESPEC SYSTEM SHEETS/DETAILED PIPING SPECIFICATION SHEETS.
 - A. Piping System Schedules follow this Section. Piping System Schedules are assigned a Section number in the range from 40 05 02.00 through 40 05 02.89.

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS PIPING SYSTEM SCHEDULES

Schedule 40 05 02.05 - Compressed Air and Vent

Process Service	Compressed Air	Vent		
Process Service Identifier	CA	V		

Test Conditions

Pressure (psig)	Duration(min.)	Medium
200	120	Air

General Requirements

- 1. Full-Faced flanges mated with raised face flanges are not permitted.
- Mating flanges for pipe shall be of the same Standard, Class, and Series. Mating flanges at valves and equipment shall have specified rating and matching drilling pattern.
- 3. Pipe threads per ASME B1.20.1.
- 4. Match metal alloy/grade/type for any metal welded to pipe or fittings. (e.g. do not weld carbon steel to stainless steel; weld Type 316L to Type 316L pipe material.)
- 5. Provide dielectric couplings at material transitions. Provide threaded adapters at material transitions.
- 6. Provide unions or flanges as shown on Drawings to allow for pipe disassembly. Spacing between unions provided for piping disassembly: not less than 60 ft.

Notes

- 1. Flange Bolt length per ASME B16.5 plus three additional threads. Hex head bolt dimensions per ASME B18.2.1. Class 2A standard coarse series threads per ASME B1.1, standard coarse thread series. Hex nut dimensions per ASME B18.2.2 (Heavy Hex). Class 2B standard coarse series threads per ASME B1.1.
- 2. Apply Anti-seize to stainless steel bolts before turning nut on flange bolts.
- 3. Provide long radius elbows.
- 4. Provide weld neck flanges on both sides of wafer, lug body, or flanged valves.
- Hard, drawn, furnished in straight lengths.
- 6. Provide annealed tube for flared fittings. Furnished in straight lengths or coils.
- 7. Furnish threaded adapters at connections to valves.
- Furnish stem extension and valve box.
- 9. Ball Valve shall be steel body with SST ball, full port, PTFE seats and packing, SST blowout-proof stem, lever operator, Class 150# flanges. Kitz 150SCTDZM, Bray Flow-Tek F15, Metso Jamesbury 9150 or equal
- 10. Piping between compressor and receiver shall be insulated with fiberglass flexible blanket (8.0 pounds per cubic foot density, minimum) or mineral wool flexible blanket with minimum 0.016 aluminum jacket constructed of smooth finish aluminum with integral vapor barrier. Attach jacket with aluminum or SST sheet metal screw and secured with 0.020 think by ¾ inch SST expansion bands. Include 20 gauge aluminum caps, sealant and reinforcing

APRIL 2022

COMPRESSED AIR AND VENT

ATTACHMENT E - TECHNICALS

40 05 02.05 - 1

Schedule 40 05 02.05 - Compressed Air and Vent

Process Service	Compressed Air	Vent		
Process Service Identifier	CA	V		

Indoor Dry, Indoor Wet, Outdoor - Exposed

Component	Line Size, in	Rating	Conn./Joints	Material	Spec Section	Notes
Pipe	All	Sch. 40	BW, FLG	Steel: ASTM A53 Gr B, Type E or Type S, Dim. per B36.10	40 05 24	10
Lining for Pipe & Fittings	All	_	_	None	_	
External Coating	All	16 mils DFT	_	<u>Liquid Epoxy</u> : Factory Applied Primer, 3-4 mils (AWWA C210), Field Applied Finish Coat per Spec. Section	09 90 00	
	Valves	16 mils DFT	_	<u>Liquid Epoxy</u> : Factory Applied Primer, 3-4 mils (AWWA C210), Field Applied Finish Coat per Spec. Section	09 90 00	
Fittings						
	1/2 thru 2	Class 150 Class 150 Class 3000	THD	Malleable Iron: ASTM A47 or A197, galvanized, Dim. per ASME B16.3 Ductile Iron: ASTM A536-Gr 65/45/12, galvanized, Dim. per ASME B16.3 Forged Steel: ASTM A105, galvanized, Dim. per ASME B16.11	40 05 24	
	2-1/2 thru 6	Class 3000 Sch. 40	BW, FLG BW, FLG	Forged Steel: ASTM A105, Dim. per ASME B16.11 Wrought Steel: ASTM A234-WPB, Dim. per ASME B16.9	40 05 24	3
Flanges	1/4 thru 2	_	_	None		
J	2-1/2 thru 6	Class 150	LWN, WN, SO	Forged Steel: ASTM A105, FF, Dim. per ASME B16.5	40 05 24	4
FLG Bolts, nuts and hardware	2-1/2 thru 6	_	_	Carbon Steel Bolts: ASTM A307 Gr A. Carbon Steel Nuts: ASTM A563 Gr A hex nuts	_	1

APRIL 2022 ATTACHMENT E - TECHNICALS COMPRESSED AIR AND VENT 40 05 02.05 - 2 Schedule 40 05 02.05 – Compressed Air and Vent

Process Service	Compressed Air	Vent		
Process Service Identifier	CA	V		

Indoor Dry, Indoor Wet, Outdoor - Exposed

Component	Line Size, in	Rating	Conn./Joints	Material	Spec Section	Notes
Flange gaskets	1/4 thru 2	_	_	None		
	2-1/2 thru 6	1/16 in	FLG	Viton/FKM	40 05 01	
Valves	1/4 thru 2	_	THD	As shown on drawings	40 05 60	7
				Needle: Stainless Steel, 40 05 89.23		
	2-1/2 thru 6	_	FLG	Ball: Steel		4, 9

Buried (Includes Embedded and Encased): Not Used

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS COMPRESSED AIR AND VENT 40 05 02.05 - 4

Schedule 40 05 02.11 - Oxygen Gas

Process Service	Oxygen Gas		
Process Service Identifier	OXG		

Test Conditions

Pressure (psig)	Duration(min.)	Medium
200	120	Air

General Requirements

- 1. Design, fabricate, inspect, and test in accordance with the ASME B31.1 Power Piping Code.
- 2. Full-Faced flanges mated with raised face flanges are not permitted.
- Mating flanges for pipe shall be of the same Standard, Class, and Series. Mating flanges at valves and equipment shall have specified rating and matching drilling pattern.
- Pipe threads per ASME B1.20.1.
- 5. Match metal alloy/grade/type for any metal welded to pipe or fittings. (e.g. do not weld carbon steel to stainless steel; weld Type 316L to Type 316L pipe material.)
- 6. Slope all pipe to low point drain. Sags or slope reversal/inflections are not permitted.

Notes

- 1. Flange bolt length per ASME B16.5 plus three additional threads. Hex head bolt dimensions per ASME B18.2.1 (Heavy Hex). Class 2A standard coarse series threads per ASME B1.1, standard coarse thread series. Hex nut dimensions per ASME B18.2.2 (Heavy Hex). Class 2B standard coarse series threads per ASME B1.1.
- 2. Apply Anti-seize to stainless steel bolts before turning nut on flange bolts.
- 3. Provide Long Radius Elbows. Provide full flow fittings. Segmentally welded fittings are not acceptable.
- 4. Provide bonding jumpers per Section 40 05 01.
- 5. Stainless steel stub end for use with Lap Joint flanges. Stub end dimensions and materials to match pipe. Fillet radius of stub ends compatible with inner corner radius of backing flange bore.
- 6. For Headspace and Submerged area exposure, use stainless steel flanges with stainless steel bolts and nuts.
- 7. Factory coat carbon steel/ductile iron backing ring flanges with Liquid Epoxy per AWWA C210, 16 mils DFT, minimum.
- Provide stainless steel flange bolts and nuts with stainless steel flanges.
- 9. Provide weld neck flanges on both sides of wafer, lug body, and flanged valves ½ thru 24 inch. Provide Slip on flanges on both sides of wafer, lug body, and flanged valves 26 thru 72 inch.
- 10. Provide magnetic tracer tape for buried pipe and valves.
- 11. Provide extension stem and valve box.

APRIL 2022 OXYGEN GAS

ATTACHMENT E - TECHNICALS 40 05 02.11 - 1

Schedule 40 05 02.11 – Oxygen Gas

Process Service	Oxygen Gas		
Process Service Identifier	OXG		

- 12. Fabricated fittings per ASTM A774 and AWWA C226 are unlisted materials per ASME B31.1. Design and fabricate fittings per requirements for unlisted materials specified in ASME B31.1 Power Piping Code.
- 13. 316 SST Ball Valves. Apollo 76J-100, Elite E1500 or equal. 800 psig. 100 °F (WOG). Seats and packing PTFE, floating ball mount, lever operator.
- 14. Provide flanged adapters for valves.

Indoor Dry, Indoor Wet, Outdoor, Process Corrosive- Exposed

Component	Line Size, in	Rating	Conn./Joints	Material	Spec Section	Notes
Pipe	1/8 thru 1/2	Sch. 80S	BW, THD, SW, FLG	Stainless Steel: ASTM A312-TP316L, SML, Dim. Per ASME B36.19.	40 05 23	
	3/4 thru 2-1/2	Sch. 40S	BW, THD, SW, FLG	Stainless Steel: ASTM A312-TP316L, SML, Dim. Per ASME B36.19.	40 05 23	
Lining for Pipe & Fittings	All	_	_	None	_	
External Coating	All	_	_	None	_	
	Valves	_	_	Manufacturer's Standard Primer and Finish Coating: Shop or Factory Applied	09 90 00	4
Fittings	1/8 thru 1/2	Class 3000	BW, SW, THD	Forged Stainless Steel: ASTM A182-F316L, Dim. per ASME B16.11.	40 05 23	
		Class 150	FLG	Forged Stainless Steel: ASTM A182-F316L, Dim. per ASME B16.5.		
		Sch. 80S	BW	Wrought Stainless Steel: ASTM A403-WP316L, Dim. per B16.9.		
	3/4 thru 2-1/2	Class 3000	BW, SW, THD	Forged Stainless Steel: ASTM A182-F316L, Dim. per ASME B16.11.	40 05 23	
		Class 150	FLG	Forged Stainless Steel: ASTM A182-F316L, Dim. per ASME B16.5.		
		Sch. 40S	BW	Wrought Stainless Steel: ASTM A403-WP316L, Dim. per B16.9.		
Taps	1/8 thru 1/2	Class 3000	THD, SW	Forged Stainless Steel Tee: ASTM A182-F316L, Dim. per ASME B16.11.	40 05 23	
		Sch. 80S	THD, SW	Wrought Stainless Steel Tee: ASTM A403-WP316L, Dim. per ASME B16.9.		
	3/4 thru 2-1/2	Class 3000	THD, SW	Forged Stainless Steel Tee: ASTM A182-F316L, Dim. per ASME B16.11.	40 05 23	
		Sch. 40S	THD, SW	Wrought Stainless Steel Tee: ASTM A403-WP316L, Dim. per ASME B16.9.		
Flanges	1/2 thru 2-1/2	Class 150	WN, SO, THD	Forged Stainless Steel: ASTM A182-F316L, FF, Dim. per ASME B16.5.	40 05 23	4

APRIL 2022

OXYGEN GAS

ATTACHMENT E - TECHNICALS

40 05 02.11 - 2

Schedule 40 05 02.11 - Oxygen Gas

Process Service	Oxygen Gas		
Process Service Identifier	OXG		

Indoor Dry, Indoor Wet, Outdoor, Process Corrosive- Exposed

Component	Line Size, in	Rating	Conn./Joints	Material	Spec Section	Notes
FLG Bolts, nuts and hardware	All	_	_	Stainless Steel Bolts: ASTM A193 Gr B8M with		1, 2, 8
				Stainless Steel Nuts: ASTM A194 Gr 8M		
Flange gaskets	3 thru 10	1/16 in Thk.	FLG	Neoprene	40 05 01	
Mechanical Coupling Gaskets	None	_	_	None	_	
Compression and Push-On Gaskets	None	_	_	None	_	
Valves	1/8 thru 2-1/2	_	THD	Ball: 316 Stainless Steel Body/Ball		13

Buried: No buried service

APRIL 2022 ATTACHMENT E - TECHNICALS OXYGEN GAS

40 05 02.11 - 3

PENASQUITOS PUMP STATION OXYGEN ADDITION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS OXYGEN GAS

40 05 02.11 - 4

Schedule 40 05 02.43 – Pressurized Wastewater and Drainage

Process Service	Raw Sewage	Raw Sewage with Oxygen		
Process Service Identifier	RS	RS/OXG		

Test Conditions

Pressure (psig)	Duration(min.)	Medium
200	120	Water

General Requirements

- 1. Full-Faced flanges mated with raised face flanges are not permitted.
- 2. Mating flanges for pipe shall be of the same Standard, Class and Series. Mating flanges at valves and equipment shall have specified rating and matching drilling pattern.
- 3. Pipe Threads per ASME B1.20.1.
- 4. Match metal alloy/grade/type for any metal welded to pipe or fittings. (e.g. Do not weld carbon steel to stainless steel; weld Type 316L to Type 316L pipe material.)
- 5. Solvent welding of PVC piping performed with Weld-On 724 (ASTM F 493, NSF/ANSI 14, NSF/ANSI 61) or Approved Equal. Universal plastic pipe solvent is not acceptable. Prior to solvent welding, clean pipe joints to remove all loose debris and prime with a compatible primer. Primer shall stain piping.

Notes

- 1. Flange bolt length per ASME B16.5 plus three additional threads. Hex head bolt dimensions per ASME B18.2.1. Class 2A standard coarse series threads per ASME B1.1, standard coarse thread series. Hex nut dimensions per ASME B18.2.2 (Heavy Hex). Class 2B standard coarse series threads per ASME B1.1.
- 2. Provide Long Radius Elbows. Provide full flow fittings. Segmentally welded fittings are not acceptable.
- Not used
- 4. Install lining and coating prior to welding Threadolet or Half Coupling.
- Provide Concrete Surround for pipe buried below structures.
- 6. Except at flanged connections at valves, flanged connections/joints not permitted on buried Ductile Iron Pipe.
- 7. FNPT tap at factory installed tapping boss. Taps at other locations on pipe and fittings are not permitted.
- 8. No lining or coating for HDPE Pipe.
- 9. Bolts and nuts with metallurgy specified in AWWA C111.
- 10. BW (Butt Weld) and RJC (Ring Joint Coupling) connections/joints not permitted for 14-inch through 24 inch pipe.
- 11. Install plug valve with seat at the inlet or upstream connection to piping.
- 12. Provide square nut operator, extension stem, and valve box for buried valves.

APRIL 2022

PRESSURIZED WASTEWATER AND DRAINAGE

ATTACHMENT E - TECHNICALS

Schedule 40 05 02.43 – Pressurized Wastewater and Drainage

Process Service	Raw Sewage	Raw Sewage with Oxygen		
Process Service Identifier	RS	RS/OXG		

Indoor Dry, Indoor Wet, Outdoor, Process Corrosive, Headspace, Submerged - Exposed

Component	Line Size, in	Rating	Conn./Joints	Material	Spec Section	Notes
Pipe 1/8 thru 2-1/2		Sch. 40	THD	Steel: ASTM A53, Gr B, Type E or Type S, galvanized, Dim. Per ASME B36.10	40 05 24	
	3 thru 12	Sch. 40 or STD	FLG	Steel: ASTM A53, Gr B, Type E or Type S, Dim. Per ASME B36.10	40 05 24	
Lining for Pipe & Fittings	1/8 thru 2-1/2	_	_	None	_	
	3 thru 12	16 mils DFT	_	Liquid Epoxy: Factory Applied, AWWA C210, NSF 61 certified	40 05 24	
External Coating	All	16 mils DFT	_	Liquid Epoxy: Factory Applied, AWWA C210	40 05 24	
	Valves	16 mils DFT	_	Liquid Epoxy: Factory Applied, AWWA C210	40 05 24	
Fittings 1/8 thru	1/8 thru 2-1/2	Class 150	THD	Malleable Iron: ASTM A47 or A197, galvanized, Dim. per ASME B16.3	40 05 24	
		Class 150	THD	<u>Ductile Iron</u> : ASTM A536-Gr 65/45/12, galvanized, Dim. per ASME B16.3		
		Class 3000	THD	Forged Steel: ASTM A105, galvanized, Dim. per ASME B16.11		
		Sch. 40 or STD	FLG	Wrought Steel: ASTM A234-WPB, Dim. per ASME B16.9		
Taps	1/2 thru 2-1/2	Class 3000	THD	Forged Steel Tee: ASTM A105, galvanized, Dim. per ASME B16.11	40 05 24	
		Class 150	THD	<u>Ductile Iron Tee</u> : ASTM A536-Gr 65/45/12, galvanized, Dim. per ASME B16.3		
		Class 150	THD	Malleable Iron Tee: ASTM A47 or ASTM A197, galvanized, Dim. per ASME B16.3		
	3 thru 12	Class 3000	FP Beveled Fillet Weld	Forged Steel Threadolet or Half Coupling: ASTM A105, Dim. per ASME B16.11	40 05 24	4

APRIL 2022

PRESSURIZED WASTEWATER AND DRAINAGE

ATTACHMENT E - TECHNICALS

Schedule 40 05 02.43 – Pressurized Wastewater and Drainage

Process Service	Raw Sewage	Raw Sewage with Oxygen		
Process Service Identifier	RS	RS/OXG		

Indoor Dry, Indoor Wet, Outdoor, Process Corrosive, Headspace, Submerged - Exposed

Component	Line Size, in	Rating	Conn./Joints	Material	Spec Section	Notes
Flanges	4 thru 12	Class 150	LWN, WN, SO	Forged Steel: ASTM A105, FF, Dim. per ASME B16.5	40 05 24	
		Class D	SO	Plate Steel: FF, Material and Dim. per AWWA C207		
FLG Bolts, nuts and hardware	All	All	_	Alloy Steel Bolts: ASTM A193-Gr B7 with Carbon Steel Nuts: ASTM A194-Gr 2H heavy hex	_	1
Flange gaskets	1/8 thru 10	1/16 in Thk.	FLG	Nitrile or Neoprene	40 05 01	
Mechanical Coupling Gaskets	3 thru 12	_	_	Nitrile or Neoprene	40 05 01	
Valves	1/4 thru 2-1/2		THD	Ball: Bronze Body/Ball, 40 05 63.02 Eccentric Plug: Ductile Iron, as shown in details	40 05 60 40 05 62.16	
				Swing Check: Bronze 40 05 65.01		
	3 thru 12		FLG	Plug: AWWA C517, Standard Port, 40 05 62.01 Swing Check: Lever Arm and Spring, Class 150, 40 05 65.16	40 05 60	11

Buried (Includes Embedded and Encased): Not Used

APRIL 2022

PRESSURIZED WASTEWATER AND DRAINAGE

ATTACHMENT E - TECHNICALS

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022

PRESSURIZED WASTEWATER AND DRAINAGE

ATTACHMENT E - TECHNICALS

Schedule 40 05 02.89 – Building Mechanical Drainage

Process Service	Drain		
Process Service Identifier	D		

Test Conditions

Pressure (psig)	Duration(min.)	Medium
5.0	15	Water

General Requirements

- 1. Minimum test conditions specified above. Comply with applicable local plumbing code.
- 2. Sleeve drain, waste and vent piping through structural concrete and masonry.
- Piping under structures, concrete encased pipe from the structure, and piping extended from the structure through the interface between piped commodities common to process/mechanical and yard piping, shall be either CISP or DIP, as specified.
- 4. Not Used.
- 5. Provide copper tube for Outdoor HVAC equipment condensate drains.
- Pipe Threads per ASME B1.20.1.

Notes

- 1. Provide cast iron soil pipe for buried pipe within 5 feet of building perimeter. Pipe materials transition to be at least 6 in above slab or 6 inches inside building perimeter wall.
- 2. Provide long radius elbows.
- Provide magnetic tracer tape,
- 4. Provide BAS joints with embedded steel joint rings for 30-inch and larger RCP.
- 5. Pipe Tape Wrap is not required for pipe installed in Indoor Dry, Indoor Wet, and Outdoor Area Exposures.
- 6. Flange bolt length per ASME B16.5 plus three additional threads. Hex head bolt dimensions per ASME B18.2.1. Class 2A standard coarse series threads per ASME B1.1, standard coarse thread series. Hex nut dimensions per ASME B18.2.2 (Heavy Hex). Class 2B standard coarse series threads per ASME B1.1.
- 7. Provide Non Corrosive, High-Strength, Low-Alloy Steel Bolts or fluoropolymer coated Carbon Steel Bolts for flanges installed in Buried Area Exposure.
- 8. PVC lining is not required for D, RWP, and STD service.
- 9. Fabricated (miter cut pipe) PVC fittings are not acceptable.
- 10. Unreinforced Precast Concrete Manholes: 6 inch minimum wall thickness. Reinforced Precast Concrete Manholes: 4 inch minimum wall thickness. Provide Rubber gasket joints or mastic sealant joints between Precast Concrete Manhole Sections.
- 11. Bolts and nuts with metallurgy specified in AWWA C111.

APRIL 2022

BUILDING MECHANICAL DRAINAGE

ATTACHMENT E - TECHNICALS

40 05 02.89 - 1

Schedule 40 05 02.89 - Building Mechanical Drainage

Process Service	Drain		
Process Service Identifier	D		

- 12. Install per Cast Iron Soil Pipe Institute recommended practice specified in Cast Iron Soil Pipe and Fittings Handbook.
- 13. Provide Polyethylene Encasement: per AWWA C105, Field Applied, for Buried pipe under buildings and within 5 feet of building perimeter.

Indoor Dry, Indoor Wet, Outdoor, Process Corrosive - Exposed

Component	ponent Line Size, in Rating Conn./Joints Material		Spec Section	Notes		
Pipe	1/2 thru 4	Sch. 80	SLV	<u>PVC</u> : ASTM D1784-Class 12454-B or ASTM D2665-Class 12454-B, Dim. Per ASTM D1785	40 05 31	
Lining for Pipe & Fittings	PVC, All	_	_	None:	_	
External Coating	PVC, All	_	_	Field applied primer and finish coat per spec	09 90 00	
Fittings	PVC, All	Sch. 80	SLV	PVC: ASTM D2665-Class 12454-B, NSF 61 certified, Dim. Per ASTM D3311	40 05 31	
Taps	All	_	_	None:		
Valves	All	_	_	Ball, Tru-Union, Viton seats	_	

Buried (includes encased and embedded) 5 feet Beyond Building Perimeter: Not Used

APRIL 2022 ATTACHMENT E - TECHNICALS BUILDING MECHANICAL DRAINAGE

40 05 02.89 - 2

SECTION 40 05 06.16 PIPING CONNECTIONS

PART 1 GENERAL

1.01 DESCRIPTION

A. This section specifies the following methods of connecting metallic piping: flanges, threading, mechanical couplings, equipment connection fittings, dielectric unions, and welding.

1.02 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 Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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 BI.1	Unified Inch Screw Threads (UN and UNR Thread Form)
ANSI BI.20.1	Pipe Threads, General Purpose (Inch)
ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings
ANSI B16.5	Pipe Flanges and Flanged Fittings
ANSI B18.2.1	Square and Hex Bolts and Screws Inch Series
ANSI B18.2.2	Square and Hex Nuts (Inch Series)
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 Procedures, Welders, Brazers, and Welding and Brazing Operators Qualifications
ASTM B98	Copper-Silicon Alloy Rod, Bar and Shapes
ASTM F37	Standard Test Methods for Sealability of Gasket Materials

APRIL 2022 ATTACHMENT E - TECHNICALS PIPING CONNECTIONS

Reference	Title
ASTM F104	Standard Classification System for Nonmetallic Gasket Materials
ASTM F152	Standard Test Methods for Tension Testing of Nonmetallic Gasket Materials
ASTM F593	Stainless Steel Bolts, Hex Cap Screws, and Studs
AWWA C111	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C206	Field Welding of Steel Water Pipe
AWWA C207	Steel Pipe Flanges for Waterworks Service-Size 4 in. through 144 in.
AWWA C219	Bolted, Sleeve-Type Couplings for Plain-End Pipe
AWWA C550	Protective Epoxy Coatings for Valves and Hydrants
AWWA C606	Grooved and Shouldered Joints
AWWA M11	Steel Pipe-A Guide for Design and Installation
NSF 61	Drinking Water System Components - Health Effects

1.03 SUBMITTALS

A. In addition to the material listed in the detailed specification, the following submittals shall be provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

PART 2 PRODUCTS

2.01 FLANGE ASSEMBLIES

A. Flanges:

- 1. General: Flanges shall either be flat flanges or convoluted ring flanges as specified in the following paragraphs.
- 2. Flat Flanges: Cast iron flanges shall be faced in accordance with ANSI B16.1. Where companion flanges are used, the flanges on pipe shall be refaced to be flush with the companion flange face. Class 150 and Class 300 forged steel flanges shall be raised face conforming to ANSI B16.5. Lightweight slip-on flanges shall be plain face conforming to AWWA C207, Class B and ANSI B16.5. Unless otherwise specified, steel flanges shall be ANSI B16.5, Class 150 or AWWA C207, Class D. Class E AWWA flanges shall be provided where test pressure exceeds 175 psi. Plain faced flanges shall not be bolted to raised face flanges.
- 3. Convoluted Ring Flanges: (Not Used)

B. Gaskets:

- 1. Gasket material shall be as specified in paragraph 2.03.
- 2. Gaskets for plain faced flanges shall be the full face type. Thickness shall be 1/16 inch for pipe 10 inches and less in diameter and 1/8 inch for pipe 12 inches and larger in diameter. Unless otherwise specified, gaskets for raised face

APRIL 2022

ATTACHMENT E - TECHNICALS

PIPING CONNECTIONS

flanges shall match the raised face and shall be 1/16 inch thick for pipe 3-1/2 inches and less in diameter and 1/8 inch thick for pipe 4 inches and larger.

C. Bolts:

- 1. Flange assembly bolts shall be ANSI B18.2.1 standard square or hexagon head bolts with ANSI B18.2.2 standard hexagon nuts. Threads shall be ANSI BI.1, standard coarse thread series; bolts shall be Class 2A, nuts shall be Class 2B. Bolt length shall conform to ANSI B16.5.
- 2. Unless otherwise specified, bolts shall be carbon steel machined bolts with hot pressed hexagon nuts. Bolts for submerged service shall be made of Type 316 stainless steel in conformance with ASTM F593, marking F593F. Nuts for submerged service shall be made of copper-silicon alloy bronze conforming to ASTM B98, alloy C65100, designation H04 or alloy C65500, designation H04. Bolts and nuts for buried service shall be made of noncorrosive high-strength, low-alloy steel having the characteristics specified in ANSI/AWWA C111/A21, regardless of any other protective coating. Where washers are required, they shall be of the same material as the associated bolts.

2.02 MECHANICAL COUPLINGS

A. Sleeve-Type Couplings:

- Unless otherwise specified, sleeve-type mechanical pipe couplings shall be Smith-Blair Type 411, Dresser Style 38, or equal, with the stop removed from the middle ring. Reducing couplings shall be Smith-Blair Type 415, Dresser Style 62, or equal. Sleeve-type flanged coupling adapters shall be Smith-Blair Type 913, Dresser Style 128, or equal. Insulating couplings shall be Smith-Blair Type 416, Dresser Style 39, or equal.
- 2. Bolts for submerged service shall be made of Type 316 stainless steel in conformance with ASTM F593, markingF593F. Nuts for submerged service shall be made of copper-silicon alloy bronze conforming to ASTM B98, alloy C65100, designation H04, or alloy C65500, designation H04. Bolts and nuts for buried service shall be made of noncorrosive high-strength, low-alloy steel having the characteristics specified in ANSI/AWWA C111/A21, regardless of any other protective coating. Where washers are required, they shall be of the same material as the associated bolts.
- 3. Gaskets shall be as specified in paragraph 2.03 and AWWA C111.

B. Plain End Couplings:

- 1. Plain end pipe couplings for pipe sizes 6 inches and smaller shall be Gustin-Bacon 200, Victaulic Style 99, or equal for Schedule 80 pipe and Gustin-Bacon 205, Victaulic Style 90, or equal for lighter weight pipe. Plain end couplings for pipe sizes 8 inches and larger shall be Gustin-Bacon 200, Victaulic Style 99, or equal. Unless otherwise specified, bolts and nuts shall comply with AWWA C606.
- 2. Gaskets shall be as specified in paragraph 2.03 and AWWA C606.

C. Grooved End Couplings:

APRIL 2022 ATTACHMENT E - TECHNICALS PIPING CONNECTIONS

- 1. Grooved end flexible-type couplings shall be Gustin-Bacon 100, Victaulic Style 77, or equal. Grooved end rigid-type couplings shall be Gustin-Bacon 120 Rigi-Grip, Victaulic Style 07 Zero-Flex, or equal. Flexible-type couplings shall be used for all piping greater than 12 inches in diameter; for pipe 12 inches in diameter and less in rack-mounted tunnel piping applications; and for grooved joints adjacent to pump or blower suction and discharge where grooved couplings are used for noise and vibration control. All other applications for piping 12 inches in diameter and less shall utilize rigid-type couplings. Grooved end flanged coupling adapters shall be either Gustin-Bacon 154, Victaulic Style 741, or equal. Snap-joint grooved end couplings shall be Gustin-Bacon 115, Victaulic Style 78, or equal. Cut grooves are not permitted on fabricated or lightwall pipe.
- 2. Unless otherwise specified, bolts and nuts shall comply with AWWA C606. Bolts for submerged service shall be Type 316 stainless steel in conformance with ASTM F593, marking F593F. Nuts for submerged service shall be made of copper-silicon alloy bronze conforming to ASTM B98, alloy C65100, designation H04 or alloy C65500, designation H04. Bolts and nuts for buried service shall be made of noncorrosive high-strength, low-alloy steel having the characteristics specified in ANSI/AWWA C111/A21, regardless of any other protective coating. Where washers are required, they shall be of the same material as the associated bolts.
- 3. Gaskets shall be as specified in paragraph 2.03 and AWWA C 606.

D. Equipment Connection Fittings

- Equipment connection fittings shall provide both lateral and angular misalignment adjustment between equipment connection flanges and the connection to field piping systems by providing individually adjustable flexible joints at each connection. In addition, equipment connection fittings shall provide full pressure thrust restraint between the field piping connection and equipment connection flanges.
- 2. Equipment connection fittings shall consist of two flanged coupling adapters, a plain end section of pipe and thrust restraint rods and associated fittings designed to transmit thrust without transmitting shear to the thrust restraint rods and without compromising provisions for accommodating angular and parallel misalignment. Materials and features shall conform to the requirements established in this paragraph. Standard "dismantling joints" incorporate only one flanged coupling adapter and are not acceptable substitutes. Equipment connection fittings shall be Romac ECF Series, or Baker Coupling Company, Los Angeles or equal, modified as specified to provide the required features.
- 3. Equipment connection fittings shall each consist of a single sleeve of plain end piping conforming to the requirements of the specified piping system of sufficient length to span the gap between the connection at the equipment and the connection at the field piping with gasketed flange adapters at each end. Thrust restraint shall be provided by means of all threaded rod spanning between flanges and male rod nuts and female washers that are rounded to provide a ball-joint type self-aligning feature. All threaded restraint rod shall project through flange and mating flange coupling adapter bolt holes or through holes in restraint lug plates that extend above the flanges and are secured to the flanges with a minimum of two flange bolts. Where the all threaded rods

APRIL 2022 PIPING CONNECTIONS

ATTACHMENT E - TECHNICALS

project through flange bolt holes, ball joint type nut and washer combinations and lock washers shall be provided at each face, each end. Where restraint lug plates are employed, ball joint type nuts and washers shall be provided only on the outside faces of the plates and the nuts shall have a self locking feature that prevents nut movement due to vibration or other operational or environmental causes. Double nutting with non-locking nuts shall not be an acceptable method of providing the self locking feature. Thrust rod diameter and material shall be selected to provide sufficient freedom of movement through all bolt holes to allow unrestricted maximum adjustment of equipment connection fittings to accommodate piping misalignment without transmitting any shear to the thrust rods and also to permit full development of thrust restraint at all thrust rod tension take-ups. Design of equipment connection fittings shall conform to AWWA C219.

- 4. Thrust rods, restraint lug plates, nuts, washers and lock washers shall be Type 316 stainless steel, all selected to develop full rated piping system pressure thrust forces. Equipment connection fittings for pump applications shall have thrust rod number and diameter selected such that thrust rod stretch under piping system operating pressure does not exceed 2 mils. Calculations shall be submitted. Dry film molybdenum di-sulfide anti-galling compound shall be factory applied to ends of thrust rods, covering all threads subject to nut travel and tightening. Gaskets shall be as specified in paragraph 2.03. Flange gaskets shall be full face type. Follower gaskets shall be compression wedge type.
- 5. Sleeves shall be carbon steel or as specified for the specific piping system. Pressure rating of flange adapters shall equal or exceed the pressure rating of mating flanges. All metal portions of equipment connection fittings, with the exception of 316 stainless steel components, shall be coated and lined with fusion bonded epoxy conforming to AWWA C550 and NSF 61.
- E. Dismantling Joints: Dismantling joints may be used as takedown couplings in accordance with paragraph 3.03. Dismantling joints shall fully restrained double flange fittings consisting of a flange coupling adapter and flanged spool piece that allows for longitudinal adjustment. Thrust restraint shall be provided by means of all threaded rod spanning between flanges and secured to the flanges with a minimum of two flange bolts. Design of equipment connection fittings shall conform to AWWA C219. Sleeves shall be carbon steel or as specified for the specific piping system. Pressure rating of flange adapters shall equal or exceed the pressure rating of mating flanges. All metal portions of equipment connection fittings, with the exception of 316 stainless steel components, shall be coated and lined with fusion bonded epoxy conforming to AWWA C550 and NSF 61. Dismantling joints shall be Romac DJ-400, Smith Blair 975, or Crane-Viking Johnson Dismantling Joint.
- F. Sleeve Band Couplings: Sleeve band couplings shall be Victaulic Depend-O-Lock. Unless otherwise noted, couplings for liquid service shall be Model F x F Type 2 fully restrained, shouldered high deflection couplings with standard width band. Couplings shall comply with AWWA C-219. Couplings for use with air systems shall be Airmaster restrained Depend-O-Lock couplings in conformance with AWWA C-606. Sleeve band couplings are acceptable wherever sleeve type couplings are used (paragraph 2.02.A Sleeve Type Coupling).

APRIL 2022 PIPING CONNECTIONS

ATTACHMENT E - TECHNICALS

G. Flexijoint: Where specified Flexijoint couplings shall be Flanged Romac Flexijoint couplings. The Flexijoint is a flexible, ductile iron joint that can accommodate expansion, contraction, rotation and bending and is rated at 350 psi working pressure. The joint can accommodate 15 to 20 degree deflection depending on size. Body shall be ductile iron, lock rings Type 410 stainless steel, and ring gasket, casing, ball and cover shall be EPDM molded watertight construction. All metal portions of Flexijoint coupling including the stainless steel lock rings shall be coated and lined with fusion bonded epoxy conforming to AWWA C550 and NSF 61. For buried installations, install with polyethylene baggy cover in accordance with the manufacturer's instructions.

2.03 GASKETS

- A. Gaskets shall be as follows:
 - 1. Neoprene or nitrile (Buna N) gaskets shall be used for push-on couplings.
 - Compressed gasketing consisting of organic fibers (Kevlar) and neoprene binder; ASTM F104 (F712400), 2500 psi (ASTM F152), 0.2 ML/HR LEAKAGE FUEL A (ASTM F37) shall be used for flanged connections.

2.04 THREAD

A. Pipe thread dimensions and size limits shall conform to ANSI BI.20.1.

2.05 DIELECTRIC UNIONS

A. Dielectric unions shall be EPCO, Capitol Manufacturing, or equal.

2.06 COATINGS

A. Unless otherwise specified, flange assemblies and mechanical type couplings for buried installation shall be field coated with System M-1 as specified in Section 09 90 00 PAINTING AND COATING.

2.07 PRODUCT DATA

A. In accordance with Section 01 33 00 SUBMITTAL PROCEDURES, the Contractor shall provide for each welder, a welder qualification certificate indicating the welder is certified for pipe welding in accordance with ASME Boiler and Pressure Vessel, Section IX. Each welder's certificate shall be provided to the Construction Manager prior to that welder working on the job.

PART 3 EXECUTION

3.01 PIPE CUTTING, THREADING AND JOINTING

A. Pipe cutting, threading and jointing shall conform to the requirements of ANSI B31.1.

APRIL 2022 ATTACHMENT E - TECHNICALS PIPING CONNECTIONS

3.02 PIPE WELDING

- A. Pipe shall be welded by ASME-certified welders using shielded metal arc, gas shielded arc or submerged arc welding methods.
- B. Welds shall be made in accordance with AWWA C206.

3.03 TAKEDOWN COUPLINGS

- A. Takedown couplings shall be screw unions, flanged or grooved end mechanical coupling type joints and shall be provided as specified. Flanged or grooved end joints shall be employed on pipelines 2-1/2 inches in diameter and larger. Where piping passes through walls, takedown couplings shall be provided within 3 feet of the wall, unless specified otherwise.
- B. A union or flanged connection shall be provided within 2 feet of each threaded end valve.

3.04 FLEXIBILITY

A. Unless otherwise specified, piping passing from concrete to earth shall be provided with two pipe couplings or flexible joints (or a single Flexijoint) as specified on the buried pipe within 2 feet of the structure for 2-inch through 6-inch diameter pipe; within 3 feet of the structure for 8-inch through 24-inch diameter pipe; and within one and one-half pipe diameters of the structure for larger pipe. Where required for resistance to pressure, mechanical couplings shall be restrained in accordance with Chapter 13 of AWWA M11, including Tables 13-4, 13-5 and 13-5A, and Figure 13-20.

3.05 DIELECTRIC CONNECTIONS

A. Where a copper pipe is connected to steel or cast iron pipe, an insulating section of rubber or plastic pipe shall be provided. The insulating section shall have a minimum length of 12 pipe diameters. Dielectric unions as specified in paragraph 2.05 may be used instead of the specified insulating sections. Where copper pipe is supported from hangers, it shall be insulated from the hangers, or copper-plated hangers shall be used.

3.06 EQUIPMENT CONNECTION FITTINGS

A. Where shown, equipment connection fittings shall be provided between field piping systems and equipment inlet and outlet connections.

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS PIPING CONNECTIONS

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS PIPING CONNECTIONS 40 05 06.16 - 8

SECTION 40 05 06.23 EXPANSION JOINTS AND FLEXIBLE METAL HOSE

PART 1 GENERAL

1.01 SUMMARY

- A. This section specifies piping expansion joints and flexible metal hose.
- B. Provide professional engineering services for a piping system design engineer (hereinafter the "Design Professional") as specified in Section 40 05 01 PIPING SYSTEMS, this Section, and related sections.

1.02 RELATED SECTIONS

- A. This section contains specific references to the following related sections. Additional related sections may apply that are not specifically listed below.
 - 1. Section 01 33 00 Submittal Procedures
 - 2. Section 40 05 01 Piping Systems
 - 3. Section 40 05 02 Piping System Schedules
 - 4. Section 40 05 06.16 Piping Connections
 - 5. Section 40 05 06.33 Piping Appurtenances
 - 6. Section 40 05 07 Hangers and Supports for Process Piping
 - 7. Section 40 05 07.13 Seismic Restraints for Piping

1.03 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.

Reference	Title
ASTM A276	Stainless and Heat-Resisting Steel Bars and Shapes
EJMA-STDS	Standards of Expansion Joint Manufacturers' Association, Edition No. 5

1.04 DEFINITIONS

- A. Terminology used in this Section conforms to the following definitions:
 - 1. Expansion Joint: Any device used to absorb dimensional changes and/or misalignment.
 - 2. Pipe Section: the portion of pipe between two anchors.

EXPANSION JOINTS AND FLEXIBLE METAL HOSE

40 05 06.23 - 1

APRIL 2022

ATTACHMENT E - TECHNICALS

- 3. Lateral Direction: Direction perpendicular to the pipe axis.
- 4. Longitudinal Direction: Direction parallel to the pipe axis.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

- 1. Coordination required with the design of piping systems, piping supports (hangers, guides, anchors, structural attachments, etc.), and expansion control and seismic restraints.
- 2. Select and install expansion joints and flexible metal hose in conformance with the expansion control system designed by the Design Professional, retained under the requirements of Section 40 05 01 PIPING SYSTEMS, and the criteria specified herein. This requirement, however, shall not be construed as relieving the Contractor of responsibility for this portion of the work.
- 3. Refer to Section 40 05 01 PIPINGS SYSTEMS for additional coordination requirements.

1.06 SUBMITTALS

A. Action Submittals:

- 1. Procedures: Section 01 33 00 SUBMITTAL PROCEDURES.
- 2. A copy of this specification section with addenda updates, and all referenced sections with each paragraph check marked to show specification compliance or marked to show deviations.
- 3. Design and construction details of formed metal bellows type expansion joints.
- 4. Percent enlongation over range of design temperatures.
- 5. Pressure thrust force and spring rate data for formed metal bellows expansion joints.
- 6. Materials, design and construction, and temperature and pressure rating for elastomer and fabric expansion joints.
- 7. Details for the installation of all expansion joints.
- 8. Listing of all flexible metal hose applications.

1.07 QUALITY ASSURANCE

A. Refer to Section 40 05 01 PIPING SYSTEMS for additional quality assurance requirements.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. NOT USED.
- B. Additional requirements: 40 05 01 PIPING SYSTEMS.

EXPANSION JOINTS AND FLEXIBLE METAL HOSE

APRIL 2022

ATTACHMENT E - TECHNICALS

PART 2 PRODUCTS

2.01 PERFORMANCE / DESIGN CRITERIA

A. General:

- 1. All expansion joints and flexible hose materials shall be new, free from defects and conforming to the requirements and standards specified in this Section.
- 2. Furnish expansion joints and flexible metal hose as specified in Part 4 of this specification.
- 3. Provide control units (tie rods or restraints) to prevent excessive axial elongation and to accept the pressure thrust in the piping system. Number and sizes of control rods or restraints shall be as determined by the manufacturer.
- Expansion joint design shall be determined by the amount and kind of movement (axial, lateral, and angular) required as determined by the Design Professional responsible for expansion control design per Section 40 05 01 PIPING SYSTEMS.
- 5. Unless otherwise noted, end connection type and rating shall match the connecting pipe per piping schedules 40 05 02 to 40 05 02.89.

B. Expansion Joints:

- Expansion joints shall be designed in accordance with EJMA Standards for pressure, temperature and service as specified in the Piping System Schedules (Section 40 05 02 through 40 05 02.89) without crimping of corrugations.
- 2. Corrugated type expansion joints shall be suitable for a minimum of 10,000 pressure, temperature and deflection cycles (non-concurrent).
- 3. Supply bellows type expansion joints suitable for a minimum of 10,000 pressure, temperature and deflection cycles (non-concurrent).

C. Flexible Metal Hose:

- 1. Flexible metal hose shall be suitable for a line pressure equal to the test pressure listed in the Piping System Schedules (Section 40 05 02 through 40 05 02.89).
- 2. Live lengths for flexible metal hose shall be based on service as specified and a design life of 1,000,000 full displacement cycles.

2.02 EXPANSION JOINTS

A. Metal Construction:

- 1. Formed Bellows Type:
 - a. Medium Temperature:
 - 1) Formed bellows-type expansion joints for temperatures up to 800 degrees F shall have 300 series stainless steel multi-ply bellows rated for the specified design temperature and pressure.

EXPANSION JOINTS AND FLEXIBLE METAL HOSE

APRIL 2022

ATTACHMENT E - TECHNICALS

- 2) Test pressures are specified in the Piping System Schedules (Section 40 05 02 through 40 05 02.89). Each expansion joint shall be factory tested at the test pressure.
- 3) Ductwork expansion joints may be rated at less than 50 psig but must be rated equal to the design pressure specified and, in no case, less than 2 psig.
- 4) Unless otherwise specified, end connections shall have class 150 flanges.
- 5) Acceptable manufacturers: Formed bellows type expansion joints shall be as manufactured by U.S. Bellows, Senior Flexonics, Inc., Hyspan Precision Products, Inc., American BOA Inc. or approved equal.

b. High Temperature:

- 1) Engine and gas turbine exhaust expansion joints for temperatures up to 1300 degrees F shall be the multi-ply bellows type designed for 15 psig. Bellows shall be constructed of 300 series stainless steel.
- 2) Unless otherwise specified, end connections shall be either the fixed flange or Vanstone flange configuration. Flange material shall be carbon steel for temperatures up to 1000 degrees F and stainless steel for temperatures 1000-1300 degrees F. Vanstone materials and flow liners, where specified, shall be the same as bellows material.
- 3) Exhaust expansion joints shall be Flexonics DEX Series, Hyspan Series 2500, American BOA Series 025E, or equal.

2. Expansion Compensator Type:

- a. Steel Expansion Compensator:
 - 1) Compensators shall have 2-ply stainless steel bellows and carbon steel shroud and end fittings. Compensators shall be rated for 175 psi maximum working pressure and 750 degrees F.
 - 2) Steel expansion compensator type expansion joints shall be Flexonics Model H Expansion Compensator, Hyspan Series 8500, Keflex 7Q, or equal.
- b. Bronze Expansion Compensator:
 - Compensators shall have multi-ply phosphor bronze or stainless steel bellows and copper tube end fittings. Compensators shall be rated for 150 psi maximum working pressure and 400 degrees F.
 - 2) Bronze expansion compensator type expansion joints shall be Flexonics Model HB Expansion Compensator, Hyspan Series 8500, Keflex 7Q, American BOA Inc., or equal.

B. Elastomer and Fabric Construction:

- 1. General Requirements:
 - a. Standard spool arch type or the precision molded spherical design type as specified.
 - b. Single arch and sphere type expansion joints, unless otherwise indicated, have 6-inch face-to-face dimension for pipe up to 8-inch and 8-inch face-to-face dimension for pipe 10-inch and 12-inch. For use with larger

EXPANSION JOINTS AND FLEXIBLE METAL HOSE

APRIL 2022

ATTACHMENT E - TECHNICALS

- diameters, Contractor must obtain approval from the Owner's Representative.
- c. Cover elastomer constructed of chlorobutyl, neoprene, or EPDM.
- d. Tube elastomer constructed of chlorobutyl or EPDM for temperatures between 80 and 115 degrees C. Neoprene or Buna N liners are acceptable for temperatures up to 80 degrees C.

2. Spool Type:

- a. Resilient arch type and standard or tapered as specified. Unless otherwise specified, all tapered connectors shall be eccentric.
- b. Constructed of multiple plies of woven fabric impregnated with elastomer and reinforced with steel rings or wire embedded in the body.
- c. Provide retaining or backup rings for standard arch type expansion joints suitable for the specified temperature and pressure. Rings shall be 10-mm-thick steel, split, either galvanized or zinc shield coated.
- d. Use filled arch type expansion joints on all piping systems carrying fluids containing solids.
- e. Acceptable manufacturers for single, multiple, or filled arch: Unisource Series 1200, Garlock Style 204, Mercer Style 500, or approved equal.
- f. Acceptable manufacturers for high pressure couplings suitable for 240 degree F operating temperatures: Unisource Series 1500, Mercer Style 510, Garlock Style 204-HP, General Style 1015, or approved equal.

3. Spherical Molded Type:

- a. Spherical molded type expansion joints shall be precision molded of multiple plys of nylon tire cord fabric and elastomer suitable for specified temperature and pressure.
- b. Spherical molded type expansion joints shall have steel or ductile iron floating flanges, and no metal parts shall come in contact with the fluid.
- c. Acceptable manufacturers for single sphere molded connectors shall be Mason Type MFNC, Mercer Type 5500, Goodall Type E-611, General Type 1010, Garlock Style 8100, or approved equal.
- d. Provide double sphere or triple sphere connectors where required to provide for the specified movement.

C. Polymer Expansion Joints:

- 1. Provide expansion joints for PVC or CPVC piping that are EPDM elastomer flexible double-bellows. Attach expansion joints to pipe using union-type couplings.
- 2. PVC/CPVC acceptable manufacturers: Spears; Flexicraft; Approved Equal.
- 3. Provide PTFE expansion joint with external stainless steel reinforcing rings, limit rods, and flanges. Expansion joints shall be designed to the FSA 0012 design standard. Use polymer-coated tie rods or grommets between the tie rods and flanges; metal-to-metal contact between the rods and flanges are not acceptable. Flanges must be completely isolated from the chemical by the molded PTFE bellows.
- 4. Provide safety shields over PTFE joints and connections.

EXPANSION JOINTS AND FLEXIBLE METAL HOSE

APRIL 2022

ATTACHMENT E - TECHNICALS

5. Molded PTFE expansion joints acceptable manufacturers: Garlock Style 214/215, Crane Resistoflex R-series, Flexicraft Teflex Series, or approved equal.

2.03 FLEXIBLE METAL HOSE

A. Flexible Metal Hose:

- 1. General:
 - a. Unless otherwise specified, flexible metal hose shall be corrugated type 321 stainless steel with stainless steel fittings and shall be provided with stainless steel single braid.
 - b. Attach end connections by helical crest welding. End connections shall match the piping systems as specified in piping schedules 40 05 02 to 40 05 02.89 here the hoses are installed.
 - c. Provide bronze flexible metal hose for copper and brass systems.
- 2. Braided Type:
 - a. Type A: Type A (stainless steel) braided flexible metal hose shall be Senior Flexonics, or equal.
 - b. Type B: Type B (bronze) braided flexible metal hose shall be Senior Flexonics, or approved equal.

2.04 FLEXIBLE TEFLON HOSE

- A. Provide teflon flexible connectors consisting of molded teflon bellows and 150-pound ductile iron flanges. The flanges shall be completely isolated from the chemical by the molded teflon bellows.
- B. Provide integral steel limit bolts and Monel reinforcing rings on the connectors. Provide connectors with non-asbestos gaskets. The connectors shall allow for an axial transverse movement of at least 1/2-inch, and an offset of at least 3/8-inch. The connectors shall be rated for a pressure of 130 psi, at a temperature of 70 degrees F.
- C. Acceptable manufacturers: Jackson Industrial, Metraflex Teflon Expansion Joint, Garlock, modified as necessary to provide the specified features, or approved equal.

2.05 FLEXIBLE METAL HOSE LOOP

- A. Flexible metal hose loops consist of two parallel sections of corrugated stainless steel metal hose and single braid with 180 degree return bend, flanged inlet and outlet connections.
- B. Furnish flexible metal hose loops that provide the amount and kind of movement (axial, lateral, angular, torsional) scheduled in this Section. Provide supports at 180 degree return bend per manufacturer's recommendations.

EXPANSION JOINTS AND FLEXIBLE METAL HOSE

APRIL 2022

ATTACHMENT E - TECHNICALS

- C. For loops using hanger supports, provide seismic break-away coupling to allow separation during seismic event.
- D. Acceptable Manufacturers: Metraflex; Flexicraft; Anvil International; Approved Equal.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Located expansion joints as specified. Location and number of guides shall be determined from EJMA Standards.
- B. For piping services operating at less than 170 degree F, do not install expansion joints during times of extreme temperature or in a fully compressed or fully expanded condition.
- C. For piping services operating at over 170 degree F, install expansion joints at percent elongation corresponding to installation temperature as a percent of maximum operating temperature.
- D. Unless otherwise specified, expansion joints 4 inches and larger shall be furnished with control rods.

3.02 ALIGNMENT

- A. Align piping systems prior to installation of expansion joints.
- B. Do not use expansion joints to correct piping misalignment during installations.
- C. Install expansion joints normally preset at the factory for rated axial compression and expansion in this preset condition.
- D. Set control units/tie rods/restraints after all pressure testing of the piping system is complete.

PART 4 SCHEDULE

4.01 EXPANSION JOINT AND CONNECTOR SCHEDULE

A. Expansion joints and/or flexible metal hose connectors provided for specific equipment items or piping systems are specified on the following schedule. The location of piping system expansion joints and design criteria, including temperature, pressure and movement for each joint, are specified and/or shown on the drawings.

EXPANSION JOINTS AND FLEXIBLE METAL HOSE

APRIL 2022

ATTACHMENT E - TECHNICALS

B. Expansion joints and connectors shall be provided in accordance with the following table. If a particular joint or connector is shown or specified for a given location, that more detailed selection shall apply.

Expansion Joint and Connector Schedule				
Type of Expansion Joint/Connector	Type of Service/Use			
Formed metal bellows; medium temperature (2.01 Medium Temperature)	Boiler exhaust, hot water, high pressure air, and gas and steel lines subjected to ambient temperature differentials sufficient to require expansion joints.			
Steel expansion compensator (2.02 Steel Expansion Compensator Type)	Same type service/use as for "formed metal bellows type expansion joint" except size of piping is limited to 3 inch diameter or less.			
Bronze expansion compensator (2.02 Bronze Expansion Compensator Type)	Copper piping.			
Elastomer spool arch (2.02 Spool Type.)	Blower connectors and expansion joints for piping 14 inch diameter and larger.			
Elastomer spherical molded (2.02 Spherical Molded Type)	Blower connectors and expansion joints for piping 12 inch diameter and less ¹ .			
PVC (2.02 Polyvinylchloride Construction)	PVC piping.			
Teflon (2.02 Teflon Construction)	RTRP (FRP) piping.			
Stainless steel braided hose (2.03 Type A)	CS, LSG and mixed service connections to digester and stand pipe.			
Bronze braided hose (2.03 Type B)	Air compressor discharge and pump connectors for copper lines.			
Teflon flexible connector (2.04)	Connection of PVC piping to chemical storage tanks.			

^{1.} Excludes steam and chemical services.

END OF SECTION

EXPANSION JOINTS AND FLEXIBLE METAL HOSE

SECTION 40 05 06.33 PIPING APPURTENANCES

PART 1 GENERAL

1.01 SCOPE

- A. Scope: This section specifies pipeline thermometers, flow and level gauges, pressure gauges, strainers, steam traps, vents and drains.
- B. Exclusions: Temperature, pressure and flow measuring devices used for instrumentation are specified in other specification sections.

PART 2 PRODUCTS

- 2.01 PIPELINE THERMOMETERS (NOT USED)
- 2.02 FLOW AND LEVEL GAUGES

A. Rotameters:

- 1. Unless otherwise specified, rotameters for purges and other low capacity services shall be Brooks Sho-Rate "50," Wallace & Tiernan 3-inch purge meter, Schutte & Koerting, or equal, with integral needle valve and flow controller. Meter tubes shall be glass, floats shall be stainless steel, and cases shall be aluminum or stainless steel. Unless otherwise specified, meter sizes shall be selected so that the flow rate recommended by the manufacturer of the purged equipment falls within the middle third of the meter scale. Units shall have a 3-inch minimum scale direct reading in the units of flow.
- 2. Rotameters for high capacity service shall be glass tube-type with a 5-inch scale and stainless steel frame. Flow range shall be as specified and scales shall indicate the units of flow. Rotameters shall be as manufactured by Brooks, Wallace & Tiernan, Schutte & Koerting, or equal.
- B. Sight Gauges: Sight gauges shall be 3/4-inch Penberthy 205 Series, Lunkenheimer Fig. 589, or equal, automatic water gauge complete with pyrex gauge glass and gauge glass protector. Overall length of gauges, type of mounting, and orientation of set shall be as specified.
- C. Flow Indicators: Flow indicators shall be provided where specified. Each indicator shall consist of a bronze body with threaded ends and a sight glass with rotary wheel. Pressure ratings for flow indicators shall match pipe pressure ratings. Indicators shall be as manufactured by Jacoby-Tarbox, Schutte & Koerting, Eugene Ernst Products, or equal.

APRIL 2022 ATTACHMENT E - TECHNICALS PIPING APPURTENANCES

40 05 06.33 - 1

2.03 PRESSURE DEVICES

A. Gauge Cocks: Unless otherwise specified, gauge cocks shall be Robertshaw 1303, Ashcroft 1095, or equal. The exposed threads of each gauge cock shall be protected by a brass plug.

B. Pressure Gauges:

- 1. Unless otherwise specified, pressure gauge scales shall be selected so that the normal operating pressure falls between 50 and 80 percent of full scale, shall be 4 1/2-inch, 270-degree movement, 1/2-percent accuracy, full-scale, and suitable for bottom stem mounting. Gauges shall have a 316-SS bourdon tube. All gauges shall have a 300 series stainless steel case, shatterproof glass, and a 1/2-inch NPT bottom connection.
- 2. Pressure gauges for air, gas, and low pressure services (0-10 feet) shall be premium grade, heavy-duty bourdon-tube units (bellow type for vacuum) with Delrin bushings and pinion, and stainless steel sector.
- 3. Gauges on liquid service shall be as noted above, except they shall be provided with an internal pulsation dampening system consisting of either a glycerin fill or a silicone fluid fill. Snubbers or orifices shall not be utilized. Gauges shall be Ashcroft Duragauge Fig. 1279, Ametek 1981L, or equal.
- C. Diaphragm Seals: Unless otherwise specified, seals shall be diaphragm type with 1/4-inch flushing connection, Type 316 stainless steel body and Type 316L diaphragm. Fill fluid shall be Silicone DC200 unless otherwise specified. Seal shall be Mansfield and Green Type SG, Ashcroft Type 101, or equal.

D. Pressure Sensors

- Unless otherwise specified, pressure sensors (tubular chemical seals) shall be the in-line full stream captive sensing liquid type. Wetted parts shall be 316 stainless steel. Flexible cylinder shall be Buna-N unless otherwise specified. Seals shall be rated for 200 psi with 5-inch SC hysteresis. Seals shall be Ronningen-Petter, Red Valve, or equal.
- 2. Fill fluid shall be rated for a temperature range of -20 degrees F to 200 degrees F. Capillary tubing shall be armored stainless steel. Fittings shall be provided for vacuum filling of system. Systems that are not factory filled shall be vacuum filled in the field. Filling connections shall be soldered shut after vacuum evacuation and filling.

2.04 STRAINERS

- A. Air and Gas Strainers: Unless otherwise specified, air and gas line strainers shall be Y-pattern, cast iron body, with 40 mesh Monel screens packed with Everdur wool. Bronze bodies shall be provided with copper piping. Compressed air line strainers shall be fitted with a brass blowoff cock. Strainers shall be Mueller, Armstrong, or equal.
- B. Steam and Water Strainers: Steam and water strainers shall be of Y-pattern, unless otherwise specified. Steam strainers shall have carbon steel body; water strainers shall have cast iron body. Bronze bodies shall be provided with copper

APRIL 2022

PIPING APPURTENANCES

ATTACHMENT E - TECHNICALS

40 05 06.33 - 2

piping. Strainers shall have 304 stainless steel screens and tapped and plugged blowoff connections. Screen perforations shall be 0.020 inch for steam service and 0.045 inch for water service. Strainers shall be Mueller, Armstrong, or equal.

- C. Fuel Oil Strainers: (Not Used)
- 2.05 STEAM TRAPS (NOT USED)
- 2.06 PRODUCT DATA
 - A. Manufacturer's product data shall be provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

PART 3 EXECUTION

- 3.01 PIPELINE THERMOMETERS (NOT USED)
- 3.02 GAUGE TAPS
 - A. Gauge taps shall be provided on the suction and discharge of pumps, fans, compressors, vacuum pumps and blowers. Gauge taps shall consist of a 1/4-inch gauge cock attached by a threaded nipple to the pipeline, duct or equipment.
- 3.03 VENTS AND DRAINS
 - A. Manual air vents shall be provided at the high points of each reach of pipeline where specified. Air vents shall consist of bronze cock and copper tubing return. Air vents shall be taken to the nearest floor with cock mounted 4 feet above the floor. Vents in piping systems for fluids containing solids shall be 1-inch nonlubricated eccentric plug valves fitted with quick couplers.
 - B. Drains shall be piped to a sump, gutter, floor drain or other collection point with a valve mounted 4 feet above the floor. Drain valves shall be threaded end gate valves of the size specified. When drains cannot be run to collection points, they shall be routed to a point of easy access and shall have hose gate valves of the size specified.

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS PIPING APPURTENANCES

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS PIPING APPURTENANCES 40 05 06.33 - 4

SECTION 40 05 07 HANGERS AND SUPPORTS FOR PROCESS PIPING

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope: This section specifies hangers and supports for all piping excluding pipe supports for fire sprinkler systems, pipe anchors, guides or seismic restraints.

B. Operating Conditions:

- 1. 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:
 - a. Hot Systems
 - 1) A 1. 120 degrees F to 450 degrees F
 - 2) A 2. 451 degrees F to 750 degrees F
 - 3) A 3. Over 750 degrees F
 - b. Ambient Systems
 - 1) B. 60 degrees F to 119 degrees F
 - c. Cold Systems
 - 1) C 1. 33 degrees F to 59 degrees F
 - 2) C 2. -20 degrees F to 32 degrees F

C. Hanger and Support Selection:

- 1. The Contractor (Pipe Designer per Section 40 05 01 PIPING SYSTEMS) 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, and any special requirements which may be specified in the project manual.
- 2. The Contractor (Pipe Designer per Section 40 05 01 PIPING SYSTEMS) 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.

HANGERS AND SUPPORTS FOR PROCESS PIPING

APRIL 2022

ATTACHMENT E - TECHNICALS

- 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.

1.02 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 Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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.

HANGERS AND SUPPORTS FOR PROCESS PIPING

APRIL 2022

ATTACHMENT E - TECHNICALS

Reference	Title
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

2.01 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, Aickinstrut, 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.

2.02 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 (interior spaces of pump station building), 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.

HANGERS AND SUPPORTS FOR PROCESS PIPING

APRIL 2022

ATTACHMENT E - TECHNICALS

- 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 2.02 Steel Pipe (Uninsulated) 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 2.02 Steel Pipe (Uninsulated) with insulation shield.
- 7. Type 7 U-BOLT: U-bolts shall be carbon steel with configuration equivalent to MSS and FEDSPEC Type 24.

HANGERS AND SUPPORTS FOR PROCESS PIPING

APRIL 2022

ATTACHMENT E - TECHNICALS

- 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: 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.
 - a. Steel pipe (insulated) shall be B-Line B3148, Grinnell Fig. 103, or equal, with insulation shield.
 - b. Steel pipe (uninsulated) shall be B-Line B3148, Grinnell Fig. 103, or equal.
 - c. Cast and ductile iron pipe shall be B-Line B3148 NS, Grinnell Fig. 103, or equal.

HANGERS AND SUPPORTS FOR PROCESS PIPING

APRIL 2022

ATTACHMENT E - TECHNICALS

- d. Copper pipe (insulated) shall be B-Line B3148, Grinnell Fig. 103, or equal, with insulation shield.
- e. Copper pipe (uninsulated) shall be B-Line B3148, Grinnell Fig. 103, or equal, lined with dielectric material.
- f. Plastic pipe shall be B-Line B3148, Grinnell Fig. 103, or equal.
- g. 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, with insulation shield.
 - 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, with insulation shield.
 - e. Copper pipe (uninsulated) shall be B-Line B3373 CT, Grinnell Fig. CT-121, Michigan model 511, or equal, with dielectric isolation from support.
 - 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, or fiberglass where specified, as per paragraph 2.02 Framing Channel. 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, Aickinstrut Series 2000, or equal.
- 3. Type 21 Pipe Rack Support: Post and cross members shall be framing channel as specified in paragraph 2.02 Framing Channel. Pipe rack fittings shall be carbon steel, of standard design manufactured by framing channel

HANGERS AND SUPPORTS FOR PROCESS PIPING

APRIL 2022

ATTACHMENT E - TECHNICALS

manufacturer. 90 degree fittings shall be gusseted Unistrut P2484, B-Line B844, or equal. Post base fittings shall be as specified in paragraph 2.02 Type E – Framing Channel Post Base.

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.
- 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.
- 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 2.02 Framing Channel. 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 2.02 Framing Channel. 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, Aickinstrut Series 2000, or equal.
- 12. Type M Wall Mounted Channel: Wall channel shall be single channel framing channel as specified in paragraph 2.02 Framing Channel.

HANGERS AND SUPPORTS FOR PROCESS PIPING

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.
- 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.

2.03 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 the pipe spec sheet. The standard shield shall be used as specified below. 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.

HANGERS AND SUPPORTS FOR PROCESS PIPING

APRIL 2022

ATTACHMENT E - TECHNICALS

2.04 PRODUCT DATA

A. Hanger and support locations and components shall be indicated on the piping layout drawings.

PART 3 EXECUTION

3.01 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.

3.02 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.

HANGERS AND SUPPORTS FOR PROCESS PIPING

APRIL 2022

ATTACHMENT E - TECHNICALS

40 05 07 - 9

- 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.

3.03 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

HANGERS AND SUPPORTS FOR PROCESS PIPING 40 05 07 - 10

PQPS Oxygenation System

K-23-2080-DBB-3

SECTION 40 05 07.13 SEISMIC RESTRAINTS FOR PIPING

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope: This section specifies seismic restraints for bracing all piping systems specified in Section 40 05 01 PIPING SYSTEMS. This section does not include seismic restraints for fire sprinkler systems.

B. Definitions:

- 1. Longitudinal direction-direction parallel to the pipe axis.
- 2. Lateral direction-direction perpendicular to the pipe axis.

C. Operating Conditions:

- The seismic restraints specified in this section are provided to resist pipe movements and loads occurring as a result of an earthquake or other seismic event
- Unless otherwise specified, all piping shall have bracing to resist seismic loading caused by forces applied at the individual pipe's center of gravity. Seismic loading shall be as specified in Section 01 73 24 DESIGN REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS AND NON-BUILDING STRUCTURES.

D. Restraint Selection:

- Unless otherwise specified, the Contractor (Pipe Designer per Section 40 05 01 PIPING SYSTEMS) shall select, locate and provide seismic restraints for piping in accordance with the project manual.
- 2. The Contractor (Pipe Designer per Section 40 05 01 PIPING SYSTEMS) shall review the piping layout in relation to the surrounding structure and adjacent piping and equipment before selecting the restraint to be used at each point.
 - a. Seismic restraints may be omitted from the following installations:
 - b. Gas piping less than 1 inch inside diameter.
 - c. Piping in boiler and mechanical rooms less than 1 1/4 inch inside diameter.
 - d. All other piping less than 2 1/2 inch inside diameter.
- 3. All piping suspended by individual hangers 12 inches or less in length from the top of the pipe to the bottom of the support for the hanger.
- 4. Piping systems shall not be braced to dissimilar parts of a building or to dissimilar building systems that may respond in a different mode during an earthquake. Examples: wall and a roof; solid concrete wall and a metal deck with lightweight concrete fill.
- 5. Restraints shall be sized to fit the outside diameter of the pipe, tubing, or, where specified, the outside diameter of insulation.

APRIL 2022

SEISMIC RESTRAINTS FOR PIPING

ATTACHMENT E - TECHNICALS

- There shall be no contact between a pipe and restraint component of dissimilar metals. The contractor shall prevent contact between dissimilar metals when restraining copper tubing by the use of copper-plated, rubber, plastic or vinyl coated, or stainless steel restraint components.
- 7. Branch lines shall not be used to brace main lines.
- 8. Seismic bracing shall not limit the expansion and contraction of the piping system.

1.02 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 Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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 A58.1-82	Minimum Design Loads for Buildings and Other Structures
AISC Manual of Steel Construction	American Institute of Steel Construction, Manual of Steel Construction, Allowable Stress Design - 9th Edition
FEDSPEC WW-H-171e-78	Hangers and Supports, Pipe
MFMA-2-91	Metal Framing Standards Publication
MSS SP-58-93	Pipe Hangers and Supports - Materials, Design and Manufacture
MSS SP-69-91	Pipe Hangers and Supports - Selection and Application
SMACNA, PPIC	Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems

B. Approval: Seismic restraint load calculations specified in paragraph 3.01 shall be reviewed and signed by a structural engineer registered in the State of California.

APRIL 2022 ATTACHMENT E - TECHNICALS SEISMIC RESTRAINTS FOR PIPING

PART 2 PRODUCTS

2.01 ACCEPTABLE PRODUCTS

A. Standard pipe restraints and components shall be manufactured by Carpenter & Patterson, B-Line, Kin-Line, ITT Grinnell, Michigan, Pipe Shields Incorporated, Superstrut, Unistrut, or equal. Pipe restraint materials shall conform to the requirements of MSS SP-58 and MFMA-1.

2.02 MATERIALS

A. General: Unless otherwise specified, restraints, including braces, pipe and structural attachments, shall be hot-dip galvanized after fabrication. Nuts, bolts and washers, fittings and accessories, may be mechanically zinc-coated except for those subject to moisture or corrosive atmosphere, which shall be type 304 stainless steel.

B. Pipe Attachments:

- Type 1s: Clevis Restraint Attachment: Clevis attachment shall be Type 1, clevis pipe hanger, as specified in Section 40 05 07-2.02 PIPE HANGERS AND SUPPORTS FOR PROCESS PIPING.
- 2. Type 3s: Double Bolt Restraint Clamp: Restraint clamp shall be Type 3, double bolt pipe clamp, as specified in Section 40 05 07 PIPE HANGERS AND SUPPORTS FOR PROCESS PIPING.
- 3. Type 4s: Roller Restraint Attachment: Roller attachment shall be Type 4, adjustable roller hanger, as specified in Section 40 05 07 PIPE HANGERS AND SUPPORTS FOR PROCESS PIPING. Hold down strap shall be carbon steel and sized as follows: pipe size 1 inch through 2 inch shall be 1 inch by 1/8 inch thick, pipe sizes 2 1/2-inch through 4 inch shall be 1 1/4-inch by 3/16 inch thick, 6 inch pipe shall be 2 inch by 3/16 inch thick, 8 inch pipe shall be 2 1/2-inch by 3/16 inch thick, 10-inch through 16-inch pipe shall be 2 1/2-inch by 1/4 inch thick, 20-inch pipe shall be 3 inch by 3/8 inch thick.
- Type 7s: U-Bolt Restraint: U-bolt restraint shall be Type 7, U-bolt, as specified in Section 40 05 07 PIPE HANGERS AND SUPPORTS FOR PROCESS PIPING.
- 5. Type 13s: Framing Channel Strap Restraint: Strap restraint shall be Type 13, framing channel pipe strap, as specified in Section 40 05 07 PIPE HANGERS AND SUPPORTS FOR PROCESS PIPING.
- 6. Type 14s: Pipe Clamp Restraint: Pipe clamp shall be carbon steel, with configuration and components equivalent to MSS and FEDSPEC Type 4. Rod attachment and longitudinal brace connection stud shall be carbon steel, fabricated and welded by the manufacturer.
 - a. Steel pipe (insulated)--shall be Superstrut No. S 720, Kin-Line No. S475, or equal, with insulation shield.
 - b. Steel pipe (uninsulated)--shall be Superstrut No. S 720, Kin-Line No. S475, or equal.

APRIL 2022

SEISMIC RESTRAINTS FOR PIPING

ATTACHMENT E - TECHNICALS

- c. Cast and ductile iron pipe--shall be Superstrut No. S-720, Kin-Line No. S475, or equal.
- d. Copper pipe (insulated)--shall be Superstrut No. S 720, Kin-Line No. S475, or equal, with insulation shield.
- e. Copper pipe (uninsulated)--shall be Superstrut No. S 720, Kin-Line No. S475, or equal, with insulation shield or dielectric lining.
- f. Plastic pipe--shall be Superstrut No. S-720, Kin Line No. S475, or equal.

C. Trapeze Restraints:

- 1. General: Unless otherwise specified, trapeze members shall have a minimum steel thickness of 12 gage, with a maximum deflection 1/240 of the span.
- 2. Type 20s: Single Channel Lateral Restraint: Trapeze restraint cross member shall be 1 5/8 inch square carbon steel framing channel, Unistrut P1000, B-Line B22, Superstrut A-1200, or equal. Pipe attachments shall be Type 13s or Type 7s specified in paragraph 2.02 Pipe Attachments. Rod stiffeners and lateral brace shall be as specified in paragraph 2.02 Braces and Fittings.
- 3. Type 21s: Double Channel Lateral Restraint: Trapeze restraint cross member shall be a double channel manufactured assembly such as Unistrut P1001, B-Line B22A, Superstrut A-1202, or equal. Pipe attachments shall be Type 13s or Type 7s specified in paragraph 2.02 Pipe Attachments. Rod stiffeners and lateral brace shall be as specified in paragraph 2.02 Braces and Fittings.
- 4. Type 22s: Double Channel Longitudinal Restraint: Trapeze restraint cross member shall be a double channel manufactured assembly such as Unistrut P1001, B-Line B22A, Superstrut A-1202, or equal. Pipe attachments shall be Type 13s or Type 7s specified in paragraph 2.02 Pipe Attachments. Rod stiffeners, longitudinal and lateral braces shall be as specified in paragraph 2.02 Braces and Fittings.

D. Braces and Fittings:

- Seismic Brace Fitting: Seismic brace fitting shall be manufactured for use with industry standard framing channel. The fitting shall be carbon steel, welded construction, two-piece linked fitting. A means to reduce noise and vibration transmission between the linked fitting parts shall be provided. Seismic brace fittings shall be Superstrut C-749N series seismic brace, Kin-Line No. 633 seismic connector fitting, or equal.
- 2. Hanger Rod Stiffener Assembly: Rod stiffener channel shall be 1 5/8 inch square carbon steel framing channel, Unistrut P1000, B-Line B22, Superstrut A-1200, or equal. Rod stiffener clamps shall be complete with channel nut and shall be Superstrut ES-142, Kin-Line No. 635, or equal.
- 3. Type A1 Seismic Brace: Seismic brace shall be 1 5/8 inch square carbon steel framing channel, Unistrut P1000, B-Line B22, Superstrut A-1200, Kin-Line No. 4112, or equal.
- 4. Type A2 Seismic Brace: Seismic brace shall be 1 5/8 inch wide by 3 1/4 inch deep carbon steel framing channel, Unistrut P5000, B-Line B11, Superstrut H-1200, Kin-Line No. 8212, or equal.

APRIL 2022

SEISMIC RESTRAINTS FOR PIPING

ATTACHMENT E - TECHNICALS

E. Structural Attachments:

- General: Unless otherwise specified, hanger rod structural attachments shall be as specified in Section 40 05 07 PIPE HANGERS AND SUPPORTS FOR PROCESS PIPING. Structural attachments for longitudinal and lateral seismic braces shall be as specified in paragraph 2.02 Structural Attachments.
- 2. Type SA-1 Attachment: Brace fitting shall be as specified in paragraph 2.02 Braces and Fittings. Concrete anchors shall be as specified in Section 05 05 19 with embedment and location dimensions as specified.
- 3. Type SA-2 Attachment: Brace fitting shall be as specified in paragraph 2.02 Braces and Fittings. Concrete anchors shall be as specified in Section 05 05 19 with embedment and location dimensions as specified. Framing channel shall be as specified in paragraph 2.02 Accessories.
- 4. Type SA-3 Attachment: Brace fitting shall be as specified in paragraph 2.02 Braces and Fittings. Cap screw, lockwasher and hex nut materials and finish shall be compatible with structural steel material.
- 5. Type SA-4 Attachment: Brace fitting shall be as specified in paragraph 2.02 Braces and Fittings.
- 6. Type SA-5 Attachment: Brace fitting shall be as specified in paragraph 2.02 Braces and Fittings. Four inch x 3 inch x 3/8 inch angle shall be carbon steel.

F. Accessories:

- 1. Hanger Rods: Rods shall be carbon steel, threaded on both ends or continuous threaded and sized as specified.
- 2. Framing Channel: Framing channel shall conform to the Metal Framing Manufacturers Association standard MFMA-1. Framing channel shall be roll formed, 12-gage carbon steel. Channel shall have a continuous slot along one side with in-turned clamping ridges. Channel shall be Unistrut P1000 series, B-Line B22 series, Superstrut A-1200 series, or equal.
- 3. Rod Coupling: Rod coupling shall be carbon steel, with sight hole in center of coupling body, Grinnell Fig. 135, Superstrut H-119, or equal.

PART 3 EXECUTION

3.01 PIPE RESTRAINT LOCATIONS

- A. The first seismic restraint on a piping system shall be located not more than 10 feet from the main riser, entrance to a building or piece of equipment.
- B. Cast iron pipe shall be braced on each side of a change in direction of 90 degrees or more. Joints in risers shall be braced or stabilized between floors.
- C. No-hub and bell and spigot cast iron soil pipe shall be braced longitudinally every 20 feet and laterally every 10 feet.
- D. Lateral bracing for one pipe section may also act as longitudinal bracing for the pipe section connected perpendicular to it, if the bracing is installed within 24 inches of the elbow or tee of the same size.

APRIL 2022

SEISMIC RESTRAINTS FOR PIPING

ATTACHMENT E - TECHNICALS

E. Seismic restraint locations and components shall be indicated on the piping layout drawings required by Section 40 05 01 PIPING SYSTEMS. The Contractor shall provide a legend giving load information and restraint component selection at each restraint location.

3.02 INSTALLATION

- A. Rod stiffener assemblies shall be used at seismic restraints for hanger rods over 6 inches in length. A minimum of two rod stiffener clamps shall be used on any rod stiffener assembly.
- B. Lateral and longitudinal bracing shall be installed between 45 degrees above and 45 degrees below horizontal, inclusive, relative to the horizontal centerline of the pipe.
- C. Welded and bolted attachments to the building structural steel shall be in accordance with the requirements of the AISC Manual of Steel Construction. There shall be no drilling or burning of holes in the building structural steel without approval of the Engineer.
- D. Embedded anchor bolts shall be used instead of concrete inserts for seismic brace 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 restraint installation. Butt joint connections to pipe insulation shall be made at the time of insulation installation in accordance with the manufacturer's recommendations.
- F. Restraint components in contact with plastic pipe shall be free of burrs and sharp edges.
- G. Rollers shall roll freely without binding.
- H. 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.

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS SEISMIC RESTRAINTS FOR PIPING

SECTION 40 05 23 STAINLESS STEEL PROCESS PIPE AND TUBING

PART 1 GENERAL

1.01 DESCRIPTION

- A. Scope: This section specifies stainless steel pipe and fittings.
- B. Types of Service: Stainless steel piping specified in this section shall be used for piping systems 40 05 02.11 OXYGEN GAS as specified in Section 40 05 01 PIPING SYSTEMS.

1.02 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 Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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 B16.1	Cast Iron Pipe Flanges and Flanged Fittings Classes 25, 125, 250, and 800
ANSI B16.11.80	Forged Steel Fittings, Socket Welding and Threaded.
ANSI B31.1	Power Piping
ANSI B36.19M	Stainless Steel Pipe
ASME Section IX (1989)	Boiler and Pressure Vessel Code; Welding and Brazing Qualifications
ASTM A182/A182M	Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service

STAINLESS STEEL PROCESS PIPE AND TUBING

APRIL 2022

ATTACHMENT E - TECHNICALS

Reference	Title
ASTM A193/A193M	Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A194/A194M	Carbon and Alloy Steel Nuts for Bolts for High Pressure and High-Temperature Service
ASTM A240	Heat-Resisting Chromium and Chromium Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels
ASTM A276	Stainless and Heat-Resisting Steel Bars and Shapes
ASTM A312/A312M	Seamless and Welded Austenitic Stainless Steel Pipes
ASTM A320/A320M	Alloy Steel Bolting Materials for Low-Temperature Service
ASTM A403/A403M	Wrought Austenitic Stainless Steel Piping Fittings
ASTM A480/A480M	General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip
ASTM A774/A774M	As-Welded Wrought Austenitic Stainless Steel Fittings for General Corrosive Service at Low and Moderate Temperatures
ASTM A778	Welded, Unannealed Austenitic Stainless Steel Tubular Products

B. Qualifications:

- 1. All shop fabricated stainless steel pipe and fittings shall be furnished by a single manufacturer who is experienced and qualified in the manufacture and fabrication of the items to be furnished. The pipe and fittings shall be shopfabricated and field-installed in accordance with common industry-wide practices and methods and shall comply with these specifications.
- 2. Only weld procedures which have been qualified under ASME Section IX and only welders who have successfully completed performance qualification tests per ASME Section IX on these qualified procedures shall be utilized.
- C. Testing: Factory testing shall conform to the requirements of ASTM A312 or ASTM A778, depending on the size and type of stainless steel pipe provided.

1.03 SUBMITTALS

- A. The following information shall be provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
 - 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

STAINLESS STEEL PROCESS PIPE AND TUBING

APRIL 2022

ATTACHMENT E - TECHNICALS

40 05 23 - 2

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. Pipe layout drawings showing details of materials, piping, fittings, couplings, dielectric connections, joint locations and details, types and locations of supports.
- 3. Other data necessary to show conformance of the complete piping system to these specifications.

PART 2 PRODUCTS

2.01 PIPE

A. A. Unless otherwise specified, stainless steel pipe 2-1/2 inches and smaller shall be Type 316L, seamless, threaded joints conforming to ASTM A312. The minimum wall thickness shall be Schedule 40S. Flanges may be used where connecting to tanks, couplings, or other specialty fittings.

2.02 FITTINGS

A. Unless otherwise specified, stainless steel fittings, 2-1/2-inches and smaller, shall be ASTM A403, of the same material and pressure rating as the pipe, threaded long radius with dimensions conforming to ANSI B16.11.

2.03 COUPLINGS

- A. General: Fabricated stainless steel piping shall be shop-prepared for pipe couplings where specified. Unless otherwise specified, couplings shall be archedband or grooved type.
- B. Arched-Band Type: Arched-band type couplings shall be stainless steel of the same material and wall thickness as the pipe and shall be Depend-O-Lok type as manufactured by Brico or equal. Couplings shall be Fixed--FxF, Expansion--ExE, or Fixed by Expansion--FxE as specified or as required. The pipe shall be plainend with external weld beads ground smooth and with S.S. restraining rings shopwelded to the piping for fixed type couplings.
- C. Expansion Type: Unless otherwise specified, expansion couplings shall be the flanged rubber arch type as specified in Section 40 05 06.23 EXPANSION JOINTS AND FLEXIBLE METAL HOSE. Pipe flanges shall be provided for these couplings.

STAINLESS STEEL PROCESS PIPE AND TUBING

APRIL 2022 ATTACHMENT E - TECHNICALS

40 05 23 - 3

2.04 THREADED CONNECTIONS

A. Threaded pipe, gage, or instrument connections shall be made using stainless steel, 150 pound, threaded half-couplings conforming to ASTM A182 or ASTM A276, shop welded to the pipe at the locations specified.

2.05 GASKETS

A. Unless otherwise specified, gaskets shall be as specified in the PIPESPECS and in Section 40 05 06.16 PIPING CONNECTIONS. For air lines, gaskets shall be neoprene or EPDM suitable for use at temperatures to 240 degrees F.

2.06 BOLTS

A. Bolts, nuts, and washers for stainless steel flange assemblies and stainless steel couplings shall be the same material, conforming to ASTM A320 for lowtemperature service and ASTM A193 and ASTM A194 for high-temperature service. Bolts, nuts and washers for other couplings shall be as specified in referenced paragraphs for the couplings.

2.07 PIPE SUPPORT SYSTEMS

A. Unless otherwise specified, all hangers, rods, structural attachments, and other components of support systems for stainless steel pipe shall be of the same materials as the pipe and conform to Section 40 05 07 HANGERS AND SUPPORTS FOR PROCESS PIPING.

2.08 FINISH

A. After all shop operations have been completed, pipe and fittings shall be pickled and passivated in manufacturer's plant and scrubbed and washed until discoloration and possible iron picked up from manufacturing process are removed. The standard finish for 16-gage through 8-gage material shall be No. 1 or 2B per ASTM A480; 3/16-inch and heavier plate material shall be No. 1 mill finish or better per ASTM A480.

2.09 PRODUCT DATA

- A. The following information and data shall be provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
 - 1. Certifications specified in the following documents:
 - a. ASTM A403, paragraph 14.1
 - b. ASTM A774, paragraph 14.1
 - c. ASTM A778, paragraph 14.1
 - 2. Test results specified in paragraph 1.02 Testing.
 - 3. Names and qualification records of proposed welders.

STAINLESS STEEL PROCESS PIPE AND TUBING

PART 3 EXECUTION

3.01 PIPE CUTTING, THREADING, AND JOINTING

A. Pipe cutting, threading, and jointing shall conform to the requirements of ANSI B31.1. All pipe threads shall be lubricated with Teflon tape.

3.02 WELDING

A. General: Piping with wall thickness up to 11 gage (0.120 inch) shall be welded with the TIG (GTAW) process. Unless otherwise specified, heavier walls shall be properly beveled and have a root pass with the TIG (GTAW) process followed by subsequent passes with the TIG (GTAW), MIG (GMAW), or Metallic Arc (SMAW) process. Filler wire of ELC grades only shall be added to all welds to provide a cross section at the weld equal to or greater than the parent metal. Weld deposit shall be smooth and evenly distributed and have a crown of no more than 1/16 inch on the I.D. and 3/32 inch on the O.D. of the piping. Concavity, undercut, cracks, or crevices shall not be allowed. Butt welds shall have full penetration to the interior surface, and inert gas shielding shall be provided to the interior and exterior of the joint. Excessive weld deposits, slag, spatter, and projections shall be removed by grinding. Welds on gasket surfaces shall be ground smooth.

B. Field Welding:

- Field welding shall be minimized to the greatest extent possible by use of couplings and prefabrication of pipe systems at the factory. Pipe butt welds may be performed at the job site, providing the but welds are performed only with an inert gas shielded process and that other applicable specified welding requirements are rigidly adhered to.
- All residue, oxide, and heat stain are to be removed from any type of field weld and the affected areas adjacent by the use of stainless steel wire brushes, followed by cleaning with an agent such as Eutectic Company's "Eucleen," or equal, followed by complete removal of the agent.
- C. Preparation of Surfaces to Be Welded: Surfaces of joints to be welded shall be free from mill scale, slag, grease, oil, paint, rust, and other foreign material. Joints to be welded shall be wire-brushed with stainless steel wire brushes and precisely fitted before welding.
- D. Weather Conditions: Welding shall be done only when the surfaces are completely free of any moisture. Welding of the pipe shall not be done during periods of high winds or rain unless the areas being welded are properly shielded.

STAINLESS STEEL PROCESS PIPE AND TUBING

479 I Page

- E. Tack Welds, Clips, and Other Attachments: Nicks, gouges, notches, and depressions in the base metal in the area of the joint shall be repaired before the joint weld is made. Tack welds, clips, and other attachments shall be removed and defects repaired, except where the tack welds occur within the weld area and these tack welds do not exceed the size of the completed weld. Cracked tack welds shall be removed. Areas to be repaired shall be ground to clean metal and then repaired by building up with weld metal. The repaired areas shall be ground smooth to form a plane surface with the base metal.
- F. Defects and Repairs: Welds with cracks, slag inclusions, porosity, undercutting, incomplete penetration, or which are otherwise deficient in quality or made contrary to any provisions of these specifications shall be removed by chipping or grinding throughout their depth to clean base metal. Calking or peening of welds to correct defects shall not be done. Welds found deficient in dimension but not in quality shall be enlarged by additional welding after thoroughly cleaning the surface of previously deposited metal and the adjoining plate. Weld deposits, slag, weld spatter, and projections into the interior of the pipe shall be removed by grinding.

3.03 MARKING, SHIPPING, AND STORAGE

A. All pipe, fittings, and fabrications shall be properly marked with type, gage, and heat number. All fabricated piping shall have openings plugged and flanges secured for storage and/or transport after fabrication. All fabricated piping shall be piece-marked with identifying numbers or codes which correspond to the Contractor's layout and installation drawings. The marks will be located on the spools at opposite ends and 180 degrees apart. Pipe spools shall be loaded and blocked and lagged as necessary to ensure protection from damage during shipping. Stainless steel pipe and fittings shall be stored per manufacturer's recommendation. Dents, gouges, and scratches in stainless steel pipe and fittings are not acceptable and are reason for rejecting pipe and fittings.

3.04 FABRICATION/INSTALLATION REQUIREMENTS

A. The piping supplier during manufacturing, fabricating and handling stages, and the Contractor during handling and installation stages, shall use extreme care to avoid the contact of any ferrous materials with the stainless steel piping. All saws, drills, files, wire brushes, etc. shall be used for stainless steel piping only. Pipe storage and fabrication racks shall be nonferrous or stainless steel or rubber-lined. Nylon slings or straps shall be used for handling stainless steel piping. Contact with ferrous items may cause rusting of iron particles embedded in the piping walls. After installation, the Contractor shall wash and rinse all foreign matter from the piping surface. All welded joints shall be treated with a pickling solution, brushed with stainless steel wire brushes and rinsed clean. If rusting of embedded iron occurs, the Contractor shall pickle the affected surface with Oakite Deoxidizer SS, or equal, scrub with stainless steel brushes, and rinse clean.

STAINLESS STEEL PROCESS PIPE AND TUBING

ATTACHMENT E - TECHNICALS

40 05 23 - 6

APRIL 2022

3.05 COATINGS

A. After installation, the Contractor shall paint all steel or iron flanges, couplings, and appurtenances in accordance with Section 09 90 00 PAINTING AND COATING with epoxy coating. Painting of the stainless steel pipe is not required. However, the Contractor shall be responsible for supplying and installing the stainless steel piping with a consistently clean surface. Identifying spool piece marks shall be removed with paint thinner or solvents and the entire stainless steel surface shall be washed with detergent and hot water and rinsed clean.

END OF SECTION

STAINLESS STEEL PROCESS PIPE AND TUBING

40 05 23 - 7

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS STAINLESS STEEL PROCESS PIPE AND TUBING 40 05 23 - 8

SECTION 40 05 24 STEEL PROCESS PIPE

PART 1 GENERAL

1.01 DESCRIPTION

A. This section specifies steel pipe and fittings.

1.02 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 Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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
ASME B16.3	Malleable Iron Threaded Fittings, Class 150 and 300
ASME B16.9	Factory-Made Wrought Steel Buttwelding Fittings
ASME B16.11	Forged Steel Fittings, Socket-Welding and Threaded
ASTM A36/A36M	Structural Steel
ASTM A47	Ferritic Malleable Iron Castings
ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A105/A105M	Forgings, Carbon Steel, for Piping Components
ASTM A106 REV A	Seamless Carbon Steel Pipe for High-Temperature Service
ASTM A197	Cupola Malleable Iron
ASTM A234/A234M	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM A283/A283M REV A	Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars

APRIL 2022 ATTACHMENT E - TECHNICALS

PQPS Oxygenation System

K-23-2080-DBB-3

STEEL PROCESS PIPE

Reference	Title
ASTM A536	Ductile Iron Castings
ASTM A570/A570M	Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality
ASTM A572/A572M REV B	High Strength Low Alloy Columbium-Vanadium Steels of Structural Quality
AWWA C200	Steel Water Pipe 6 Inches and Larger
AWWA C205	Cement-Mortar Protective Lining and Coating for Steel Water Pipe4 In. and Larger Shop Applied
AWWA C206	Field Welding of Steel Water Pipe
AWWA C207	Steel Pipe Flanges for Waterworks ServicesSizes 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 C600	Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA M11	Steel PipeA Guide for Design and Installation
SSPC-SP10	Near-White Blast Cleaning

B. Testing: Factory testing shall conform to the requirements of ASTM A53, ASTM A106, or AWWA C200 as applicable.

PART 2 PRODUCTS

2.01 PIPE MATERIALS

- A. Steel pipe and fittings shall be provided in accordance with ASTM A53, ASTM A106, or AWWA C200 as specified in Section 40 05 01 PIPING SYSTEMS.
- B. Steel for pipe fabricated to meet requirements of AWWA C200 shall conform to the requirements of ASTM A36, ASTM A572, Grade 42, or ASTM A283, Grade D. Steel for ASTM A53 and ASTM A106 pipe shall be Grade B.

2.02 PIPE MANUFACTURE

A. Unless otherwise specified, ASTM A53 pipe shall be Type E, electric resistance welded or Type S, seamless pipe as specified in Section 40 05 01 PIPING SYSTEMS. The minimum wall thickness for ASTM A53 or ASTM A106 pipe shall be Schedule 40 for pipe 10 inch diameter and less and 3/8 inch for pipe 12 inch through 24 inch diameter. Increased shell thickness shall be provided where specified.

APRIL 2022

STEEL PROCESS PIPE

ATTACHMENT E - TECHNICALS

B. AWWA C200 pipe shall be straight or spiral seam. The minimum wall thickness shall be 7 gage for pipe 6 inch through 24 inch diameter and 1/4 inch for pipe 26 inch diameter and larger. Increased shell thickness shall be provided where specified.

2.03 CONNECTIONS

A. Connections shall be as specified in Section 40 05 01 PIPING SYSTEMS and shall conform to Section 40 05 06.16 PIPING CONNECTIONS. Coating for buried connections shall be as specified in Section 40 05 06.16 PIPING CONNECTIONS.

2.04 FITTINGS AND APPURTENANCES

- A. Malleable iron threaded fittings and appurtenances shall conform to the requirements of ASTM A47 or ASTM A197, ASME B16.3.
- B. Unless otherwise specified, steel fittings and appurtenances shall conform to the requirements of ASTM A234, ASTM A105, or ASME B16.11; and fabricated steel fittings and appurtenances shall conform to AWWA C208.
- C. Fittings for grooved end piping systems shall be full flow cast fittings, steel fittings, or segmentally welded fittings with grooves or shoulders designed to accept grooved end couplings. Cast fittings shall be cast of ductile iron conforming to ASTM A536 or malleable iron conforming to ASTM A47. Standard steel fittings, including large size elbows, shall be forged steel conforming to ASTM A106. Standard segmentally welded fittings shall be fabricated of Schedule 40 carbon steel pipe.
- D. Unless otherwise specified, all fittings shall be rated for pressure and loadings equal to the pipe.

2.05 PIPE LINING

A. Epoxy:

- 1. Unless otherwise specified, pipe and fittings shall be lined with a liquid epoxy as specified in AWWA C210 with the following exceptions:
 - a. No coal tar products shall be incorporated in the liquid epoxy.
 - b. The curing agent may be an amidoamine as well as the other curing agents listed in AWWA C210.
- 2. The lining shall be applied to a minimum thickness of 16 mils in not less than two coats.
- B. Cement Mortar: Not Used
- C. High Temperature Service Epoxy: Not Used
- D. Glass Lining: Not Used

APRIL 2022

STEEL PROCESS PIPE

ATTACHMENT E - TECHNICALS

2.06 PIPE COATING

A. Epoxy:

- 1. Unless otherwise specified, pipe and fittings shall be coated with a liquid epoxy as specified in AWWA C210 with the following exceptions:
 - a. No coal tar products shall be incorporated in the liquid epoxy.
 - b. The curing agent may be an amidoamine as well as the other curing agents listed in AWWA C210.
- 2. The coating shall be applied to a minimum thickness of 16 mils in not less than two coats.
- B. Polyethylene Tape: Not Used
- C. Cement Mortar: Not Used
- 2.07 FUSION EPOXY COATING AND LINING NOT USED

2.08 JOINT GASKETS

A. Joint gaskets shall be as specified in Section 40 05 06.16 PIPING CONNECTIONS.

2.09 PRODUCT DATA

- A. The following information shall be provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
 - 1. Affidavits of Compliance with AWWA C200, ASTM A53, or ASTM A106 as applicable.
 - 2. Contractor's layout drawings as specified in Section 40 05 01 PIPING SYSTEMS.

PART 3 EXECUTION

3.01 INSTALLATION

A. General:

- Pipe shall be installed in accordance with AWWA M11, Chapter 16. Welded joints shall be in accordance with AWWA C206 and Section 40 05 06.16 PIPING CONNECTIONS.
- 2. Sleeve-type mechanical pipe couplings shall be provided in accordance with AWWA M11 and Section 40 05 06.16 PIPING CONNECTIONS.
- 3. Pipe lining and coatings at field joints shall be applied as specified in Section 40 05 06.16 PIPING CONNECTIONS.
- Unless otherwise specified, buried flanges, mechanical couplings, and valves shall be field coated as specified in Section 40 05 06.16 PIPING CONNECTIONS.

APRIL 2022

STEEL PROCESS PIPE

ATTACHMENT E - TECHNICALS

B. Anchorage:

1. Anchorage shall be provided as specified. Calculations and drawings for proposed alternative anchorage shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

3.02 TESTING

A. Hydrostatic testing shall be in accordance with Section 4 of AWWA C600 except that test pressures and allowable leakage shall be as listed in Section 40 05 01 PIPING SYSTEMS.

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS STEEL PROCESS PIPE

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS STEEL PROCESS PIPE 40 05 24 - 6

SECTION 40 05 31 THERMOPLASTIC PROCESS PIPE

PART 1 GENERAL

1.01 DESCRIPTION

- A. Scope: This section specifies polyvinylchloride and chlorinated polyvinylchloride, pipe and fittings.
- B. Pipe Designations: For use in the Piping System Specification Sheets (PIPESPEC) in Section 40 05 01 PIPING SYSTEMS and in this section, the following plastic pipe designations are defined:

Designation	Definition
PVC	Polyvinylchloride
CPVC	Chlorinated polyvinylchloride

1.02 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 Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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)

APRIL 2022 ATTACHMENT E - TECHNICALS THERMOPLASTIC PROCESS PIPE

40 05 31 - 1

Reference	Title
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 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 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

2.01 PVC PIPE

A. Pressure Pipe:

- B. 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 40 05 01 PIPING SYSTEMS and the Piping Specification Sheets. Neoprene gaskets with push on joints shall conform to ASTM F477.
- C. 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.

APRIL 2022 ATTACHMENT E - TECHNICALS THERMOPLASTIC PROCESS PIPE

40 05 31 - 2

2.02 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.

2.03 PRODUCT DATA

A. The following information shall be provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES: Manufacturer's certificates of compliance with the specified standards and Contractor's layout drawings.

PART 3 EXECUTION

3.01 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 and CPVC piping exposed to sunlight shall be painted with coating system L 2 as specified in Section 09 90 00 PAINTING AND COATING.
- 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.

3.02 TESTING

A. Testing of plastic piping shall be as specified in Section 40 05 01 PIPING SYSTEMS.

END OF SECTION

APRIL 2022

THERMOPLASTIC PROCESS PIPE

ATTACHMENT E - TECHNICALS

40 05 31 - 3

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS THERMOPLASTIC PROCESS PIPE 40 05 31 - 4

SECTION 40 05 57.13 MANUAL ACTUATORS

PART 1 GENERAL

1.01 DESCRIPTION

A. This section specifies manual operators for valves and gates, and operator appurtenances.

1.02 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 Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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
AWWA C500	Gate Valves 3 through 48 inch NPS, for Water and Sewage Systems

PART 2 PRODUCTS

2.01 GENERAL

A. Except as specified in valve and gate specification sections, manual operators shall be as specified herein. Operators shall be mounted on the valve or gate and provided as a unit. Each valve body or operator shall have cast thereon the word "OPEN," an arrow indicating the direction to open, and flow direction arrows.

APRIL 2022 ATTACHMENT E - TECHNICALS MANUAL ACTUATORS 40 05 57.13 - 1

2.02 OPERATORS

- A. General: Manual operators shall have operating torques less than 80 foot-pounds. Unless specified otherwise, each manual operator shall be provided with an operating wheel. Unless specified otherwise, the direction of rotation of the operator shall be counterclockwise for opening.
- B. Wrench Nuts: (NOT USED)
- C. Chain Wheels: Chain wheels shall be ductile iron. Operating chains shall be galvanized.

2.03 OPERATOR APPURTENANCES (NOT USED)

2.04 PRODUCT DATA

A. Manufacturer's catalog information and other data confirming conformance to design and material requirements shall be provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

PART 3 EXECUTION

3.01 GENERAL

A. Installation shall be as specified herein. Valve operators shall be located so that they are readily accessible for operation and maintenance. Valve operators shall be mounted for unobstructed access, but mounting shall not obstruct walkways. Valve operators shall not be mounted where shock or vibration will impair their operation. Support systems shall not be attached to handrails, process piping, or mechanical equipment.

3.02 OPERATORS

- A. General: Valves and gates shall be provided with manual operators, unless specified otherwise.
- B. Wrench Nuts: (NOT USED)
- C. Chain Wheels: Unless otherwise specified, valves with centerlines more than 7 feet, 6 inches above the specified operating level shall be provided with chain wheels and operating chains. Chain wheel operated valves shall be provided with a chain guide. Operating chains shall be looped to extend within 4 feet of the specified operating level below the valve. For plug-type valves 8 inches and larger, the operator shall be provided with a hammer blow wheel. Hooks shall be provided for chain storage where the chain may hang in a walkway.

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS MANUAL ACTUATORS 40 05 57.13 - 2

SECTION 40 05 60 VALVES

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies the supply, installation and testing of valves. Materials and performance requirements for valves are specified in Detailed Valve Specifications. Detailed Valve Specifications are provided in Sections fall between 40 05 62.16 ECCENTRIC PLUG VALVES FOR LIQUID SERVICE through 40 05 78.23 AIR/VACUUM VALVES FOR LIQUID SERVICE. Additional Detailed Valve Specifications for some valves used for HVAC service are provided in Division 23.

B. Determining Valve Type:

- 1. Drawings specify valve types (gate, plug, butterfly, check, globe, etc.) used for each process service. Process fluids that will be conveyed in pipelines are identified by the Process Service Identifiers shown on the Drawings.
- 2. Section 40 05 02 PIPING SYSTEM SCHEDULES specify piping system materials and components based on the Process Service Identifier specified on the Drawings for the pipeline or piping system.
- 3. Provide valves conforming to the Piping System Schedule for the valve/line size, process service, and valve type specified on the Drawings and specified in Sections 40 05 60 VALVES, 40 05 62.16 ECCENTRIC PLUG VALVES FOR LIQUID SERVICE, 40 05 65.23 SWING CHECK VALVES, and 40 05 78.23 AIR/VACUUM VALVES FOR WASTEWATER SERVICE.

1.02 RELATED SECTIONS

- A. This section contains specific references to the following related sections. Additional related sections may apply that are not specifically listed below.
 - 1. Section 01 61 00 COMMON PRODUCT REQUIREMENTS
 - 2. Section 01 78 23 OPERATION AND MAINTENANCE DATA
 - 3. Section 40 05 02 PIPING SYSTEMS SCHEDULES
 - 4. 40 05 62.16 ECCENTRIC PLUG VALVES FOR LIQUID SERVICE
 - 5. 40 05 65.23 SWING CHECK VALVES
 - 6. 40 05 78.23 AIR/VACUUM VALVES FOR WASTEWATER SERVICE

1.03 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.

APRIL 2022 VALVES

B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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 16.10	Face-to-Face and End-to-End Dimensions of Valves
ANSI B1.20.1	Pipe Threads, General Purpose
ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, and 250
ANSI B16.5	Pipe Flanges and Flanged Fittings
ANSI B16.34	Valves—Flanged, Threaded, and Welding End
API 607	Fire Test for Quarter-turn Valves and Valves Equipped with Nonmetallic Seats
ASTM A48	Gray Iron Castings
ASTM A108	Steel Bars, Carbon, Cold-Finished, Standard Quality
ASTM A126	Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A216/A216M	Steel Castings, Carbon, Suitable for Fusion Welding, for High Temperature Service
ASTM A276	Stainless and Heat Resisting Steel Bars and Shapes
ASTM A351	Castings, Austenitic, for Pressure-Containing Parts
ASTM A516	Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower- Temperature Service
ASTM A536	Ductile Iron Castings
ASTM A571	Austenitic Ductile Iron Castings
ASTM A995/A995M- 13	Castings, Austenitic-Ferritic (Duplex) Stainless Steel, for Pressure-Containing Parts
ASTM B124	Copper and Copper Alloy Forging Rod, Bar, and Shapes
ASTM B148	Aluminum-Bronze Sand Castings
ASTM C283	Resistance of Porcelain Enameled Utensils to Boiling Acid
ASTM D1784	Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D5162	Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates
AWWA C500	Metal-Seated Gate Valves for Water Supply Service
AWWA C504	Rubber-Seated Butterfly Valves
AWWA C507	Standard for Ball Valves
AWWA C508	Swing Check Valves for Waterworks Service, 2 – 24 Inches NPS

APRIL 2022 ATTACHMENT E - TECHNICALS VALVES

40 05 60 - 2

Reference	Title
AWWA C517	Resilient-Seated Cast Iron Eccentric Plug Valves
AWWA C550	Protective Interior Coatings for Valves and Hydrants
MSS SP-70	Gray Iron Gate Valves, Flanged and Threaded Ends
MSS SP-80	Bronze Gate, Globe, Angle and Check Valves
MSS SP-81	Stainless Steel, Bonnetless, Flanged, Knife Gate Valves
MSS SP-110	Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends
NSF 61	Drinking Water System Components - Health Effects
UL 429	Electrically Operated Valves
UL 1002	Electrically Operated Valves for Use in Hazardous Locations, Class I, Groups A, B, C, and D, and Class II, Groups E, F, and G

1.04 SUBMITTALS

A. Action Submittals:

- Procedures: Section 01 33 00 SUBMITTAL PROCEDURES
- 2. A copy of this Section, addendum updates included, with each paragraph check-marked to indicate compliance or marked to indicate requested deviations from specification requirements. Check-marks (✓) denote full compliance with a paragraph as a whole. Underline deviations and denote with a number in the margin to the right of the identified paragraph. The remaining portions of the paragraph not underlined signify compliance on the part of the Contractor with the specifications. Include a detailed, written justification for each deviation. 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 will be sufficient cause for rejection of the entire submittal with no further consideration.
- Catalog cuts and/or shop drawings for each type of valve indicating the valve type (Detailed Valve Specification Section Number), materials of construction, dimensions, operating torque, valve end connection configuration, pressure rating, and operating temperature range.
- 4. An amended Detailed Valve Specification for all valve types provided for this contract. Indicate with check marks where the valve supplied meets the requirements specified and with written amendments where the product differs from the specification.
- 5. Factory Acceptance Test results and/or Certified Statement of Proof-of-Design testing results when specified in Detailed Valve Specifications.
- 6. Action Submittal Items listed on Detailed Valve Specifications

B. Informational Submittals:

- 1. Affidavits and registration numbers as specified.
- 2. Operating and Maintenance data for incorporation in operation and maintenance manual, as specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA. Include complete description of operation together

APRIL 2022 VALVES
ATTACHMENT E - TECHNICALS 40 05 60 - 3

- with detailed drawings, a complete list of replacement and repair parts, and parts manufacturer's identifying numbers.
- 3. Informational Submittal Items listed on Detailed Valve Specifications.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Procedures: Section 01 61 00 COMMON PRODUCT REQUIREMENTS.
- B. Deliver valves to site in accordance with Section 01 61 00 COMMON PRODUCT REQUIREMENTS and using loading methods which do not damage any valve components or coatings.
- C. Tag loose valves stating size, type, coatings and mating parts shipped loose or separate.
- D. Store on site until ready for incorporation in the work using methods recommended by the manufacturer to prevent damage, undue stresses, or weathering.

PART 2 PRODUCTS

2.01 VALVE CONFIGURATION REQUIREMENTS

A. General:

- 1. Provide valves of the same type, size range and service from a single manufacturer.
- 2. Provide new, unused valves for the work.
- 3. Provide valve materials free from defects or flaws, with true alignment and
- 4. Provide valves that open by turning the valve shaft to rotate counter-clockwise unless otherwise specified in the Detailed Valve Specification Section.
- B. Provide padlockable lockout feature on all valves.

C. Manual Operators:

- 1. Provide valves with manual operators as specified in the Detailed Valve Specification, unless identified as actuated in the drawings or specifications.
- 2. For hand wheels, clearly show the direction of opening in raised lettering and symbols.
- 3. The maximum rim pull on a hand wheel is not to exceed 65 lb. when one side of the valve is at test pressure and the other side is at atmospheric pressure. Where a shaft mounted hand wheel would require greater force to operate, provide a torque reduction gearbox operator. Unless different operators are scheduled or specified on the Drawings, conform to the following minimum requirements.
- 4. Quarter turn lever operators are to be perpendicular to the pipe runs when the valves are closed.

APRIL 2022 VALVES 40 05 60 - 4

- 5. Provide butterfly valves with 10 position latching levers except where used to balance air flows. Where used to balance air flows provide infinite position, screw down levers.
- 6. The maximum pull at the end of the lever arm is not to exceed 65 lb. when one side of the valve is at test pressure and other side is at atmospheric pressure. Where greater force would be required to operate the valve with a lever, provide a torque reduction gearbox operator.
- 7. Provide grease lubricated, worm gear type operators for torque reduction gearbox operators. Gearbox operators equipped with a hand wheel and a visual indicator of the valve position. Provide gear operators with adjustable mechanical stop-limiting devices to prevent over travel of the disc/ball/plug in the open and closed positions and which are self-locking and designed to hold the valve in any intermediate position between full open and full closed. Where gearbox operators are intended for direct bury or submergence, seal units with long life lubricant.
- 8. For manual valves on lines 3 inches and greater, mounted over 7.0 feet above the operating floor, provide chain wheel gear operators. Design chain wheel operators so that a force of 30 lb. is sufficient to open the valve when one side of the valve is at test pressure and the other side is at atmospheric pressure. Provide chain pulley that positively engages the chain links. The chain will extend from the valve operator to an operating height of 4 feet above the floor or as directed by the CITY. The exact dimensions will be field determined. Provide approved chain hooks where required to prevent chain from hanging within traffic paths.
- 9. Where manual operators are installed over 7.0 feet above the operating floor and the Drawings specify a vertical valve shaft, revise the gear operator and/or chain wheel position to provide a horizontal chain wheel shaft. Retain the valve orientation specified on the Drawings.
- 10. Provide ductile iron chain wheels. Provide galvanized steel operating chains.
- D. Power Actuators. Actuators shall be per individual equipment sections.
- E. Valve Stem Extensions and Wrench Nuts
 - 1. Provide valve stem extensions where additional clearance is required for pipe insulation or where valve operation without the extension is difficult; and in manholes.
 - 2. Where angle valve stem extensions are employed, they will be angle geared. Universal joint types are not permitted.
 - 3. Wrench nuts shall comply with AWWA C500. A minimum of two operating keys, but no less than one key per every ten valves, shall be provided for operation of wrench nut operated valves.
- F. Operator Appurtenances (Not Used)

2.02 VALVE IDENTIFICATION TAGS

A. Provide valve identification tags for all valves with an identification tag number as provided by Construction Manager.

APRIL 2022 VALVES

ATTACHMENT E - TECHNICALS 40 05 60 - 5

B. Type 316 stainless steel tags, minimum 2.5-inches x 0.75 inches, with 0.1875 inch numbers and letters. Complete tag number shall be embossed on the tag. Tags shall be attached using stainless steel wire.

PART 3 EXECUTION

3.01 PREPARATION

- A. The valve and piping arrangement indicated on the Drawings is based on typical dimensions for valves of the specified type. Make the necessary modifications in the piping to allow for discrepancies between the valve dimensions shown and those supplied for the Work.
- B. Prior to installation of valves, field measure and check all equipment locations, pipe alignments, and structural installations. Ensure that the valve location and orientation provides suitable access to manual operators and that sufficient space and accessibility is available for hydraulic, pneumatic, and electric power actuators.
- C. Where conflicts are identified, inform the CITY.

3.02 INSTALLATION

- A. Install valves in conjunction with the piping specified in the Piping System Schedules (Section 40 05 02).
- B. In horizontal pipe runs, other than in locations where space does not permit, install all valves (except for butterfly valves, eccentric plug valves, and trunnion ball valves) with a vertical operating shaft with the actuator at the top. In no case install a valve with the operator below the valve.
- C. Unless otherwise specified on the drawings, install butterfly valves, eccentric plug valves, and trunnion ball valves with the shaft in a horizontal orientation. Install eccentric plug valves with the plug above the valve shaft centerline when the valve is full open.
- D. When joining valves to pipe or fittings, do not over torque bolts to correct for misalignment.
- E. Support valves in position using temporary supports until valves are fixed in place.
- F. Permanently support valves to prevent transmission of loads to adjacent pipework and/or equipment.
- G. Install gate valves in the closed position.
- H. Install valves which are bubble tight in one direction to provide bubble tight seal of flow in normal direction of flow unless otherwise noted or directed by the CITY.

APRIL 2022 VALVES
ATTACHMENT E - TECHNICALS 40 05 60 - 6

- I. Unless otherwise specified, install single seated valves with the seat downstream. Install valves at tank connections with seat away from tank. Install valves on pump discharge and suction lines with seat end towards the pump.
- J. Install all valves in accordance with the manufacturer's recommendations.
- K. Protect valves installed below grade with a shrink sleeve or polyethylene sheath attached to the pipe with tape wrap.

3.03 FIELD QUALITY CONTROL

- A. Field or Site Tests and Inspections per Detailed Valve Specifications.
- B. Pressure test all valves in conjunction with the pipes in which the valves are installed at test pressures specified in the applicable Piping System Schedule.

END OF SECTION

APRIL 2022 VALVES
ATTACHMENT E - TECHNICALS 40 05 60 - 7

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS VALVES

40 05 60 - 8

SECTION 40 05 62.16 ECCENTRIC PLUG VALVES FOR LIQUID SERVICE

PART 1 GENERAL

1.01 DESCRIPTION

A. This section specifies eccentric plug valves.

1.02 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 Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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
ASME B16.1	Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250, and 800
ASTM A126	Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A276	Stainless and Heat-Resisting Steel Bars and Shapes
ASTM A436	Austenitic Gray Iron Castings
ASTM A536	Ductile Iron Castings
AWWA C504	Rubber Seated Butterfly Valves

B. Proof of Design Tests: The Contractor shall furnish the Engineer three certified copies of a report from an independent testing laboratory certifying successful completion of proof-of-design testing conducted in accordance with AWWA C504, Section 5.2, except that where the word "disc" appears in the standard, it is understood to mean "plug." In lieu of testing the valves at an independent testing laboratory, proof-of-design testing may be performed at the valve manufacturer's laboratory, but must be witnessed by a representative of a qualified independent testing laboratory, and all test reports must be certified by the laboratory

ECCENTRIC PLUG VALVES FOR LIQUID SERVICE

ATTACHMENT E - TECHNICALS

40 05 62.16 - 1

APRIL 2022

representative. Proof-of-design testing shall have been performed on not less than three 6-inch diameter valves, with all three test units demonstrating full compliance with the test standards. Failure to satisfactorily complete the test shall be deemed sufficient evidence to reject all valves of the proposed make or manufacturer's model number.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials of construction shall be as follows:

Component	Material
Body	Cast iron, ASTM A126, Class B
Plug	Cast iron, ASTM A126, Class B, or cast iron ASTM A436 (Ni-resist), or ductile iron, ASTM A536
Plug facing	Neoprene or Buna-N
Body seats	
• Less than 3 inches	Cast iron, ASTM A126, Class B
3 inches and larger	Stainless steel, ASTM A276, Type 304 or nickel
Packing	Buna V-flex or TFE

B. 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.

2.02 MANUFACTURE

A. General:

- 1. Valves shall be straight-flow nonlubricated resilient plug type suitable for driptight, bi-directional shutoff at the specified valve design pressure. Port areas for the valve shall be at least 80 percent of the adjacent full pipe area and shall be capable of passing solids 25 percent of pipe size. Valve body seats consisting of nickel for valves 3 inches and larger shall be constructed of a welded-in overlay of not less than 90 percent pure nickel. Upper and lower journal bearings shall be replaceable, sleeve-type, corrosion resistant, and permanently lubricated. Packing shall be self-adjusting chevron type replaceable without disassembling the valve.
- 2. Unless otherwise specified, valves shall, as a minimum, conform to the following pressure ratings:

Size, inches	Design pressure, psig			
12 and smaller	175			

APRIL 2022 ATTACHMENT E - TECHNICALS ECCENTRIC PLUG VALVES FOR LIQUID SERVICE

40 05 62.16 - 2

- B. End Connections: Valves 3 inches and smaller shall have threaded ends. Valve flange drilling for valves larger than 3 inches shall be per ASME B16.1, Class 125. Grooved-end valves may be provided with grooved-end piping systems.
- C. Manual Operators: Unless otherwise specified, valves 4 inches and smaller shall be provided with a lever type manual operator. Valves larger than 4 inches shall be provided with totally enclosed worm gear operators. Where specified, manual operators shall have an adjustable stop. All operator components shall be sized for the valve design pressure in accordance with AWWA C504, Section 4.5. Operators shall comply with applicable portions of Section 40 05 57.13 MANUAL ACTUATORS.

2.03 PRODUCT DATA

- A. The following information shall be provided in accordance with Section 01 33 00 SUBMITTALPROCEDURES:
 - 1. Manufacturer's product data.
 - 2. Proof-of-design test reports specified in paragraph 1.02 Proof of Design Tests.

PART 3 EXECUTION

3.01 INSTALLATION

A. Unless otherwise specified, valves shall be provided with the seat downstream away from flow. Valves at tank connections shall be installed with seat away from tank. Valves on pump discharge lines shall be installed with seat adjacent to the pump.

END OF SECTION

FOR LIQUID SERVICE

40 05 62.16 - 3

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS ECCENTRIC PLUG VALVES FOR LIQUID SERVICE 40 05 62.16 - 4

SECTION 40 05 63.02

BALL VALVE, BRONZE/BRASS, FULL PORT

GENERAL

- 1. Line Size: 1/4 through 2 1/2 inches
- 2. Rated Limits: Pressure 600 psi; Temperature 400 F (CWP)

VALVE MATERIALS

- 1. Body: Bronze or Brass
- 2. Ball: Bronze or Chrome-Plated Brass
- 3. Seats: PTFE or RPTFE
- 4. Shafts: Bronze, Brass, or Stainless Steel; blowout-proofstem

VALVE CONFIGURATION

- 1. Valve End/Connections: Threaded, Female; provide threaded end cap and chain in drainpipes
- 2. Pattern: 2 Piece; regular port
- 3. Ball Mount: Floating
- 4. Operator:
 - a. Lever/Handwheel: MSS SP-91; provide lever for valves 4 inches and smaller, totally enclosed worm gear for valves 6 inches and larger, operator components shall be sized in accordance with the corresponding AWWA or MSS SP standard.
- 5. Reference Standard: MSS SP-110

SUBMITTALS

- 1. Action Submittals:
 - a. Refer to specification Section 40 05 60 VALVES and in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.
- 2. Information Submittals:
 - The following minimum informational submittals shall be submitted in accordance with the timing requirements specified in the Contract Documents, prior to Substantial Completion and in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.
 - Operations and Maintenance Manuals (including Warranty) in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.
- 3. Closeout Submittals: Refer to specification Section 01 33 00 SUBMITTAL PROCEDURES.
 - a. Per specification Section 40 05 60.

APRIL 2022

CHECK VALVE, BRONZE SWING

CANDIDATE MANUFACTURERS

- 1. Stockham T-285-BR-R
- 2. Nibco T-585-70
- 3. Apollo 70-100 Series
- 4. Or Approved Equal

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS CHECK VALVE, BRONZE SWING 40 05 65.01 - 2

SECTION 40 05 65.01 CHECK VALVE, BRONZE SWING

GENERAL

1. Line Size: 1/4 through 3 inches

2. Rated Limits: Pressure 240 psi; Temperature 275 °F

VALVE MATERIALS

1. Body: Bronze

2. Disc: Brass or Bronze

3. Seats: Bronze

4. Hinge Pin: Stainless Steel or Copper

VALVE CONFIGURATION

1. Valve End/Connections: Threaded, Female

2. Check Mechanism: Swing Check, T or Y Pattern; regular port

3. Reference Standard: MSS SP-80 Type 3

SUBMITTALS

- 1. Action Submittals:
 - Refer to specification Section 40 05 60 VALVES and in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.
- 2. Information Submittals:
 - a. The following minimum informational submittals shall be submitted in accordance with the timing requirements specified in the Contract Documents, prior to Substantial Completion and in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.
 - 1) Operations and Maintenance Manuals (including Warranty) in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.
- 3. Closeout Submittals:
 - a. Refer to specification Section 01 33 00 SUBMITTAL PROCEDURES.

CANDIDATE MANUFACTURERS

- 1. Hattersley Figure 47
- 2. Crane Figure 37/137
- 3. Kitz No. 29 Copper hinge pin
- 4. Or equal

END OF SECTION

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS CHECK VALVE, BRONZE SWING 40 05 65.01 - 2

SECTION 40 05 65.23 SWING CHECK VALVES

PART 1 GENERAL

1.01 DESCRIPTION

A. This section specifies spring-loaded swing check valves.

1.02 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 Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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 A126	Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A276	Stainless and Heat-Resisting Steel Bars and Shapes
ASTM A536	Ductile Iron Castings
ASTM B148	Aluminum-Bronze Sand Castings
AWWA C508	Swing-Check Valves for Waterworks Service, 2 In. Through 24 In. NPS

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The Owner and Construction Manager believe 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 Golden Anderson and APCO, or equal.

APRIL 2022

SWING CHECK VALVES

ATTACHMENT E - TECHNICALS

40 05 65.23 - 1

2.02 MATERIALS

A. Materials of construction shall be as follows:

Component	Material
Body, cover	Cast iron, ASTM A126, Class B
Disc	Ductile iron, ASTM A536
Seat rings	Aluminum bronze, ASTM B148 or Stainless steel, ASTM A276, Type 316
Hinge shafts and hinge pins	Stainless steel, ASTM A276, Type 301 or 304
Shaft bushings	Bronze, AWWA C508

B. 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.

2.03 MANUFACTURE

- A. Disc, disc arm, shaft, keyways, lever and spring shall be capable of closing within .05 seconds of pump stoppage and fluid moving at velocity of 8 feet per second. Spring tension shall be adjustable. The valve design shall permit mounting levers and springs on either side of the valve. The design of the spring attachment shall permit adjustment of closing force by tensioning the spring or replacement with different active length springs.
- B. Valves shall be provided with a clear opening equal to or greater than the connecting piping, with no raised seating surface. Seats shall be threaded onto the body or fitted with an O ring seal and locked in place with stainless steel screws or pins and shall be replaceable. Shafts shall be provided with stuffing box and packing or O ring seals at each end. Seals shall be externally replaceable. Minimum shaft diameters shall be as follows:

Valve Inlet Connection Size, inches	Shaft diameter, inches			
3	0.75			
4	0.825			
6	1.0			
8	1.75			
10	2.0			
12	2.5			

C. The pivot arm shall be secured to the disc with either twin bolted connections with lockwashers or a pinned nut. In either instance, the connection shall be designed to prevent disc movement relative to the arm. Shaft bearings shall extend the entire

APRIL 2022

SWING CHECK VALVES

ATTACHMENT E - TECHNICALS

40 05 65.23 - 2

length of the shaft other than the section required for the disc arm attachment. Disc and lever arms shall be keyed to the shaft and retained by bushings or pins.

D. Unless otherwise specified, valves shall, as a minimum, conform to the following pressure ratings:

Size, inches	Working pressure, pressure, PSIG	Hydrostatic test
2 through 12	175	350
14 through 30	150	300

E. Check valves wetted parts shall be coated with fusion bonded epoxy.

2.04 PRODUCT DATA

A. Manufacturer's catalog information including dimensions, cross-sectional views, details of construction and materials list shall be provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

PART 3 EXECUTION

3.01 INSTALLATION

A. Spring loaded swing check valves shall be installed in accordance with the manufacturer's recommendations.

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS SWING CHECK VALVES 40 05 65.23 - 3

513 I Page

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS SWING CHECK VALVES 40 05 65.23 - 4

SECTION 40 05 78.23

AIR/VACUUM VALVES FOR WASTEWATER SERVICE

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope: This Section specifies air release valves, air and vacuum relief valves, and combination valves for wastewater service.

B. Types:

- General: Valves furnished under this specification shall be tubular in design with direct acting cylindrical hollow and solid float mechanisms designed to function efficiently in the presence of grease, fibers and particulate material commonly present in municipal and domestic wastewaters and wastewater treatment effluents. The design shall incorporate materials and geometry that provides self-flushing of the valve internals on emptying.
 - a. Valve designs that employ float guide brackets, levers, springs and ball type floats are specifically prohibited. Valves furnished under this Section shall be fitted with direct vents of flanged for connection to piping connections as indicated. Main venting orifices and outlet connections shall be equal in diameter to the specified pipeline connection.
 - b. Air and vacuum valve nomenclature originated with valves used in clean water service which had the three valve types listed in below. Valves for wastewater service as covered in this Section are available in the types listed in below.
- 2. Air Release Valves: Wastewater air release valves (ARV) shall have a small venting orifice to vent the accumulation of air and other gases with the line or system under pressure. Size and capacity shall be as specified.
- 3. Air and Vacuum Valves: Wastewater air and vacuum valves (ARVV) shall have a dual float system with a large venting orifice to permit the release of air as the line is filling or relieve the vacuum as the line is draining or is under negative pressure. As the pipeline approaches the full condition on filling, the large orifices shall be sealed by the primary float and the secondary float shall allow the remaining air to vent at a reduced rate to prevent development of hydraulic transients. Size and capacity shall be as specified.
- 4. Combination Air Valves: Wastewater combination air valves (CARV) shall have operating features of both the air and vacuum valve and the air release valve. Size and minimum capacity under both air release and vacuum relief shall be as specified.
- 5. Combination Air Valve with Bias Spring: Wastewater combination air valves with bias springs (CARV-B) are similar to CARV units except that a bias spring is employed that causes air to vent through the smaller orifice at a reduced rate to prevent development of hydraulic transients during start-up or other venting periods (and not only at excessively high exhaust velocities as happens in CARV units).

AIR/VACUUM VALVES FOR WASTEWATER SERVICES

APRIL 2022

ATTACHMENT E - TECHNICALS

40 05 78.23 - 1

SECTION 40 06 70

SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Instrument Index.
- B. Related Sections:
 - 1. Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS
 - 2. Section 40 61 21 PROCESS CONTROL SYSTEM TESTING
 - 3. Section 46 51 50 OXYGENATION SYSTEM

1.02 SUBMITTALS

- A. Procedures: Section 01 33 00 SUBMITTAL PROCEDURES.
- B. PICS submittal requirements: Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS.
- C. Action Submittal: Submit updated schedule with field instrumentation submittal to match equipment being provided.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EXAMINATION

- A. Instruments furnished by others or existing.
 - 1. Listed equipment, furnished under other contracts, is an integral part of the instrumentation systems specified under this contract and listed in the Instrument Index.
 - 2. Inspect items to verify operation and integration requirements.
 - 3. Provide wiring, testing, and commissioning services for the listed equipment. Notify the Construction Manager where equipment fails to provide the required function."

3.02 INSTALLATION

A. Refer to Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS for requirements.

SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS

APRIL 2022

ATTACHMENT E - TECHNICALS

40 06 70 - 1

3.03 FIELD QUALITY CONTROL

- A. Refer to Section 40 61 21 PROCESS CONTROL SYSTEM TESTING for requirements.
- B. Maintain a copy of the complete Instrument Index with modifications during construction in Excel format. Provide a copy of the latest version to the Construction Manager upon request.

3.04 ATTACHMENTS

- A. 40 06 70 Attachment A: INSTRUMENT INDEX
 - 1. Description of headings in Instrument Index

Instrument Field or Heading	Example	Comment or Description
Tag No. Function Abbreviation	PDIT	See P&ID sheet legend.
Tag No. Loop Identifier	0023	See P&ID sheet legend.
Tag No. Suffix 1	A	See P&ID sheet legend.
Tag No. Suffix 2	1	See P&ID sheet legend.
Device Function	Primary sludge Pump 1 Discharge flow	Provides the functional description of the instrument, analyzer, or device.
Size or Connection	4" flange	Provides the application data relative to sizing the instrument; flow tube diameter, probe length, associated pipe sizes, etc. 4-inch, 6-inch flange, 3/4-inch tap
Operating Range	25–65	Expected operating range of instrument
Calibration Range	0-1000	Calibrated range of instrument
Setpoint	24	Alarm or Trip setpoint
Units	mgd	mgd, kW, psi, etc.
Signal Type	4-20 mA	4-20 mA, Ethernet, DeviceNet, etc., discrete contact, etc.
Power Requirements	120 V	None, loop, 120-volt, 24-volt, internal battery, etc.
Comments	Class 1 Div 2 Area, Owner-supplied for installation by contractor. Provide	Provides the features, interlocks, and information applicable to the instrument, analyzer, or device.
	grounding ring to match instrument.	Describes special installation instructions, area classifications, modifiers to standard instrument specs, Owner-supplied, existing, accessories, signal surge protection, options, etc.

SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

Instrument Field or Heading	Example	Comment or Description
Device Type	FM	Instruspec type or other name in specification listed below
Specification Number	40 71 00	Specification under which device is provided or specified.
P&ID Number	P-003	P&ID sheet number

END OF SECTION

SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS

APRIL 2022 ATTACHMENT E - TECHNICALS

40 06 70 - 3

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS

APRIL 2022

ATTACHMENT E - TECHNICALS

40 06 70 - 4

INSTRUMENTATION INDEX

Tag Function Abb.	Tag Loop Identifier	Device Function	Operating Range	Instrument Range	Calibration Range	Setpoint	Units	Signal Type	Power Req	Comments	Device Type	Specification Number	P&ID Number
PG	0012-1	Side Stream Pump Suction Pressure		0-100	0-100	NA	PSI	NA	NA			40 73 00	I-2
PG		Side Stream Pump Discharge Pressure				NA	PSI	NA	NA			40 73 00	I-2
AE/AIT	0111-1	Ambient Air Oxygen Monitor	0-25	0-25	0-25		%	4-20mA	24 Vdc			40 76 00	I-2
AE/AII	0211-1	Ambient Air Oxygen Monitor	0-25	0-25	0-25	25	%	4-20MA	24 Vac			40 76 00	1-2
AE/AIT	0014-1A	Ambient Air Oxygen Monitor	0-25	0-25	0-25	25	%	4-20mA	24 Vdc			40 76 00	I-2
AE/AIT	0014-1B	Ambient Air Oxygen Monitor	0-25	0-25	0-25	25	%	4-20mA	24 Vdc			40 76 00	I-2
AE/AIT	0015-1A	Ambient Air Oxygen Monitor	0-25	0-25	0-25	25	%	4-20mA	24 Vdc			40 76 00	I-2
	0015-1B	Ambient Air Oxygen Monitor	0-25	0-25	0-25	25	%	4-20mA	24 Vdc			40 76 00	I-2
	1	Ambient Air Oxygen Monitor	0-25	0-25	0-25	25	%	4-20mA	24 Vdc			40 76 00	1-3
AE/AIT	0026-1B	Ambient Air Oxygen Monitor	0-25	0-25	0-25	25	%	4-20mA	24 Vdc			40 76 00	I-3
AE/AIT	0027-1A	Ambient Air Oxygen Monitor	0-25	0-25	0-25	25	%	4-20mA	24 Vdc			40 76 00	I-3
AE/AIT	0027-1B	Ambient Air Oxygen Monitor	0-25	0-25	0-25	25	%	4-20mA	24 Vdc			40 76 00	I-3
LIT	0011-1	Oxygen Pressure Vessel Level Transmitter					FT	4-20mA	Loop			40 72 00	I-2
PIT	0011-2	Oxygen Pressure Vessel Pressure Transmitter	0-150	0-200			PSI	4-20mA	Loop			40 73 00	I-2
FE/FIT	0012-1	Oxygen Flow Transmitter					GPM	4-20mA	Loop		+	40 71 00	I-2
FS	0012-2	Raw Sewage Flow Switch							NA			40 71 00	I-2
FSL	0013	Seal Water Flow Switch					1		NA		+	40 71 00	I-2
PG	0013	Seal Water Pressure Gauge							NA			40 73 00	I-2
FI	0013	Seal Water Rotometer							NA			40 71 00	I-2
TE/TIT	0013	Discharge Water Temperature							Loop			40 74 00	I-2
PRV	0021-1	Air Pressure Regulator Gauge							NA		+	40 73 00	I-3
PIT	0021-1	Pressure Transmitter	0-150	0-200				4-20mA	Loop		+	40 73 00	I-3
PIT	0021-1	Adsoption Vessel A Inlet Pressure	0-150	0-200				4-20mA	Loop			40 73 00	I-3
PIT	0022-1	Adsoption Vessel B Inlet Pressure	0-150	0-200				4-20mA	Loop			40 73 00	I-3
PIT	0022-2	Adsoption Vessel A Outlet Pressure	0-150	0-200				4-20mA	Loop			40 73 00	I-3
PIT	0022-3	Adsoption Vessel B Outlet Pressure	0-150	0-200				4-20mA	Loop			40 73 00	I-3
PG	0022-1	Adsorption Vessel A Outlet Pressure Gauge		0-200					NA			40 73 00	I-3
PG	0022-2	Adsorption Vessel B Outlet Pressure Gauge		0-200					NA			40 73 00	I-3
PG	0023-1	Oxygen Storage Tank Pressure Gauge		0-200					NA			40 73 00	I-3
AE/AIT	0023-1	Inline Oxygen Analyzer						4-20mA	24 Vdc				I-3
PG	0025-1	Oxygen Buffer Tank Pressure Gauge		0-200					NA			40 73 00	I-3
PG	0034-1	Compressed Air Storage Tank Pressure Gauge		0-200					NA			40 73 00	I-4

THIS PAGE INTENTIONALLY LEFT BLANK

1.02 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 Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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 A240	Heat-Resisting Chromium and Chromium Nickel Stainless Steel Plate,
	Sheet, and Strip for Pressure Vessels

1.03 SCHEDULE

A. Valve size shall be as shown. Valve performance shall be as listed in Table 1 below

Table 1	Performance	e Data for Manufacturer's Sta	ndard CARVs			
Valve size, inches	Vent connection ^a	System pressure, PSIG	Pressure relief capacity, minimum, standard cubic feet/min at 0.75 PSI differential ^b	Anti-shock vent capacity, maximum, standard cubic ft/min at 14.5 PSI differential ^b	Vacuum relief capacity, minimum standard cubic feet/min at 5 PSI differential ^b	
2	Т	Determined by Oxygenation System Provider	200	42	430	
3	Т	Determined by Oxygenation System Provider	500	105	1,100	
4	F	Determined by Oxygenation System Provider	790	190	1,720	

^a F= Flange, T = Threaded connection

APRIL 2022 ATTACHMENT E - TECHNICALS AIR/VACUUM VALVES FOR WASTEWATER SERVICES

^b Capacities shall be documented by an independent testing method acceptable to the Construction Manager and shall be as listed in a report detailing the testing methodology. The report shall be dated not more than two years prior, shall be specific to the model proposed, shall be signed by the test author and shall be notarized as true and correct.

1.04 SUBMITTALS

- A. Submittal material, to be provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, shall include the following:
 - 1. Catalog information for each size to be furnished
 - 2. A copy of this specification Section and the referencing Section and all other applicable specification Sections governing the pump, drive and driver, supports and specified appurtenances. The specification copies shall be complete with addendum updates included, with each Paragraph checkmarked 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. The remaining portions of the Paragraph not underlined will signify compliance on the part of the Contractor with the specifications. The submittal shall be accompanied by a detailed, written justification for each deviation. 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.
 - 3. Certified performance information produced by an independent testing laboratory acceptable to the Construction Manager, current to within five years from the date of the submittal, specific to the construction details for the model proposed, confirming performance not less than that required by this specification. The test methodology may use mathematical modeling techniques to affirm specific model size performance so long as the test performance for specific size valve(s) has been spot-checked by bench tests of the valve size in question and the results show modeling performance within ± 5 percent of bench test results. The performance confirmation shall be dated, signed by the author of responsible for the test information, notarized as true and correct.
 - 4. Materials of construction
 - 5. Installation requirements.

PART 2 PRODUCTS

2.01 ACCEPTABLE PRODUCTS

- A. Wastewater air release valves shall be Vent-Tech SWG, as furnished by International Valve Marketing, or Vent-O-Mat RGX as produced by RF Technologies, Inc.
- B. Alternative manufacturers' products will be considered, provided the following information has been submitted and accepted as proof the proposed substitution provides equal or improved performance over that of the specified product and

AIR/VACUUM VALVES FOR WASTEWATER SERVICES

40 05 78 23 - 3

materials. Any submittal requesting substitution shall include the information specified under paragraph 1.04 and the following:

- Detailed construction and functional description of operation with bill of materials and detailed graphics showing construction features and step-bystep operation demonstrating compliance with the features and operational characteristics specified in this Section.
- 2. Certified performance (air venting and vacuum venting) curves for each size valve to be provided. Performance curves shall be certified and notarized correct by an independent testing laboratory.
- 3. Not less than four affidavits of performance signed by general managers or executive officers of the owning agency and notarized. The affidavits of performance shall, as a minimum, document the following:
 - a. Side-by-side operation with the specified Vent-Tech or Vent-O-Mat valves in unscreened wastewater service for periods of not less than 6 months.
 - b. During the side-by-side periods of operation, the proposed valve and the specified valves shall have been inspected for clogging and function on not less than a weekly basis and shall not have required more maintenance effort than the valves specified in this Section.
 - c. The affidavits shall contain unreserved acceptance of the proposed valve as a complete equal to the Vent-Tech or Vent-O-Mat valves specified herein.

2.02 MATERIALS

Component	Material
Body and cover	Stainless steel, ASTM A240, Type 316L
Hardware	Stainless Steel, Type 316
Primary and secondary floats	High density polyethylene
Seats	Nitrile or EPDM
Trim and venting orifices	Stainless steel, ASTM A240, Type 316L

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.

2.03 CONSTRUCTION

A. General: All wastewater air release and vacuum valves shall have tubular elongated bodies and shall be specifically designed for operation on wastewater and wastewater applications. Valve bodies shall be certified for not less than twice the system pressure specified in paragraph 1.03 and shall have over pressure relief features to prevent catastrophic rupture of the valve body. The relief feature shall be incorporated into easily replaced components. The valve size shall be the nominal size of the valve inlet and outlet (piping connection) as herein described.

AIR/VACUUM VALVES FOR WASTEWATER SERVICES

ATTACHMENT E - TECHNICALS

40 05 78.23 - 4

APRIL 2022

All valve clearances shall be designed for unobstructed flow of air through all passages with a net cross-sectional area at least equal to that of the nominal piping connection. The valve manufacture shall be prepared to document compliance with this requirement in all respects for each component in the valve assembly.

- B. Body: The valve body shall have a fused glass lining or equivalent finish. The valve body shall, be sized to assure the unobstructed annular space between the valve floats and the inner surface of the valve body exceeds the cross-sectional area of the valve's inlet and outlet connections. Valved upper and lower flushing ports (1/2 inch minimum) shall be provided. Materials for flushing ports shall be the same as the body.
- C. Air Inlet/Outlet Fitting: The air inlet/outlet fitting shall have a net opening equal in cross-sectional area to the valve size and shall be screened with a high efficiency punched screen to prevent ingression of airborne debris. The connection from the air inlet cap chamber to the valve body shall be a smooth toroidial transition, polished to facilitate movement from the cap to the body with minimal energy losses by gradual acceleration to the connection with the valve body air passages. The underside of the fitting shall be finished smooth to affect an air tight seal with the anti-surge floats. The valve shall form an airtight seal with an internal pressure of no more than 3 psig.
- D. Air Outlet/Inlet Fitting: The air outlet/inlet fitting at the connection to the piping shown shall formed to provide a smooth transition to the valve outlet in a manner equal to that described in paragraph 2.03 Air Inlet/Outlet Fitting. The connection to the piping system shall have a cross-sectional area as described in paragraph 2.03 General.
- E. Floats: The anti-shock float shall have not less than five tubular orifices to evenly distribute pressurized air across the face of the float. Air inlets for the tubular orifices shall be a smooth, rounded transition to reduce shock and discharged moisture as the as the float seats. The main float shall be tubular in construction, fitted with a centering guide on the upper float cap for contacting and centering on the anti-shock float.

2.04 SPARE VALVES

A. One spare valve shall be provided for each type and size of valve specified.

2.05 PRODUCT DATA

- A. The following information shall be provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
 - 1. Manufacturer's product data.
 - 2. O&M instructions per Section 01 78 23 OPERATION AND MAINTENANCE DATA.

AIR/VACUUM VALVES FOR WASTEWATER SERVICES

40 05 78.23 - 5

PART 3 EXECUTION

3.01 INSTALLATION

A. Wastewater air release and vacuum valves shall be installed in accordance with the manufacturer's recommendations. Isolation valves shall be provided below each air valve, as shown on the Contract Drawings.

END OF SECTION

AIR/VACUUM VALVES FOR WASTEWATER SERVICES 40 05 78.23 - 6

SECTION 40 61 13

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

PART 1 GENERAL

1.01 SUMMARY

- A. This section specifies general requirements applicable to the specifications for the process control, instrumentation, communication, network, and signal systems. This work will be referenced as the Process and Instrumentation Control System (PICS).
- B. System overview. Detailed requirements are in individual related specification sections.
 - 1. Field Instrumentation:
 - a. New and modified field instruments.
 - 2. Process Control Hardware:
 - a. Expansion of an existing control system.
 - b. Field controllers use programmable logic controllers (PLC).
 - c. New control panels.
 - d. Modification of existing control panels
 - 3. Process Control Software, Programming, and Integration:
 - a. Expansion of an existing control system.
 - b. Integrated hardware and software across controllers and operator interface systems from separate manufacturers.
 - c. All programming and integration by supplier.
 - d. Coordinated programming and testing responsibilities between supplier and Owner.
 - e. Integration with packaged system controls in other sections.
 - f. Integration with existing plant network and communication system.
 - 4. Communications and Networking
 - a. Interface to existing Owner networks.
 - b. Hardwired fiber-optic and copper communications systems.
- C. Related sections: The requirements of this section are applicable to work specified in Section 40 61 21 PROCESS CONTROL SYSTEM TESTING.

1.02 REFERENCES

- A. Abbreviations:
 - 1. dBm: decibel-milliwatts
 - 2. DCS: distributed control system
 - 3. DCU: distributed control unit, or digital control unit.

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

APRIL 2022

ATTACHMENT E - TECHNICALS

- 4. HIM: human interface module
- 5. HMI: human-machine interface
- 6. OIT: operator interface terminal
- 7. PCS: plant control system
- 8. PICS: Process and Instrumentation Control System
- 9. PLC: programmable logic controller
- 10. RTU: remote terminal unit
- 11. SCADA: supervisory control and data acquisition
- 12. SI: Systems Integrator

B. Definitions General:

- General: Definitions of terminology related to Instrumentation and Industrial Electronic Systems used in the specifications as defined in IEEE 100, ISA S51.1, and NEMA ICS 1.
- 2. Data sheets: Data sheets refer to ISA S20 or ISA TR20.00.01, as referenced within ISA-20-1981 specification.
- 3. Two-wire transmitter: A transducer that derives operating power supply from the signal transmission circuit and requires no separate power supply connections. A two-wire transmitter produces a 4- to 20-milliampere current regulated signal in a series circuit with a 24-volt direct current (VDC) driving potential and a maximum circuit resistance of 600 ohms.
- 4. Four-wire transmitter: A transducer that derives operating power from separate power supply connections. A four-wire transmitter produces a 4- to 20-milliampere current regulated signal in a series circuit with a maximum circuit resistance of 600 ohms. Four-wire transmitters typically require 120-volt alternating current (VAC) or 24VDC input power supply.
- 5. Galvanic isolation: An electrical node having no direct current path to another electrical node. Galvanic isolation refers to a device with electrical inputs and/or outputs that are isolated from ground, the device case, the process fluid, and separate power supply terminals. Inputs and/or outputs may be externally grounded without affecting the characteristics of the devices or providing a path for circulation of ground currents.
- 6. Panel: An instrument support system that may be a flat surface, partial enclosure, or complete enclosure for instruments and other devices used in process control systems including consoles, cabinets, and racks. Panels provide mechanical protection, electrical isolation, and environmental protection from dust, dirt, moisture, and chemical contaminants that may be present in the atmosphere.
- 7. Systems Integrator: A firm engaged in the business of detailed control system design and engineering, instrumentation component purchase, system and panel assembly, control device programming, and implementing of the specified process control and industrial automation systems.

C. Definitions—Signal Types:

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

APRIL 2022

ATTACHMENT E - TECHNICALS

- 1. Analog, low level: Signal with full output level of 100 millivolts or less including thermocouples and resistance temperature detectors.
- 2. Analog, high level: Signals with full output level greater than 100 millivolts but less than 30 volts, including 4 to 20 mA transmission.
- 3. Audio signals, high level: Audio signals exceeding plus 4 dBm, including loudspeaker circuits.
- 4. Digital code: Coded information from the output of an analog-to-digital converter or digital transmission terminal.
- 5. Discrete control or events: Dry contact closures and signals monitored by solidstate equipment, relays, or control circuits.
- 6. Discrete control or events, low voltage: Dry contact closures and signals monitored by solid-state equipment, relays, or control circuits operating at less than 30 volts and 250 milliamperes.
- 7. Modulated signals: Signals from modems or low-level audio signals. Normal signal level: plus 4 dBm to minus 22 dBm. Frequency range is 300 to 10,000 hertz.
- 8. Pulse frequency: Counting pulses emitted from speed or flow transmitters.
- 9. Radio frequency (RF) signals: Continuous wave alternating current signals with fundamental frequency greater in a range of 310 kilohertz to 300 gigahertz.

D. Definition—Drawing Types:

- 1. Elementary or schematic diagram:
 - a. Use graphic symbols to indicate the electrical connections and functions of a specific circuit arrangement. The schematic diagram facilitates tracing of the circuit and its functions without regard to the actual physical size, shape, or location of the component devices or parts.
 - b. Indicate connections to internal and external components connected to the panel. Note which devices are external to the panel.
 - c. Depicted in ladder logic format.
 - d. Indicates contact arrangement of internal and external devices such that circuits are complete and match equipment furnished.
 - e. Indicates equipment designations/tag numbers to match contract drawings and P&IDs.
- 2. Block diagram: A diagram of a system, instrument, computer, or program in which selected portions are represented by annotated boxes and interconnecting lines.
- 3. Network block diagram:
 - a. A diagram of the overall control system, containing annotated boxes showing the primary network components (controllers, hubs, routers, switches, computers, displays).
 - b. Include annotated interconnecting lines showing the system communication media and communication protocols.
 - c. Indicate manufacturer and model of the primary network components and software.

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

APRIL 2022

ATTACHMENT E - TECHNICALS

d. Indicates functions performed by each device (e.g., Historical Data Server, Field controller, Database Server, Operator workstation, etc.)

4. Connection diagram:

- a. Purpose is to show wiring requirements between internal panel components.
- b. Show components of a control panel in an arrangement similar to the actual panel layout.
- c. Indicate internal wiring between components.
- d. Show terminal blocks used for internal wiring and field wiring, with identification as such.
- e. Indicate insulation color code, signal polarities, wire numbers, and terminal block numbers.

5. Interconnection diagram:

- a. Purpose is to show wiring requirements between panels, standalone devices, components, and instruments.
- b. Indicate wire numbers, cable numbers, raceway numbers, terminal box numbers, terminal block numbers, panel numbers, and field device tag numbers.
- c. Show external connections between terminals of equipment and outside points, such as motors and auxiliary devices.
- d. Indicate references to connection diagrams that interface to the interconnection diagrams.
- e. Interconnection diagrams are to be of the continuous line type. Show bundled wires as a single line with the direction of entry/exit of the individual wires clearly shown. Wireless diagrams and wire lists are not acceptable.
- f. Show termination of each cable. Clearly mark each termination point. Show each wire's identification as actually installed. The wire identification for each end of the same wire shall be identical. Identify devices and equipment.
- g. Depict terminal blocks as actually installed and identified in the equipment with individual terminal identification.
- h. Indicate external jumpers, shielding, and grounding terminations.
- i. Indicate polarities for signal and DC circuit.
- j. Depict spare wires and cables installed or slated for installation.

6. Arrangement, layout, or outline drawings:

- a. Show the physical space and mounting requirements of a piece of equipment.
- b. Indicate ventilation requirements and space provided for connections or the location to which connections are to be made.
- c. Indicate clearance requirements for ventilation and access.
- d. Show the dimensioned external and interior control panel views with components and Bill of Material.

7. Loop diagrams:

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

APRIL 2022

ATTACHMENT E - TECHNICALS

- a. Prepared per ISA S5.4.
- b. Show device element wiring of the system. Indicate device terminations, with terminal numbers.
- c. Show circuits for hardwired device interlocks.
- d. Show circuit cable and wire cable numbers, signal polarities, and terminal block numbers.
- e. Show connection to power supplies. Include alternating current (AC) and direct current (DC) power supplies and circuit information for instruments furnished under this contract.
- f. Indicate controller or I/O card address/node, rack, slot, and point wiring terminals.
- g. Show power supplies for signal loops. Indicate in which panel components reside and power originates with circuit numbering/name. Where new/modified loops connect to an existing power supply, show the existing power supply name, location, and circuit.
- h. Indicate surge protection type, manufacturer, and model number (i.e., types include floating ground reference or grounded reference).
- Show new and modified terminal blocks with numbering in new and existing panels.
- j. Indicate signal loop grounding terminations.
- k. Indicate loop numbers, wire numbers, and cable numbers used in field wiring and panel wiring.
- I. Indicate field element being controlled or monitored (i.e., normally open contact from relay CR17, or FIT 365).

E. Reference Standards:

- 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 prevail.
- 2. Unless otherwise specified, references to documents mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids).
- 3. If referenced documents have been discontinued by the issuing organization, references to those documents 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 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.

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

ATTACHMENT E - TECHNICALS

40 61 13 - 5

APRIL 2022

Reference	Title
CGA G-4.1	Cleaning Equipment For Oxygen Service
IEEE 100	Standard Dictionary of Electrical and Electronics Terms
ISA S5.4	Instrument Loop Diagrams
ISA S20	Specification Forms for Process Measurement and Control Instrumentation, Primary Elements, and Control Valves
ISA S51.1	Process Instrumentation Terminology
ISA TR20.00.01	Specification Forms for Process Measurement and Control Instruments Part 1: General Considerations
NEMA ICS 1	General Standards for Industrial Control and Systems

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

- 1. Coordinate the process and instrumentation control system for proper operation with related equipment and systems specified in other Divisions.
- 2. Integrate equipment in conformance with the drawings, specifications, and recommendations of the equipment manufacturer and the related processes equipment manufacturers.
- Obtain manufacturer's technical information for items of equipment not provided with, but connected to, the control system. Provide the necessary coordination and components for correct signal interfaces between equipment and the control system.
- 4. Coordinate interface requirements and schedule with other project subcontractors and equipment suppliers.
- 5. Present to the Construction Manager conflicts between the plans, specifications, manufacturer/vendor drawings, and installation instructions, etc. for resolution before proceeding.

B. Pre-submittal conference:

- 1. Schedule a pre-submittal conference with the Contractor, Systems Integrator, Owner, Engineer, and Construction Manager within 30 calendar days after Contract award to discuss the work, equipment, and submittal format, and to establish the framework for project coordination and communication.
- 2. Provide the following materials 10 days prior to the conference:
 - a. Proposed Systems Integrator that will meet the qualifications requirements of this section.
 - b. Indicate full conformance with the specification sections covered by this section with a contract deviations request. Requested contract deviations to reference and to be attached to the applicable contract specifications and drawings. Provide justification for requested deviations.
 - c. Proposed "equal" products that differ from specified manufacturers/models with comparative listing of the published specifications for the specified item and the proposed item.

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

APRIL 2022

ATTACHMENT E - TECHNICALS

- d. Project schedule with deliverables and milestones through project completion.
- e. Sample submittal drawings, as specified to be provided for this project. Samples can be a copy from a previous project provided that represents the format being proposed for this project.
 - 1) Control system block diagram.
 - 2) Documented controller and operator interface program.
 - 3) Control panel schematic diagram.
 - 4) Interconnection diagram.
 - 5) Analog and discrete loop diagrams.
 - 6) Control panel arrangement drawing.
- 3. The pre-submittal conference will not replace the Product and Shop Drawing Submittal review process.

1.04 SUBMITTALS

- A. Procedures: Section 01 33 00 SUBMITTAL PROCEDURES.
- B. This article indicates general requirements applicable to all PICS submittals. Additional information to be submitted with each section will be listed under Action Submittals or Closeout Submittals in this and each related section.
- C. Submit all information for sections covered by a submittal as a complete package in one submittal. Partial submittals of a section from multiple vendors showing contractor's division of equipment, labor, or portions of the work are not acceptable.
- D. Include a table of contents in each submittal divided by specification section and content of each section such as drawings and components. Clearly indicate the article or paragraph to which each table of content item applies.
- E. Related sections indicate additional detail for each submittal.
- F. Bookmark PDF submittals to match the table of contents of each submittal. Submitted information is to conform to the following:
 - 1. Shop Drawings: Prepare drawings in MicroStation with borders and title blocks identifying the project, system, revisions to the drawing, and type of drawing. Include a date and description for each revision of a drawing including the date and description of the revisions. Drawing prints shall be 11" by 17" with a minimum lettering size of 1/8". Coordinate the version of MicroStation with the Owner. Generate drawings in adherence to Owner's drawing standards.
 - 2. Product Literature: Provide manufacturer's specifications, data sheets, and catalog literature for the equipment and components that clearly and unambiguously show what is being provided and that it meets the requirements specified. Indicate provided and available options, materials of construction, environmental characteristics, electrical characteristics, and connection requirements. Include only applicable information.

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

APRIL 2022

ATTACHMENT E - TECHNICALS

G. Conformance with Contract Documents:

- 1. Provide a copy of sections applicable to the submittal group with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements.
- 2. Check-marks (✓) denote full compliance with a paragraph as a whole. Underline deviations and denote them with a number in the margin to the right of the identified paragraph. Paragraph portions not underlined signify specification compliance. Include a detailed, written justification for each deviation. Show conformance with all paragraphs in a section. Failure to include a copy of the marked-up specification sections and justification(s) for requested deviations is cause for rejection of the entire submittal with no further consideration.
- 3. Mark 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, to show specific changes necessary for the equipment proposed in the submittal. If no changes are required, mark the drawing or drawings "no changes required." Failure to include copies of the relevant drawings with the submittal is cause for rejection of the entire submittal with no further review. Contract drawings include the following:
 - a. Network system block diagrams
 - b. Cabinet and panel arrangement drawings
 - c. Control single-line diagrams
 - d. Loop diagrams
 - e. Equipment installation details
- 4. Show conformance across suppliers and vendors in one submittal. Partial submittals from multiple vendors showing contractor's division of labor or portions of the work are not acceptable.
- 5. Provide a detailed written request and explanation for each deviation. Failure to include a copy of the marked-up specification sections and drawings, along with justification(s) for requested deviations to the contract requirements, with the submittal, is cause for rejection of the entire submittal with no further consideration.
- H. Closeout submittal general requirements.
 - Procedures: Section 01 78 23 OPERATION AND MAINTENANCE DATA.
 - 2. Provide record drawing prints of drawings and schedules following project startup, but prior to acceptance of the work, showing the final constructed state of the process instrumentation and control systems.
 - 3. Include the following in each operation and maintenance manual:
 - a. Final reviewed submittals, including revised as-built record drawings.
 - b. Manufacturer's operation and maintenance instructions, edited for this project.

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

- c. Written record of menu configuration, jumpers, switch settings, and other configurable parameters for each instrument.
- d. Final application software configurations, in the software native format. Include a comprehensive report print-out from each controller CPU in full color. Provide in Adobe PDF format on compact disc media.
- e. Final network equipment software configurations.
- 4. Markup of existing O&M documentation that show modifications to existing panels, communications, and loops/wiring.
- 5. Maintenance Material Submittals
 - a. Provide one listing of spare parts that is divided by specification section.
 - b. Include list prices for spare parts, expendable supplies, and tools.
 - c. Indicate spare parts packaging and storage methods.
 - d. Indicate spare parts or components that could be deleted or reduced based on manufacturer's recommendations.
 - e. Indicate where manufacturer's recommendations exceed the spare parts specified.
 - f. Obtain spare parts from the equipment manufacturer. Do not provide third-party equivalent replacements.
 - g. Packaging, Testing, and Storage:
 - 1) Provide protective toolboxes for special tools.
 - 2) Test spare boards, circuit cards, power supplies, and similar spare electronic assemblies on site prior to acceptance.
 - 3) Carefully repackage operable parts. Immediately remove inoperable parts from the site and order replacement parts. Test replacement parts prior to acceptance.
 - 4) Package spare parts for protection against dirt and moisture. Label each package as to its contents with a description and part number.
 - 5) Do not place spare parts for different equipment items in the same package.

1.05 ACTION SUBMITTALS

- A. Quality Assurance (within 30 days of contract Notice to Proceed):
 - 1. Systems Integrator qualifications per paragraph 1.08, Quality Assurance.
 - 2. Project personnel qualifications per paragraph 1.08, Quality Assurance.
- B. System Overview
 - 1. Network block diagram
 - 2. System description
- C. PLC Panel Arrangement Drawings
- D. Control Single Line Drawings
- E. Loop Diagrams

APRIL 2022

ATTACHMENT E - TECHNICALS

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

1.06 CLOSEOUT SUBMITTALS

A. Provide record drawing prints of drawings and schedules following project startup, but prior to acceptance of the work, showing the final constructed state of the process instrumentation and control systems.

1.07 QUALITY ASSURANCE

- A. All work covered by this section and Section 40 61 21 PROCESS CONTROL SYSTEM TESTING shall be the responsibility of a single Systems Integrator as defined within this article.
- B. The instrumentation and control system functions are shown on the drawings and specified in subsequent sections of Division 40. The Systems Integrator drawings and integration practices shall be as defined in IEEE 100, ISA S51.1, and NEMA ICS 1.
- C. Demonstrate the overall system performance to the Owner for acceptance.
- D. Systems Integrator qualifications:
 - 1. Evidence of Experience—Company specializing in the products and work of this section and related sections:
 - a. Documented experience with the equipment specified as well as overall systems responsibility for systems of similar size and complexity.
 - b. Experience in performing similar successful projects (equipment type, software type, Systems Integrator responsibilities, complexity, and dollar value of work performed by Systems Integrator).
 - c. End-user satisfaction of projects based on end-user interviews by the Owner or Engineer. Submit project descriptions of projects completed with contact names, addresses, and telephone numbers from the project Owner, General Contractor, and Principal Design Firm.
 - d. Panel fabrication and staging facilities adequate to provide services for this project. Demonstrate by including the following:
 - 1) Minimum 10,000 square feet of dedicated space for panel fabrication and testing.
 - 2) Panel shop shall be UL 508 recognized to produce panels to UL 508 and UL 698 standards and labeling.
 - e. Financial resources available and projected for successful completion of this project. Submit financial data for Systems Integrator division when subsidiary to a parent corporation. Include 2 years of financial data:
 - 1) Financial statement.
 - 2) Balance sheet.
 - 3) Dun & Bradstreet Report.
- E. Systems Integrator Personnel Qualifications: Provide qualified personnel to complete the work specified for this project. Demonstrate by including the following:

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

APRIL 2022

ATTACHMENT E - TECHNICALS

- 1. Organization chart and resumes for proposed project personnel showing experience for the proposed roles on this project.
- 2. Training and certification information. Completion of the following training courses or appropriate portions thereof or possession of the following certifications included with the Systems Integrator's personnel experience requirements described above:
 - a. Project manager: Control System Engineer (CSE) registration, Professional Engineer (PE) registration, or Project Management Professional (PMP) certification.
 - b. Systems engineer: Control System Engineer (CSE) registration, Professional Engineer (PE) registration, or completion of the relevant core courses in the Engineering Skills Training program as certified by ISA.
 - c. Programmer: Certified by the software/hardware manufacturer for the software and hardware being used on the project, or Control System Engineer (CSE), or Professional Engineer (PE) registration.
 - d. Field instrument technician: Certified Control Systems Technician (CCST) registration or completion of the relevant core courses in the Technical Skills Training program as certified by ISA.
 - e. The certification requirements shown in a thru d above may be waived by the Owner's CSE based on the qualifications and verifiable related experience of the Systems Integrator's personnel proposed.

1.08 ENVIRONMENTAL CONDITIONS

- A. Ambient conditions: Per Section 01 61 00 COMMON PRODUCT REQUIREMENTS
- B. Corrosive locations: Per Section 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL.
- C. Hazardous (Classified) areas: Per Section 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL and on the contract drawings.
- D. Seismic: Brace equipment and supports per Section 01 73 24 DESIGN REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS AND NON-BUILDING STRUCTURES.

PART 2 PRODUCTS

- 2.01 CONTROL SYSTEM
 - A. Owner's DCS is Ovation by Emerson.
- 2.02 EQUIPMENT/MATERIALS
 - A. General requirements:
 - 1. New.

APRIL 2022

ATTACHMENT E - TECHNICALS

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

- 2. Free from defects.
- 3. Rated for the installed environment.
- B. Similar control system components, instrument, instrument accessory, and devices used throughout the work shall be manufactured by one firm, where possible.
- C. The components, modules, devices, and control system equipment shall be recognized industrial-quality products. Recognized commercial- or office-grade products are prohibited.
- D. Use electronic equipment of solid-state construction with printed or etched circuit boards of glass epoxy of sufficient thickness to prevent warping.
- E. Printed circuit boards in field-mounted equipment are to be coated with 2 mils of conformal coating in compliance with MILSPEC MIL-I-46058C.
- F. Equipment supports: shall be 316L stainless steel, as shown or specified.

2.03 SOFTWARE

- A. Software packages are to be latest versions available or compatible with the Owner's existing DCS software.
- B. Provide licenses required for the software required to program the Process Control System.

2.04 ENCLOSURES

A. Table A specifies the instrument and control panel enclosure material and minimum NEMA rating for the location and application where not identified in other specification sections.

Table A	
Location	Enclosure Material and NEMA Rating
Indoor: architecturally finished area	NEMA 12: mild steel
Indoor: electrical room	NEMA 12: mild steel
Indoor: process areas	NEMA 4X: 316 stainless steel
Indoor: corrosive area	NEMA 4X: 316 stainless steel
Outdoor: corrosive area	NEMA 4X: 316 stainless steel
Outdoor: non-corrosive areas	NEMA 4X: 316 stainless steel
Corrosive area (hypochlorite)	NEMA 4X: non-metallic
Classified area	NEMA 7: galvanized malleable iron or aluminum or NEMA 4X and UL listed or FM approved for the hazardous area. Where no such enclosure is available, enclosure ratings shall be for the indoor or outdoor area and shall be made intrinsically safe.

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

ATTACHMENT E - TECHNICALS

40 61 13 - 12

APRIL 2022

Table A	
Location	Enclosure Material and NEMA Rating
Classified and corrosive area	NEMA 7: iron or aluminum with factory-applied corrosion-resistant coating or NEMA 4X and UL listed or FM approved for the hazardous area. Where no such enclosure is available, enclosure ratings shall be for the indoor or outdoor area and shall be made intrinsically safe.

2.05 NAMEPLATES

- A. Provide nameplates for field-mounted instrument, analyzer, or equipment covered by this section with the following requirements:
 - 1. Include the equipment or instrument loop title and the instrument or equipment tag number, where nameplate engraving is not specified or shown.
 - 2. Machine engraved white phenolic with black 5/32-inch-high lettering, as minimum, unless otherwise specified or shown.
- B. Nameplate wording may be changed without additional cost or time, if changes are made prior to commencement of engraving.
- C. Attach nameplates to support hardware with a minimum of two self-tapping type 316 stainless steel screws in a readily visible location so the nameplate will remain to identify the service when the device is removed. Attach field instrument nameplates with braided stainless-steel straps where not stand-mounted.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify field measurements prior to fabrication.

3.02 INSTALLATION

A. General:

- 1. Install equipment in locations that are accessible for operation and maintenance services.
- Installation, calibration, settings, and testing procedures are specified in Section 40 61 13 PROCESS CONTROL SYSTEM GENERALPROVISION Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEM.

B. Field Equipment:

- 1. Space instruments and cabinets from concrete walls by 5/8 inch with framing channel between instrument or cabinet and wall. Add supports to block wall to avoid damage to the wall.
- 2. Design support systems, including panels, in accordance with Section 01 73 24 DESIGN REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

APRIL 2022

ATTACHMENT E - TECHNICALS

40 61 13 - 13

- AND NON-BUILDING STRUCTURES to prevent deformation greater than 1/8 inch in any direction under the attached equipment load and under an external load of 200 pounds.
- 3. In wet or outdoor areas, make conduit penetrations into instrument housing or panels through the bottom (preferred) or side of enclosures to minimize water entry from around or from inside of conduits. Provide conduit hubs for connections and waterproof mastic for moisture sealant.
- 4. Provide nameplates for field-mounted equipment. Attach nameplates in a readily visible location, but such that if the field device is replaced, the nameplate will remain to identify the service.

3.03 FIELD QUALITY CONTROL

- A. Delivery Inspection: Notify the Owner's Representative upon arrival of material or equipment to be incorporated into the work. Remove protective covers or otherwise provide access in order that the Owner's Representative may inspect such items.
- B. Inspection and Installed Tests: Refer to Section 40 61 21 PROCESS CONTROL SYSTEM TESTING.

3.04 CLEANING

- A. All instrumentation shall be cleaned in accordance with CGA G-4.1.
- B. Execute final cleaning prior to final project assessment.
- C. Clean surfaces exposed to view, remove temporary labels, stains, and foreign substances.
- D. Replace filters of operating equipment.
- E. Remove waste and surplus materials, rubbish, and construction facilities from site.

END OF SECTION

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

40 61 13 - 14

SECTION 40 61 21 PROCESS CONTROL SYSTEM TESTING

PART 1 GENERAL

1.01 SUMMARY

- A. This section specifies testing requirements applicable to Sections 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS and 40 61 21 PROCESS CONTROL SYSTEM TESTING of these specifications for the process control, instrumentation, communication, network, and signal systems. This work will be referenced as the Process and Instrumentation Control System (PICS) to be provided by a PICS Testing Manager meeting the Qualifications section of this specification. Section includes:
 - 1. Testing documentation.
 - 2. Testing organization and sequencing.
 - 3. Factory Acceptance Testing (FAT)
 - 4. Performance testing.
 - Loop testing.
 - 6. Functional testing.
 - 7. Operational testing.
- B. Related sections: Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS.

1.02 REFERENCES

- A. Definitions: The term "instrumentation" covers field and panel instruments, analyzers, primary sensing elements, transmitters, power supplies, and monitoring devices.
- B. Reference Standards: This section contains references to the following documents with additional references listed in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS.
 - 1. References are part of this section as specified and modified. In case of conflict between the requirements of this section and those of the referenced documents, the requirements of this section prevail.
 - Version: Latest documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no bids) unless noted otherwise.
 - 3. If referenced documents have been discontinued by the issuing organization, use 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.

APRIL 2022

PROCESS CONTROL SYSTEM TESTING

ATTACHMENT E - TECHNICALS

4. Where document dates are given in the following listing, reference to those documents means the specific document version associated with that date, whether the document has been superseded by a version with a later date, discontinued, or replaced.

Reference	Title
ISA RP7.1	Pneumatic Control Circuit Pressure Test
ISA S51.1	Process Instrumentation Terminology

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

- 1. Coordinate testing with Section 01 45 33 SPECIAL INSPECTION, OBSERVATION, AND TESTING.
- 2. Provide notice to the Construction Manager prior to conducting a test.
- 3. Provide a detailed step by step test procedure, between 60 and 70 days before the commencement of testing activity, complete with forms for the recording of test results, testing equipment used, and a place for identification of the individuals performing and witnessing the test.
- Provide detail assistance to the Contractor in generating Section 01 45 33-Form A, customized for this project. Submit detailed form prior to testing per the requirements of Section 01 45 33 SPECIAL INSPECTION, OBSERVATION, AND TESTING.
- 5. Equipment and System Performance and Operational Testing: Section 01 45 33 specifies testing of the mechanical, electrical, instrumentation, and HVAC systems. Coordinate, manage, and supervise the work with the quality assurance program including:
 - a. Testing plan with the sequence for the test work.
 - b. Calibration program for instruments and analyzers.
 - c. Documentation program that records tests results.
 - d. Performance testing program systems.

1.04 SUBMITTALS

- A. Procedures: Section 01 33 00 SUBMITTAL PROCEDURES.
- B. PICS submittal requirements: Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS.
 - Submit process and instrument control system instrumentation, hardware, and software together as an integrated system in staged submittal groupings as defined in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS.

C. Action Submittals:

- 1. Quality Assurance submittal:
 - a. PICS Testing Manager Qualifications.
 - b. Testing Technician Qualifications.

APRIL 2022

PROCESS CONTROL SYSTEM TESTING

ATTACHMENT E - TECHNICALS

- c. Network Testing Firm Qualification.
- d. Proposed process area and process system organization.
- e. Submit test procedures and sample forms for approval within 90 days from the date of Notice to Proceed.

2. Testing submittal:

- a. Submit detailed testing plan and proposed testing documentation after review of the Quality Assurance submittal showing conformance with Part 2 of this specification. Obtain approved submittal prior to testing. Separate submittals may be provided for each process area or test group:
 - 1) Control descriptions.
 - 2) I/O interface.
 - 3) Testing status spreadsheets.
 - 4) Test procedures.
 - 5) Proposed test forms per this section, detailed for each test for this project.
 - 6) Certified Factory Calibration Reports.
- b. Test equipment and test equipment calibration date.
- c. List of factory calibrated items and calibration certificates.
- d. Performance test results.
- e. Loop test results.
- f. Functional test results.
- g. Operational test results.

D. Closeout Submittals

- 1. Final Test Report assembled in a three-ring binder and submitted at the completion of the inspection and testing activities for a process area.
 - a. Label the binder cover and spine to identify the project name and process area. Include in the test report the applicable test procedures for the process area and the completed inspection and test report forms associated with the equipment and systems of that area.
 - b. Organize test results by equipment item or system with individual, labeled tab dividers to identify each. The responsible testing entity is to acknowledge system deficiencies and noncompliant test results identified in the final test report as corrected.
 - c. Documentation of network data communication nodes for network-type instruments, devices, and variable-frequency drives.

1.05 QUALITY ASSURANCE

- A. Appoint a startup engineer or qualified specialist as PICS Testing Manager to manage, coordinate, and supervise the testing work.
- B. The quality assurance program includes:
 - 1. Definition of process areas and systems, with testing executed on an area-by-area basis, based on the P&ID drawings.

APRIL 2022

PROCESS CONTROL SYSTEM TESTING

ATTACHMENT E - TECHNICALS

- 2. Testing for each process area executed in sequential tasks.
- 3. Regularly updated testing status tracking by process area, system, and task.
- 4. Regularly updated separate testing documentation for each process system.
- C. PICS Testing Manager Qualifications: The PICS Testing Manager shall have experience in managing the testing and startup of similar electrical and instrumentation control systems.
- D. Testing Technician Qualifications: Employ technicians who are qualified by completion and certification from training courses offered by the International Society of Automation (ISA), the instrumentation and analyzer manufacturer's training courses, or technician training courses at a recognized trade school that specializes in instrumentation calibration.

PART 2 PRODUCTS

2.01 SOURCE QUALITY CONTROL

- A. Factory Acceptance Test (FAT):
 - 1. Provide a Factory Acceptance Test with the factory acceptance tests and subsequent retests witnessed by the Construction Manager and Owner.
 - Load software and configuration for control system panels, controllers, network components, operator interfaces, servers, and the programming and graphic configuration application at the control system equipment supplier's factory prior to the FAT.
 - 3. Inspect equipment, panel instruments, panels, or cabinets with factory testing performed.
 - 4. Provide written notice to the Engineer and Construction Manager 30 working days before the commencement of the FAT activity and include:
 - a. Schedule for the FAT.
 - b. Location of the FAT.
 - c. Testing equipment used.
 - d. Detailed test procedure with forms for the recording of test results.
 - e. Sign-off spaces for the individuals performing and witnessing the tests.
 - 5. Network and interwire equipment and panels as applicable. Operate and check out equipment prior to the FAT. Submit certification indicating that the panels are ready for the FAT. Include the following:
 - a. Visual inspection of equipment, instruments, control panels, and graphic displays.
 - b. Validation of each input loop and output loop by simulated signals for analog inputs and by shorting discrete inputs.
 - c. Validation includes:
 - 1) Monitoring state changes on operator interface screens based on the inputs state change.

APRIL 2022

PROCESS CONTROL SYSTEM TESTING

ATTACHMENT E - TECHNICALS

- 2) Observation of online controller programming application software with the associated outputs state change.
- 3) Outputs triggered by operator interface software devices (pushbuttons, sliders, manually entered values, etc.)
- 4) Calibration and operation of instruments on or in the control panels.
- d. Repair of loops that do not pass validation.
- e. Retest of the FAT at no additional cost.

PART 3 EXECUTION

3.01 GENERAL

A. General Requirements:

- 1. Provide the labor, tools, material, power, and services necessary to provide the process instrumentation and control system inspection and testing specified herein.
- 2. Inspect materials, equipment, and construction included under this specification in accordance with this section and subsequent sections of this division. Perform testing in accordance with this and subsequent sections of this division.
- 3. Have a certified instrument technician qualified to calibrate the instrumentation calibrate and set up field instruments and analyzers.

B. Test Equipment and Materials:

- 1. Provide test equipment to conduct the specified tests that simulate inputs and read outputs with a rated accuracy at the point of measurement at least three times greater than the component under test.
- Provide a calibration sticker on test instruments showing date of calibration, deviation from standard, name of calibration laboratory and technician, and date recalibration is required. Include certified calibration reports traceable to the National Institute of Standards and Technology with the final test report.
- Provide a documenting calibration system to conduct process instrumentation calibration activities that consist of a documenting process calibrator and an instrumentation data management software system that captures the calibration results and electronically document instrument data, date of calibration, calibration procedures, and as-found and as-left instrument calibration data.
- 4. Provide an instrument calibration system such as Fluke 743B with Fluke DPC/Track Instrumentation Management software or similar system. Submit calibration files with the final test report in hard-copy and electronic formats that does not require specialized equipment or software to read and print the files.
- 5. Provide buffer solutions and reference fluids for tests of analytical equipment.
- 6. Provide a communications and software package to record final configuration parameters and settings for variable-frequency drives with the parameters

APRIL 2022

PROCESS CONTROL SYSTEM TESTING

ATTACHMENT E - TECHNICALS

- acquired by connection to the network that record the configuration settings without manual data entry or transcription of values.
- 7. Vendor software tools may document the systems where a licensed copy of the identical software including connectors, cables, keys, interface cards, and devices required for operation is submitted with the final documentation files.

C. Performance Deviation Tolerances:

- 1. Tolerances are specified in individual sections. Where tolerances are not specified, refer to the manufacturer's published performance specifications.
- Calculate overall accuracy requirements for loops consisting of two or more components, by the root-summation-square (RSS) of the component accuracy specifications. Calculate and record tolerances for each required calibration point on the associated test report form.
- D. Witnessing: The Engineer reserves the right to observe factory and field instrumentation testing and calibration procedures. Notify the Engineer prior to testing, as specified herein.

3.02 TESTING SEQUENCE

- A. Perform tests for each area or system in the following sequence:
 - 1. Performance testing
 - 2. Loop testing
 - 3. Functional testing
 - 4. Operational testing
- B. Group equipment and I/O based on the relationship of the equipment to operate safely as specified, including fully automatic and manual control and monitoring through the control system. Equipment and I/O in a given area or system shall pass testing prior to proceeding to the next set of tests in the sequence above.

3.03 PERFORMANCE TESTING

- A. Perform tests in the order below.
- B. Wiring Tests: Verify that electrical power and signal cable ring-out and resistance testing has been performed as specified in Sections 26 05 00 and 26 08 00. Conduct wiring tests after cables have been properly terminated, tagged, and inspected.
 - 1. Power and Control: Section 26 08 00 COMMISSIONING OF ELECTRICAL SYSTEMS.
 - 2. Signal: Section 40 61 13-Form A (see Section 01 99 90 REFERENCE FORMS).
- C. Network and Bus Cable Inspection and Testing:
 - 1. Inspected and tested by independent industrial network testing firms.
 - 2. Test proprietary bus systems by the manufacturer's qualified field services technician. Manufacturer's sales personnel are not considered to be qualified

APRIL 2022

PROCESS CONTROL SYSTEM TESTING

ATTACHMENT E - TECHNICALS

- technicians unless qualifications are documented and certified by the manufacturer.
- 3. Have a qualified independent network testing service test standardized networks and buses. The following types of cabling and networks shall be tested and certified by the independent industrial network testing firm:
 - a. Ethernet system cabling.
 - b. Other networks provided as a part of a packaged monitoring or control system.
- 4. Test and verify control and instrumentation bus cabling using the standards that apply to the specific cable and bus type as follows:
 - a. Ethernet Category 5E and Category 6: per TIA/EIA-568B standards.
- 5. Pre-Active Testing: Inspect and test cables prior to energizing to verify the following:
 - a. Media type and specifications.
 - b. Physical routing and project-specific cable identification tagging.
 - c. Correct termination installation and connection of conductors to pins at terminations.
 - d. Record cable run length and compare to the manufacturer or industry standards to verify that lengths are within specifications.
 - e. Locations and values of network termination resistance.
 - f. Integrity and grounding of cable shields.
 - g. Values of transient protection (surge) elements.
 - h. Firmware revision level of network devices available prior to energization.
 - i. Settings of dip switches and configuration parameters.
- 6. Active System Testing: After the cable or network system has been activated for testing, provide diagnostic monitoring and signal analysis for the bus network system to evaluate network and bus integrity and data transfer quality. Measure, verify, and record the following parameters:
 - a. Node addressing.
 - b. Signal attenuation before and after a repeater device and at the farthest point in the network.
 - c. Total network trunk voltage and current loading as applicable.
 - d. Baud rate, message traffic rate, percent bandwidth used, error rate, and lost packet count.
 - e. Firmware revision level of the network devices.
 - f. Pre-active and active testing: within the specified range of values established by the referenced standards.
 - g. Correct the functionality of networks and devices connected to the network.
- D. Piping Tests: Liquid Piping Systems: Tested for leaks in compliance with Section 40 05 01 PIPING SYSTEMS.
- E. Instrument and Component Inspection:
 - 1. PICS components inspection activities include the following:

APRIL 2022

PROCESS CONTROL SYSTEM TESTING

ATTACHMENT E - TECHNICALS

- a. Compare and validate instrument type and nameplate data with the drawings, specifications, and data sheet.
- b. Validate instrument identification tag.
- c. Confirm that instrument installation conforms to drawings, specifications, and manufacturer's instructions.
- d. Verify proper conductor termination and tagging.
- e. Visually check for physical damage, dirt accumulation, and corrosion.
- f. Verify that isolation amplifiers, surge protection, and safety barriers are properly installed.
- g. Report deficiencies identified within 24 hours of discovery. No instrument or system component shall be tested until deficiencies are addressed.

F. Instrumentation Calibration:

- Calibrate instruments and final elements in accordance with the manufacturer's recommended procedures and tested in accordance with the Contractor's test procedure.
- 2. Complete and document instruments and component inspections to the satisfaction of the Engineer prior to individual component calibration and testing.
- 3. Calibrate analog instrument at 0, 10, 50, 90, and 100 percent of the specified full-scale range. Adjust each signal sensing trip and process sensing switch to the required setting. Verify instrument readout matches loop signal. Test data recorded on test forms as specified herein.
- 4. Test and adjust final element alignment to verify that each final element operates smoothly over the full range in response to the specified process control signals.
- 5. Enter test data on the applicable test forms at the time of testing: set alarm trips, control trips, and switches to initial values specified in Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEM at this time. Check final elements for range, deadband, and speed of response.
- 6. Have any component repaired or replaced by the manufacturer where the component fails to meet the required tolerances. Repeat the specified tests until the component is within tolerance.
- 7. Install a calibration sticker on each instrument following successful calibration that indicates the date of calibration, the name of the testing company, and personnel who calibrated the instrument.
- 8. Certified Test Reports: Field test and inspection activities include verification of instrument parameter setup, verification of instrument zero, and performance at three operating points within the instrument range. Return each instrument that fails to demonstrate proper performance for recalibration or replaced as agreed depending on the impact to the project as determined by the Construction Manager.

G. Pre-Loop Testing:

1. Test every I/O point from the field device to the termination on the I/O card in the panel.

APRIL 2022

PROCESS CONTROL SYSTEM TESTING

ATTACHMENT E - TECHNICALS

- 2. Perform tests with loop wiring complete and terminated for each point being tested between initial field device and I/O termination point.
- 3. For each discrete I/O point, verify and document contact status value for both the open and closed positions of the contact.
- 4. For analog points, verify analog value matches local display. Confirm calibration at 0, 25, 75, and 100 percent of value.

3.04 LOOP TESTING

- A. Provide a request to perform loop testing at least 2 weeks prior to the requested loop test date. Include the following with the request:
 - 1. Area/system for which request is being made.
 - 2. Written certification that performance testing has been completed, documented, and passed for the area/system for which loop testing is being requested.
 - 3. Submittal numbers that define the tests and data points for the I/O to be tested. Provide updates to the I/O list or instrument calibration as an outcome of the performance testing.
- B. Commence loop testing after the performance testing has been completed and documented to the satisfaction of the Engineer.
- C. Test each instrument loop as an integrated system. Check operation from field instruments to transmitter to receiving components to the vendor panel or the Plant Control System Operator Interface Station. Inject test signals at the process impulse line connection where the measuring technique permits, and otherwise at the most primary signal access point.
- D. For each discrete I/O point, verify and document field contact status value for both the open and closed position of the contact.
- E. For analog points, verify that analog value matches local display. Confirm calibration at 0, 25, 75, and 100 percent of value.
- F. Where loops are interfaced to a controller, verify the controller input/output assignment and operation of the input/output system and processor. Inspect the data table or register in the PLC memory to verify proper operation.
- G. If the output control or monitoring device fails to indicate properly, make corrections to the loop circuitry or device. Repeat the test until devices and instruments operate as required.
- H. Correct loop circuitry and repeat the test until the instruments operate properly.

3.05 FUNCTIONAL TESTING

- A. Process Control Strategy/Functional Testing:
 - 1. Commence control strategy testing after loop testing has been completed and documented to the satisfaction of the Engineer.

APRIL 2022

PROCESS CONTROL SYSTEM TESTING

ATTACHMENT E - TECHNICALS

- Control strategy testing, performed by the Programmer, consists of installing and debugging the PLC control logic program, verifying the interface points between the controller I/O cards and field devices and equipment, and exercising the control strategies. Perform control strategy testing on one PLC at a time.
- Provide qualified personnel to immediately correct deficiencies in the work that
 may be encountered during control strategy testing. Failure of the Contractor
 to provide such personnel in a timely manner may prolong the time allotted to
 complete control strategy testing.

B. Control System Closed-Loop Testing:

- 1. Commence closed-loop commissioning after the control strategy testing has been successfully completed and documented to the satisfaction of the Engineer.
- 2. Demonstrate stable operation of each loop under operating conditions. Adjust loop tuning parameters as part of the test.
- 3. Tuning parameters: gain (or proportional band), integral time constant, and derivative time constant for each control loop, adjusted to provide 1/4-amplitude damping, unless otherwise specified.
- 4. Provide the loop response to a step disturbance for each loop. Provide two graphs for cascaded control loops, one showing the secondary loop response with its set point in manual, and the second showing overall loop response.
- 5. Adjust control loops with "batch" features to provide optimum response following startup from an integral action saturation condition.
- 6. Provide graph recording showing the response and made at sufficient speed and amplitude to show 1/4 amplitude damping. Label to show loop number and title, and settings of parameters and set point.
- 7. Where a loop is controlled under the direction of a PLC, the Programmer will perform the necessary adjustment of loop tuning parameters and set points, record the loop response, adjusting final elements, and ensuring total integrated loop performance as specified.
- C. Functional Checkout: Conduct to verify the operation of discrete and hardwired control devices, refer to Section 01 45 33 MANUFACTURERS' FIELD SERVICES. Exercise the operable devices and energize the control circuit. Operate control element, alarm device, and interlocks to verify that the specified action occurs.

3.06 OPERATIONAL TESTING

- A. Perform the System Acceptance Test (SAT) after component and subsystem tests have been completed. Perform the test of the completed system in full operation and demonstrate that functional requirements of this specification have been met. Demonstrate the following:
 - 1. Each component of the system operates correctly with other components of the system.
 - 2. Analog control loops operate in a stable manner.
 - 3. Hard-wired and software equipment interlocks perform correctly.

APRIL 2022

PROCESS CONTROL SYSTEM TESTING

ATTACHMENT E - TECHNICALS

- 4. Process control sequences perform correctly.
- 5. Application program performs monitoring and control functions correctly.
- 6. Operator interface graphics represent the monitoring and control functions correctly.

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS PROCESS CONTROL SYSTEM TESTING
40 61 21 - 11

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS PROCESS CONTROL SYSTEM TESTING 40 61 21 - 12

SECTION 40 61 93

PROCESS CONTROL SYSTEM INPUT/OUTPUT LIST

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:

- 1. Input/output (I/O) list showing the following types of points that interface with the control system:
 - a. Points that are hardwired into the control system.
 - b. Points that are interfaced to the control system over a communications link.
- 2. The I/O list does not include internal software points generated by the control system and used solely within the control system.

B. Related sections:

- Refer to Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS.
- 2. Refer to Section 40 61 21 PROCESS CONTROL SYSTEM TESTING.

1.02 SUBMITTALS

- A. Procedures: Section 01 33 00 SUBMITTAL PROCEDURES.
- B. Submittal grouping: Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS.
 - Submit process and instrument control system instrumentation, hardware, and software together as an integrated system in staged submittal groupings as defined in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS. What should be in each submittal grouping is clarified in the following paragraphs.

C. Action Submittal:

- 1. Panels and Consoles submittal group. Submit I/O information applicable to the equipment and panels within the submittal group.
- D. Informational Submittal: Provide a copy of the electronic version of the complete list to the Owner, at least monthly, when requested.

PROCESS CONTROL SYSTEM INPUT/OUTPUT LIST

553 I Page

40 61 93 - 1

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

- 3.01 FIELD QUALITY CONTROL
 - A. Refer to Section 40 61 21 PROCESS CONTROL SYSTEM TESTING.
 - B. Maintain a copy of the complete Input/Output List with modifications during construction in Excel format.

3.02 ATTACHMENTS

- A. 40 61 93 Attachment A: Input/Output (I/O) List
 - 1. Description of headings in Input/Output (I/O) List.

Field or Heading	Example	Comment or Description		
Tag No. Function Abbreviation PDI		See tagging on instrument legend sheets.		
Tag No. Area Code	01	See tagging on instrument legend sheets.		
Tag No. Loop Identifier	23	See tagging on instrument legend sheets.		
Tag No. Suffix 1	Α	See tagging on instrument legend sheets.		
Tag No. Suffix 2	1	See tagging on instrument legend sheets.		
Description		Match contract drawings.		
Panel	LCP-14	Number or tag to match contract documents		
PCM	PCM	Number or tag to match contract documents		
I/O Type	Al	AI, DI, DO, AO		
Module or Signal Type	4-20 mA	-20 mA, Ethernet, DeviceNet, Discrete Contact, etc.		
Min Calibration or Function Low	0	0, Open, Normal		
Max Calibration or Function High	55	55, Not Open, Fail		
Units	PSIG	mgd, kW, psi, etc.		
Application Notes or Comments		Optional, as required for clarification.		
P&ID Number		Contract P&ID drawing		
Alarm	No	Yes or No		
Alarm Priority		1, A, 7A, etc.		

END OF SECTION

PROCESS CONTROL SYSTEM INPUT/OUTPUT LIST

APRIL 2022 ATTACHMENT E - TECHNICALS

PQPS OXYGENATION SYSTEM - INPUT/OUTPUT LIST

PID No.	lag	Description	Field Device	Field Panel	Signal From	DCS Panel	I/O Type	Signal Type
I-2	LI-0011-1	Oxygenation Pressure Tank Level (Differential)	LIT-011-1	LCP-0012-1	LIT-011-1 to LCP-0012-1	PCM	Al	Analog In
I-2	FI-0012-1	Sidestream Pump Discharge Flow	FIT-0012-1	LCP-0012-1	FIT-0012-1 to LCP-0012-1	PCM	Al	Analog In
I-2	YI-0012-1A	Sidestream Pump Running	LCS-0012-1	LCP-0012-1	LCS-0012-1 to LCP-0012-1	PCM	DI	Discrete In
I-2	YI-0012-1B	Sidestream Pump Stopped	LCS-0012-1	LCP-0012-1	LCS-0012-1 to LCP-0012-1	PCM	DI	Discrete In
I-2	YI-0012-1C	Sidestream Pump In Remote	LCS-0012-1	LCP-0012-1	LCS-0012-1 to LCP-0012-1	PCM	DI	Discrete In
I-2	HC-0012-1A	Sidestream Pump Start Cmd	LCS-0012-1	LCP-0012-1	LCS-0012-1 to LCP-0012-1	PCM	DO	Discrete Out
I-2	HC-0012-1B	Sidestream Pump Stop Cmd	LCS-0012-1	LCP-0012-1	LCS-0012-1 to LCP-0012-1	PCM	DO	Discrete Out
I-2	YA-0012-1	Sidestream Pump Fail	LCS-0012-1	LCP-0012-1	LCS-0012-1 to LCP-0012-1	PCM	DI	Discrete In
I-2	AAH-0014-1A	Ambient Oxygen High Level Alarm	AIT-0014-1A	LCP-0012-1	AIT-0014-1A to LCP-0012-1	PCM	DI	Discrete In
I-2	AI-0014-1A	Ambinet Oygen Level	AIT-0014-1A	LCP-0012-1	AIT-0014-1A to LCP-0012-1	PCM	Al	Analog In
I-2	AAH-0014-1B	Ambient Oxygen High Level Alarm	AIT-0014-1B	LCP-0012-1	AIT-0014-1B to LCP-0012-1	PCM	DI	Discrete In
I-2	AI-0014-1B	Ambinet Oygen Level	AIT-0014-1B	LCP-0012-1	AIT-0014-1B to LCP-0012-1	PCM	Al	Analog In
I-2	AAH-0015-1A	Ambient Oxygen High Level Alarm	AIT-0015-1A	LCP-0012-1	AIT-0015-1A to LCP-0012-1	PCM	DI	Discrete In
I-2	AI-0015-1A	Ambinet Oygen Level	AIT-0015-1A	LCP-0012-1	AIT-0015-1A to LCP-0012-1	PCM	Al	Analog In
I-2	AAH-0015-1B	Ambient Oxygen High Level Alarm	AIT-0015-1B	LCP-0012-1	AIT-0015-1B to LCP-0012-1	PCM	DI	Discrete In
I-2	AI-0015-1B	Ambinet Oygen Level	AIT-0015-1B	LCP-0012-1	AIT-0015-1B to LCP-0012-1	PCM	Al	Analog In
I-3	PI-0021-1	Inlet Air Pressure	PIT-0021-1	LCP-0012-1	PIT-0021-1 to LCP-0012-1	PCM	Al	Analog In
I-3	PI-0022-1	Adsorption Vessel A Pressure	PIT-0022-1	LCP-0012-1	PIT-0022-1 toLCP-0012-1	PCM	Al	Analog In
I-3	PI-0022-2	Adsorption Vessel B Pressure	PIT-0022-2	LCP-0012-1	PIT-0022-2 toLCP-0012-1	PCM	Al	Analog In
I-3	PI-0022-3	Adsorption Vessel B Pressure	PIT-0022-3	LCP-0012-1	PIT-0022-3 toLCP-0012-1	PCM	Al	Analog In
I-3	PI-0022-4	Adsorption Vessel A Pressure	PIT-0022-4	LCP-0012-1	PIT-0022-4 toLCP-0012-1	PCM	Al	Analog In
I-3	HC-0023-1	Oxygenation Storage Tank Solenoid	LCP-0012-1	SV-0023-1	LCP-0012-1 to SV-0023-1	PCM	DO	Discrete Out
I-3	ZSO-0023-1	Oxygenation Storage Tank Inlet Valve Opened	MOV-0023-1	LCP-0012-1	MOV-0023-1 to LCP-0012-1	PCM	DI	Discrete In
I-3	ZSC-0023-1	Oxygenation Storage Tank Inlet Valve Closed	MOV-0023-1	LCP-0012-1	MOV-0023-1 to LCP-0012-1	PCM	DI	Discrete In
I-3	YI-0023-1	Oxygenation Storage Tank Inlet Valve In Remote	MOV-0023-1	LCP-0012-1	MOV-0023-1 to LCP-0012-1	PCM	DI	Discrete In
I-3	HC-0023-1A	Oxygenation Storage Tank Inlet Valve Open Cmd	MOV-0023-1	LCP-0012-1	MOV-0023-1 to LCP-0012-1	PCM	DO	Discrete Out
I-3	PI-0023-1	Oxygenation Storage Tank Outlet Pressure	PIT-0023-1	LCP-0012-1	PIT-0023-1 to LCP-0012-1	PCM	Al	Analog In
I-3	YI-0024-1A	Oxygen Booster Pump Running	LCS-0024-1	LCP-0012-1	LCS-0024-1 to LCP-0012-1	PCM	DI	Discrete In
I-3	YI-0024-1B	Oxygen Booster Pump Stopped	LCS-0024-1	LCP-0012-1	LCS-0024-1 to LCP-0012-1	PCM	DI	Discrete In
I-3	YI-0024-1C	Oxygen Booster Pump In Remote	LCS-0024-1	LCP-0012-1	LCS-0024-1 to LCP-0012-1	PCM	DI	Discrete In
I-3	HC-0024-1A	Oxygen Booster Pump Start Cmd	LCS-0024-1	LCP-0012-1	LCS-0024-1 to LCP-0012-1	PCM	DO	Discrete Out
I-3	HC-0024-1B	Oxygen Booster Pump Stop Cmd	LCS-0024-1	LCP-0012-1	LCS-0024-1 to LCP-0012-1	PCM	DO	Discrete Out
I-3	YA-0024-1	Oxygen Booster Pump Fail	LCS-0024-1	LCP-0012-1	LCS-0024-1 to LCP-0012-1	PCM	DI	Discrete In
I-3	AAH-0026-1A	Ambient Oxygen High Level Alarm	AIT-0026-1A	LCP-0012-1	AIT-0026-1A to LCP-0012-1	PCM	DI	Discrete In
I-3	AI-0026-1A	Ambinet Oygen Level	AIT-0026-1A	LCP-0012-1	AIT-0026-1A to LCP-0012-1	PCM	Al	Analog In
I-3	AAH-0026-1B	Ambient Oxygen High Level Alarm	AIT-0026-1B	LCP-0012-1	AIT-0026-1B to LCP-0012-1	PCM	DI	Discrete In
I-3	AI-0026-1B	Ambinet Oygen Level	AIT-0026-1B	LCP-0012-1	AIT-0026-1B to LCP-0012-1	PCM	Al	Analog In
I-3	AAH-0027-1A	Ambient Oxygen High Level Alarm	AIT-0027-1A	LCP-0012-1	AIT-0027-1A to LCP-0012-1	PCM	DI	Discrete In
I-3	AI-0027-1A	Ambinet Oygen Level	AIT-0027-1A	LCP-0012-1	AIT-0027-1A to LCP-0012-1	PCM	Al	Analog In
I-3	AAH-0027-1B	Ambient Oxygen High Level Alarm	AIT-0027-1B	LCP-0012-1	AIT-0027-1B to LCP-0012-1	PCM	DI	Discrete In
I-3	AI-0027-1B	Ambinet Oygen Level	AIT-0027-1B	LCP-0012-1	AIT-0027-1B to LCP-0012-1	PCM	Al	Analog In
1-4	ZSO-0031-1	Compressor Drain Valve Opened	MOV-0031-1	LCP-0012-1	MOV-0031-1 to LCP-0012-1	PCM	DI	Discrete In
I-4	ZSC-0031-1	Compressor Drain Valve Closed	MOV-0031-1	LCP-0012-1	MOV-0031-1 to LCP-0012-1	PCM	DI	Discrete In
I-4	YI-0031-1	Compressor Drain Valve In Remote	MOV-0031-1	LCP-0012-1	MOV-0031-1 to LCP-0012-1	PCM	DI	Discrete In
1-4	HC-0031-1A	Compressor Drain Valve Open Cmd	MOV-0031-1	LCP-0012-1	MOV-0031-1 to LCP-0012-1	PCM	DO	Discrete Out
1-4	YI-0032-1A	Air Compressor Running	CMPR-0032-1	LCP-0012-1	CMPR-0032-1 to LCP-0012-1	PCM	DI	Discrete In
I-4	YI-0032-1B	Air Compressor Stopped	CMPR-0032-1	LCP-0012-1	CMPR-0032-1 to LCP-0012-1	PCM	DI	Discrete In
1-4	YI-0032-1C	Air Compressor In Remote	CMPR-0032-1	LCP-0012-1	CMPR-0032-1 to LCP-0012-1	PCM	DI	Discrete In
1-4	HC-0032-1A	Air Compressor Start Cmd	CMPR-0032-1	LCP-0012-1	CMPR-0032-1 to LCP-0012-1	PCM	DO	Discrete Out
1-4	HC-0032-1B	Air Compressor Stop Cmd	CMPR-0032-1	LCP-0012-1	CMPR-0032-1 to LCP-0012-1	PCM	DO	Discrete Out
1-4	YA-0032-1	Air Compressor Fail	CMPR-0032-1	LCP-0012-1	CMPR-0032-1 to LCP-0012-1	PCM	DI	Discrete In
I-4	ZSO-0033-1	Dryer Drain Valve Opened	MOV-0033-1	LCP-0012-1	MOV-0033-1 to LCP-0012-1	PCM	DI	Discrete In

PROCESS CONTROL SYSTEM
INPUT/OUTPUT LIST
ATTACHMENT A
40 61 93 - 1
555 I Page

PQPS OXYGENATION SYSTEM - INPUT/OUTPUT LIST

14	PID No.	Tag	Description	Field Device	Field Panel	Signal From	DCS Panel	I/O Type	Signal Type
H	I-4	ZSC-0033-1	Drver Drain Valve Closed	MOV-0033-1	LCP-0012-1	MOV-0033-1 to LCP-0012-1	PCM	DI	Discrete In
H							PCM	1	
14									
14									
14 \$25,0034-1 As Strage Task left Valve Concel MOV-0304-1 CP-9012-1 MOV-0304-1 DE-0012-1 POM DI Descele In 14 MOV-0304-1 As Strage Task left Valve Coper Cord MOV-0304-1 MOV-0304-1 DE-0012-1 POM DI Descele In 14 RO-0304-1 As Strage Task Ref Valve Coper Cord MOV-0304-1 MOV-0304-1 DE-0012-1 POM DI Descele In 14 ZS-0304-2 As Strage Task Ref Valve Coper Cord MOV-0304-2 DE-0012-1 MOV-0304-2 DE-0012-1 POM DI Descele In 14 ZS-0304-2 As Strage Task Ref Supply Valve Cord MOV-0304-2 DE-0012-1 MOV-0304-2 DE-0012-1 POM DI Descele In 14 ZS-0304-2 As Strage Task Ref Supply Valve Cord MOV-0304-2 DE-0012-1 MOV-0304-2 DE-0012-1 POM DI Descele In 14 DE-0012-1 As State Task Ref Supply Valve Cord MOV-0304-2 DE-0012-1 MOV-0304-2 DE-0012-1 POM DI Descele In 14 DE-0012-1 As State Task Ref Supply Valve Cord DE-0012-1 MOV-0304-2 DE-0012-1 DE-00			· ·						
14		ZSC-0034-1							
14							PCM	DI	
14 ZSC-0034-2 Ar-Storage Flank A Surgey Valve Remote MOV-0034-2 CP-0012-1 MOV-0034-2 CP-0012-1 POM DI Discrete NOV-0034-2 CP-0012-1 POM		HC-0034-1A	Air Storage Tank Inlet Valve Open Cmd	MOV-0034-1	LCP-0012-1	MOV-0034-1 to LCP-0012-1	PCM	DO	
14 ZSC-0034-2 Ar-Storage Flank A Surgey Valve Remote MOV-0034-2 CP-0012-1 MOV-0034-2 CP-0012-1 POM DI Discrete NOV-0034-2 CP-0012-1 POM	I-4	ZSO-0034-2	Air Storage Tank Air Supply Valve Opened	MOV-0034-2	LCP-0012-1	MOV-0034-2 to LCP-0012-1	PCM	DI	Discrete In
14		ZSC-0034-2				MOV-0034-2 to LCP-0012-1			Discrete In
14 H-0.033-2A As Storage Task Ar Storage	I-4							DI	Discrete In
15	I-4	HC-0034-2A		MOV-0034-2	LCP-0012-1	MOV-0034-2 to LCP-0012-1	PCM	DO	Discrete Out
15	I-5	AI-0111-1	Kika Court Offgas O2 Level	AIT-0111-1	RTU-0111-1		PCM	Al	Analog In
15							PCM		Discrete In
	I-5	YA-0111-2	Kika Court RTU Intrusion Alarm	ZS-0111-1	RTU-0111-1	ZS-0111-1 to RTU-0111-1	PCM	DI	Discrete In
	I-5	YA-002-1	PQPS RTU Intrusion Alarm	ZS-002-1	RTU-002-1	ZS-002-1 to RTU-002-1	PCM	DI	Discrete In
The state of the									
The color of the									
The second sec									
The color of the									
The color of the									
State									
Math Math <th< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>									
State									
Signed by the control of the contro									
State									
Mathematical Control Mathemati									
Math Math <th< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>									
Image: Control of the contro									
Signet Signed									
Image: Control of the contro									
Image: Control of the contro									
Math Math <th< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>									
Image: Control of the contro									
Image: Control of the contro									
Image: Control of the contro									
Image: Control of the contro									
Image: Control of the contro									
Image: Control of the contro				-					
PROCESS CONTROL S									

PROCESS CONTROL SYSTEM
INPUT/OUTPUT LIST
ATTACHMENT A
40 61 93 - 2
556 I Page

SECTION 40 71 00 FLOW MEASUREMENT

PART 1 GENERAL

1.01 DESCRIPTION

- A. This section specifies requirements for instrumentation elements that quantitatively convert the measured variable energy into a form suitable for measurement and process measurement accessories. Application requirements are specified in Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEM.
- B. This section specifies requirements for process flow transmitters, associated indication devices, and accessories.
- C. This section specifies requirements for process flow activated switches, devices, and accessories.
- D. This section specifies requirements for instrumentation elements which form a part of the process control systems specified in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS and Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEM. Application requirements are specified in the instrument schedule, Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEM.

1.02 QUALITY ASSURANCE

- A. Manufacturer: Equipment furnished under this section shall be the products of firms regularly engaged in the design and manufacture of such equipment.
- B. Installer: Installation, calibration and testing of equipment furnished under this section shall be performed by qualified, skilled, Certified Technicians specified in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS, who are regularly engaged in such activities involving systems of similar complexity.
- C. References: References are listed in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS and are a part of this section as specified and modified.

1.03 ENVIRONMENTAL CONDITIONS

A. Equipment provided under this section shall be suitable for oxygen service and operation under ambient conditions described in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS.

APRIL 2022 FLOW MEASUREMENT

ATTACHMENT E - TECHNICALS

1.04 CLEANING

A. Equipment provided under this section shall be factory cleaned for use in oxygen in accordance with Section 46 31 59 OXYGEN CLEANING.

1.05 SUBMITTALS

- A. Submittals shall be provided as specified in Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEM.
- B. Submittals shall be provided as specified in Sections 01 33 00 SUBMITTAL PROCEDURES and 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS, including:
 - 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. Referenced and applicable sections to be marked up and submitted include:
 - a. Section 01 43 33 MANUFACTURERS' FIELD SERVICES
 - b. Section 01 78 23 OPERATION AND MAINTENANCE DATA
 - c. Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS
 - d. Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEM

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. 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. Marked Contract Document Mechanical and/or Electrical Plan drawings, sections, and details showing sensor installation locations and details. Failure to

APRIL 2022 FLOW MEASUREMENT

ATTACHMENT E - TECHNICALS

- include copies of the relevant drawings with the submittal shall be cause for rejection of the entire submittal with no further review.
- 4. Marked product literature of all equipment and features to be provided.
 - a. Installation drawings for only the transmitters, sensors, and mounting accessories to be provided.
 - b. Electrical and signal connection drawings for only the transmitters and sensors to be provided.
- 5. List of miscellaneous items, cables, spare parts, that will be provided in accordance with INSTRUSPEC sheet requirements.
- 6. Marked product literature for surge protectors.
- C. Provide manufacturers calibration certificate.

PART 2 PRODUCTS

2.01 INSTRUMENTATION SPECIFICATION SHEETS (INSTRUSPEC)

- A. General requirements for instruments specified in this section are specified on the INSTRUSPEC sheets in the Appendix at the end of this section.
- B. Application requirements are specified in the Instrument Index, and/or on the drawings.

2.02 SYSTEM EQUIPMENT

A. General:

- In accordance with Section 01 33 00 SUBMITTAL PROCEDURES, the General Conditions of the Contract Documents, drawings, information, and technical data for all equipment as, required in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS and this section shall be provided. All required product data for this section shall be included in one complete package.
- B. Process switches and devices shall comply with the following requirements:
 - 1. Contact outputs used for alarm actuation shall be normally-closed or normally-opened as required by the process condition to open to initiate the alarm.
 - 2. Contact outputs used to control equipment shall be normally-opened and shall close to start the equipment.
 - 3. Contacts monitored by solid state equipment such as programmable controllers or annunciators shall be hermetically sealed and rated for switching currents from 20 to 100 mA at 24 volts DC.
 - 4. Contacts, monitored by electromagnetic devices such as mechanical relays, shall be rated as NEMA ICS 2, designation B300.
 - 5. Double barriers provided between switch elements and process fluids such that failure of one barrier will not permit process fluids into electrical enclosures.
 - 6. Switch electrical enclosures rated as NEMA 250, Type 4 minimum.

APRIL 2022 FLOW MEASUREMENT

ATTACHMENT E - TECHNICALS

- 7. Switch contacts located in Class I, Division 1 areas and monitored by solid-state circuits shall be made safe by intrinsic safety barriers as specified in paragraph 2.04.
- 8. Switch range shall be selected so that the specified set point is at least 30 percent but not more than 70 percent of the span, between the upper range limit and the lower range limit.
- C. Measuring elements and transmitters shall comply with the following requirements:
 - 1. Measured parameter output indicators complying with paragraph 2.03 shall be provided with any transmitter that does not include an integral indicator. Indicators, whether integral or separate, shall be calibrated in process units, and engraved on the indicator scale plate.
 - 2. The two-wire type transmitters shall have operating power derived from the signal transmission circuit.
 - 3. Transmitters shall meet specified performance requirements with load variations within the range of 0 to 600 ohms with the power supply at a nominal 24 volts DC with the default range of 0 to 100% linearly corresponding to 4 to 20 mAdc.
 - 4. Transmitter output shall increase with increasing measurement.
 - 5. Time constant shall be adjustable from 0.5 to 5.0 seconds for transmitters used for flow, level transmitters used for flow measurement, or pressure measurement.
 - 6. Transmitter output shall be galvanically isolated via electro-mechanical or optical technology.
 - 7. Transmitter enclosures shall be rated NEMA 250, Type 4, unless otherwise specified.
 - 8. Transmitters located outdoors shall be provided with surge protectors:
 - a. Signal: Emerson/Rosemount Model 470 D, Emerson/EDCO SS64-036-2, CCI SPN-42 FS28 Series, or accepted equal.
 - b. AC Power: UL 1449, LED indicator, screw terminal connections, NEMA 4X. EDCO HSP121A or accepted equal.
 - 9. Two-wire transmitter located in a facility area classified as hazardous per the NFPA and the NEC shall be made safe by means of an intrinsic safety barrier as specified in paragraph 2.04.
 - 10. Four-wire transmitters shall be isolated from the process and power or provided with a loop-powered signal current isolator as specified in paragraph 2.05 connected in the output signal circuit.

2.03 PROCESS PARAMETER OUTPUT INDICATOR

- A. Provide digital LED or LCD indicators that integral to the instrument housing where available from the manufacturer. Displays shall be scaled in engineering units, over the calibrated range of the instrument. Calibrate the indicator scale in process units.
- B. Analog output indicators shall be 2.5-inch milli-ammeter with 90-degree movement enclosed in a NEMA 7/9 rated meter case. Provide indicators with accuracy within two percent of span. Provide a diode to maintain loop continuity for indicator removal.

APRIL 2022 FLOW MEASUREMENT

ATTACHMENT E - TECHNICALS

2.04 INTRINSIC SAFETY BARRIERS

A. Intrinsic safety barriers for two-wire transmitters shall be of the active, isolating, loop powered type. Barrier shall be Stahl Series 9000, or accepted equal.

2.05 SIGNAL CURRENT ISOLATOR

- A. Isolator shall provide galvanic isolation of milliampere transmission signals from transmitters. Isolator shall be housed in a NEMA 250, Type 4/7 conduit body and derive operating power from the signal input circuit.
- B. Input and output signals shall be 4 to 20 milliamperes, and error shall not exceed 0.1 percent of span. Input resistance shall not exceed 550 ohms with an output load of 250 ohms.
- C. Isolator shall be Moore Industries SCX 4-20madc to 4-20madc / 5.5VPL / -RF [DIN rail mounted with maximum 250 ohm output impedance, or equal.

2.06 PRODUCT DATA

- A. Additional Information: The following product data shall be provided:
 - 1. Flow calculation for each differential-type flow element.
 - 2. Record documentation shall include the data sheets specified in this section.
- B. The following data provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
 - 1. Operating and maintenance information as specified in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS. Include final reviewed submittal and separate record of all final configuration, jumper, and switch settings for each instrument.
 - 2. Test results as specified in Section 40 61 21 PROCESS CONTROL SYSTEM TESTING.

PART 3 EXECUTION

3.01 INSTALLATION

A. General:

- 1. General requirements for the installation of primary elements specified in this section are listed on INSTRUSPEC sheets.
- Installation requirements are specified in paragraph 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS.

B. Process Connections:

 General: Unless otherwise specified, process taps shall comply with Section 40 05 01. Process connections shall be arranged such that instruments may be readily removed for maintenance without disruption of process units or draining

APRIL 2022 FLOW MEASUREMENT

ATTACHMENT E - TECHNICALS

of large tanks or vessels. Unions or flange connections shall be provided as necessary to permit removal without rotating equipment.

- a. Where process taps are not readily accessible from instrument locations, an isolation valve shall be provided at the instrument.
- b. Isolation valves shall be provided for each instrument where multiple instruments are connected to one process tap.
- c. Pipe between the process connection and instruments shall be 1/2-inch stainless steel with treatment material for easy removal, as specified herein.
- 2. Safety Instruments: No valves shall be installed at pressure taps for safety instruments. Safety instruments shall not be connected to the same process tap as instruments used for control, indication, or recording except when annular chemical seals are used.
- 3. Root Valves: Root valves shall be provided at all process taps, except as follows:
 - a. Temperature taps, where valves are unnecessary.
 - b. Pump discharge pressure taps where no instrument is permanently installed. Isolation valves shall be provided.
 - c. Process taps for safety instruments.
 - d. Where gauge valves are provided.
 - e. Where chemical seals are used.
- 4. Gauge Valves: Gauge valves shall be provided for each pressure gauge tap except where chemical seals are used.
- 5. Flushing/Calibration Connection: Provide a tee and isolation valve between the root or gauge valve and the instrument or diaphragm seal.

C. Tubing:

- 1. Tubing shall be installed on supports spaced not more than 3 feet apart and shall run parallel of perpendicular to walls structural members, or intersections of vertical planes and the ceiling. Unless otherwise shown, tubing shall follow building surfaces closely or shall be carried in trays or conduit.
- 2. Tubing shall not be supported from piping or equipment except at process taps or connections to the device served. Tubes supported directly on concrete surfaces shall be spaced at least 1/8 inch from the concrete. Tubing support shall be one-hole malleable iron clamps with clamp backs as required. Bends shall be formed to uniform radii without flattening.
- 3. Ends of tubing shall be square-cut and de-burred before installation in fittings. Fittings shall be used for splices, connections, and turns near final connections. Bulkhead fittings shall be used when tubing enters a panel.

D. Electrical Connections:

1. Final connections between rigid raceway systems and instruments shall be made with jacketed flexible conduit with a maximum length of 2 feet.

E. Outdoor Transmitters:

1. Transmitters mounted outdoors shall be provided with rain/sun hood per Drawing Details.

APRIL 2022 FLOW MEASUREMENT

ATTACHMENT E - TECHNICALS

3.02 TESTING

- A. Applicable testing requirements are specified in Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEM.
- B. Testing requirements are specified in Section 40 61 21 PROCESS CONTROL SYSTEM TESTING.

3.03 PROCESS CONNECTIONS:

A. Process connection piping and tubing shall be tested in accordance with Section 40 05 01 PIPING SYSTEMS.

3.04 TRAINING

Training requirements are specified in Section 01 43 33 MANUFATURERS' FIELD SERVICES and Section 01 91 14 TESTING AND STARTUP. Provide two training sessions, each with one-half hour for each type of level transmitter.

PART 4 APPENDIX - INSTRUSPECS

4.01 INSTRUSPECS

A. General requirements for instruments specified in this section are listed on INSTRUSPEC sheets herein. Application requirements are specified in the Instrument Index, and/or on the drawings.

Table A					
INSTRUSPEC Symbol	Instrument description	Instrument function			
FPS	Piston Flow Switch	Flow Measurement			
FTD	Thermal Dispersion Flow Transmitter	Flow Measurement			
FTS	Thermal Flow Switch	Flow Measurement			

4.02 INSTRUMENT IDENTIFICATION: FPS

A. Instrument Function: Flow Measurement

B. Instrument Description: Piston Flow Switch

C. Power Supply: N/A

D. Signal Input: Process

E. Signal Output: Contact as specified in paragraph 2.02.

F. Process Connection: 1/2-inch female NPT

APRIL 2022 FLOW MEASUREMENT

ATTACHMENT E - TECHNICALS

G. Product Requirements:

- 1. Piston flow switch shall consist of a field adjustable line restriction and a spring loaded piston in a bypass circuit. The piston shall carry a magnet, which shall activate a hermetically sealed reed switch.
- 2. The entire unit enclosed in a brass bar stock housing with brass trim. Actuation point for liquid service adjustable from 0.5 to 5.0 gpm and differential fixed at not more than 15 percent. Pressure drop shall not exceed 2 psi at set point flow.
- 3. Execution: Installation: Install in accordance with manufacturer's instructions and to the specified requirements.

4.03 INSTRUMENT IDENTIFICATION: FTD

- A. Instrument Type: Flow Measurement
- B. Instrument Description: Thermal Dispersion Flowmeter
- C. Power Supply: 120 Vac, 60-Hertz nominal or 24 Vdc as specified in Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEM
- D. Signal Input: Process
- E. Signal Output: 4 to 20 milliamperes into 0 to 600 ohms, galvanically isolated
- F. Process Connection: 0.75-inch male NPT

G. Product Requirements:

- 1. Flow indicating transmitter mounted remotely or integral with the flow element, as scheduled in Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEM, with LCD flowrate display and totalized flow display. Provide continuous interconnecting cable and mounting hardware.
- 2. Convert resistance difference to gas flow rate with a maximum error of ±1 percent of reading + 0.5% of full scale.
- 3. Transmitter housed in a NEMA 4X enclosure and rated for a minimum temperature range of 0 to 140 degrees F.
- 4. Sensing element shall consist of two matched platinum resistance temperature elements, one heated and the other passive sheathed in a nickel brazed 316 stainless steel insertion assemblies.
- 5. Element suitable for gas flow velocities from 0.5 to 50 actual feet per second, gas temperatures of -40 to +350 degrees F, static pressures from full vacuum to 300 psig, process pipes 1-inch diameter and larger.
- 6. Flow conditioner, flow element, and flow transmitter provided and calibrated as a unit from the manufacturer.
- 7. Flow conditioner shall match the process piping schedule, material, and end-connection pressure service rating.
- 8. Manufacturer shall provide NIST testing and certification documentation for 20, 40, 60, 80 and 100% of the expected flow rate, as provided by the Engineer.

APRIL 2022 FLOW MEASUREMENT

ATTACHMENT E - TECHNICALS

- 9. Thermal dispersion flow transmitter manufacturer:
 - a. Fluid Components, Inc., ST98
 - b. Kurz instruments, Inc., 454FTB
 - c. Accepted equal.
- 10. Flow conditioner:
 - a. VORTAB VMR
 - b. Accepted equal.

H. Execution:

- 1. Installation: Install flowmeter per manufacturer's instructions and Engineer's installation detail.
- 2. Install flow conditioners per manufacturer's instructions and piping specifications, including gasket material and bolt torque requirements.
- 3. Test: In accordance with paragraph 3.03.

4.04 INSTRUMENT IDENTIFICATION: FTS

- A. Instrument Function: Flow Measurement
- B. Instrument Description: Thermal Flow Switch
- C. Power Supply: 24 volts DC
- D. Signal Input: Process
- E. Signal Output: Contact as specified in paragraph 2.02
- F. Process Connection: As specified
- G. Product Requirements:
 - Flow switch shall be the thermal convection type. Switch point shall not be affected by process fluid temperature changes in the range of 32 to 140 degrees F and shall have a repeatability of plus or minus 5 percent of range.
 - 2. Control unit shall operate with the specified repeatability in an ambient temperature range of 25 to 120 degrees F.
- H. Approved Manufacturers: Fluid Components Inc., Flow Technology Inc., or equal.
- I. Execution: Installation: Install in accordance with manufacturer's instructions.

END OF SECTION

APRIL 2022 FLOW MEASUREMENT

ATTACHMENT E - TECHNICALS

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE INTENTIONALLY LEFT BLANK

APRIL 2022 FLOW MEASUREMENT

ATTACHMENT E - TECHNICALS

SECTION 40 72 00 LEVEL MEASUREMENT

PART 1 GENERAL

1.01 DESCRIPTION

- A. This section specifies requirements for instrumentation elements that quantitatively convert the measured variable energy into a form suitable for measurement and process measurement accessories. Application requirements are specified in Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS.
- B. This section specifies requirements for process level transmitters, associated indication devices, and accessories.
- C. This section specifies requirements for process level activated switches, devices, and accessories.

D. Scope:

This section specifies requirements for instrumentation elements which form a
part of the process control systems specified in Section 40 61 13 PROCESS
CONTROL SYSTEM GENERAL PROVISIONS and Section 40 06 70
SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS -3.03.
Application requirements are specified in the instrument schedule, Section 40 06
70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS -3.03.

1.02 QUALITY ASSURANCE

- A. Equipment furnished under this section shall be the products of firms regularly engaged in the design and manufacture of such equipment.
- B. Installation, calibration, and testing of equipment furnished under this section shall be performed by qualified, skilled, Certified Technicians specified in Section 40 61 13, who are regularly engaged in such activities involving systems of similar complexity.
- C. References are listed in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS and are a part of this section as specified and modified.

1.03 ENVIRONMENTAL CONDITIONS

A. Equipment provided under this section shall be suitable for use for Oxygen Service and operation under ambient conditions described in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS -1.03.

APRIL 2022 LEVEL MEASUREMENT

ATTACHMENT E - TECHNICALS

1.04 CLEANING

A. Equipment provided under this section shall be factory cleaned for use in oxygen in accordance with Section 46 31 59 OXYGEN CLEANING.

1.05 SUBMITTALS

- A. Submittals shall be provided as specified in Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS -1.03.
- B. Submittals shall be provided as specified in Sections 01 33 00 SUBMITTAL PROCEDURES and 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS, including:
 - 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. Referenced and applicable sections to be marked up and submitted include:
 - a. Section 01 43 33 MANUFACTURERS FIELD SERVICES
 - a. Section 01 78 23 OPERATION & MAINTENANCE DATA
 - b. Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS
 - c. Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS

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. 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. Marked Contract Document Mechanical and/or Electrical Plan drawings, sections, and details showing sensor installation locations and details. Failure to include copies of the relevant drawings with the submittal shall be cause for rejection of the entire submittal with no further review.

APRIL 2022 LEVEL MEASUREMENT

ATTACHMENT E - TECHNICALS

- 4. Marked product literature of all equipment and features to be provided.
 - a. Installation drawings for only the transmitters, sensors, and mounting accessories to be provided.
 - b. Electrical and signal connection drawings for only the transmitters and sensors to be provided.
- 5. List of miscellaneous items, cables, spare parts, that will be provided in accordance with INSTRUSPEC sheet requirements.
- 6. Marked product literature for surge protectors.
- C. Provide manufacturers calibration certificate.

PART 2 PRODUCTS

2.01 INSTRUMENTATION SPECIFICATION SHEETS (INSTRUSPEC)

- A. General requirements for instruments specified in this section are specified on the INSTRUSPEC sheets in the Appendix at the end of this section.
- B. Application requirements are specified in the Instrument Index, and/or on the drawings.

2.02 PRODUCT DATA

A. General:

- In accordance with Section 01 33 00 SUBMITTAL PROCEDURES, the General Conditions of the Contract Documents, drawings, information, and technical data for all equipment as, required in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS and this section shall be provided. All required product data for this section shall be included in one complete package.
- B. Process switches and devices shall comply with the following requirements:
 - 1. Contact outputs used for alarm actuation shall be normally-closed or normally-opened as required by the process condition to open to initiate the alarm.
 - 2. Contact outputs used to control equipment shall be normally-opened and shall close to start the equipment.
 - 3. Contacts monitored by solid state equipment such as programmable controllers or annunciators shall be hermetically sealed and rated for switching currents from 20 to 100 mA at 24 volts DC.
 - 4. Contacts, monitored by electromagnetic devices such as mechanical relays, shall be rated as NEMA ICS 2, designation B300.
 - 5. Double barriers provided between switch elements and process fluids such that failure of one barrier will not permit process fluids into electrical enclosures.
 - 6. Switch electrical enclosures rated as NEMA 250, Type 4 minimum.
 - 7. Switch contacts located in Class I, Division 1 areas and monitored by solid-state circuits shall be made safe by intrinsic safety barriers as specified in paragraph 2.04.

APRIL 2022 LEVEL MEASUREMENT

ATTACHMENT E - TECHNICALS

- 8. Switch range shall be selected so that the specified set point is at least 30 percent but not more than 70 percent of the span, between the upper range limit and the lower range limit.
- C. Measuring elements and transmitters shall comply with the following requirements:
 - 1. Measured parameter output indicators complying with paragraph 2.02 shall be provided with any transmitter that does not include an integral indicator. Indicators, whether integral or separate, shall be calibrated in process units, and engraved on the indicator scale plate.
 - 2. The two-wire type transmitters shall have operating power derived from the signal transmission circuit.
 - 3. Transmitters shall meet specified performance requirements with load variations within the range of 0 to 600 ohms with the power supply at a nominal 24 volts DC with the default range of 0 to 100% linearly corresponding to 4 to 20 mAdc.
 - 4. Transmitter output shall increase with increasing measurement.
 - 5. Time constant shall be adjustable from 0.5 to 5.0 seconds for transmitters used for flow, level transmitters used for flow measurement, or pressure measurement.
 - 6. Transmitter output shall be galvanically isolated via electro-mechanical or optical technology.
 - 7. Transmitter enclosures shall be rated NEMA 250, Type 4, unless otherwise specified.
 - 8. Transmitters located outdoors shall be provided with surge protectors:
 - a. Signal: Emerson/Rosemount Model 470 D, Emerson/EDCO SS64-036-2, CCI SPN-42 FS28 Series, or accepted equal.
 - b. AC Power: UL 1449, LED indicator, screw terminal connections, NEMA 4X. EDCO HSP121A or accepted equal.
 - 9. Two-wire transmitter located in a facility area classified as hazardous per the NFPA and the NEC shall be made safe by means of an intrinsic safety barrier as specified in paragraph 2.04.
 - 10. Four-wire transmitters shall be isolated from the process and power or provided with a loop-powered signal current isolator as specified in paragraph 2.05 connected in the output signal circuit.

2.03 PROCESS PARAMETER OUTPUT INDICATOR

- A. Provide digital LED or LCD indicators that integral to the instrument housing where available from the manufacturer. Displays shall be scaled in engineering units, over the calibrated range of the instrument. Calibrate the indicator scale in process units.
- B. Analog output indicators shall be 2.5-inch milli-ammeter with 90-degree movement enclosed in a NEMA 7/9 rated meter case. Provide indicators with accuracy within two percent of span. Provide a diode to maintain loop continuity for indicator removal.

2.04 INTRINSIC SAFETY BARRIERS

APRIL 2022 LEVEL MEASUREMENT

ATTACHMENT E - TECHNICALS

A. Intrinsic safety barriers for two-wire transmitters shall be of the active, isolating, loop powered type. Barrier shall be Stahl Series 9000, Accepted equal.

2.05 SIGNAL CURRENT ISOLATOR

- A. Isolator shall provide galvanic isolation of milliampere transmission signals from transmitters. Isolator shall be housed in a NEMA 250, Type 4/7 conduit body and derive operating power from the signal input circuit.
- B. Input and output signals shall be 4 to 20 milliamperes, and error shall not exceed 0.1 percent of span. Input resistance shall not exceed 550 ohms with an output load of 250 ohms.
- C. Isolator shall be Moore Industries SCX 4-20madc to 4-20madc / 5.5VPL / -RF [DIN rail mounted with maximum 250 ohm output impedance, or equal.

2.06 PRODUCT DATA

- A. Additional Information: The following product data shall be provided:
 - 1. Flow calculation for each differential-type flow element.
 - 2. Record documentation shall include the data sheets specified in this section.
- B. The following data provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
 - 1. Operating and maintenance information as specified in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS -2.03. Include final reviewed submittal and separate record of all final configuration, jumper, and switch settings for each instrument.
 - 2. Test results as specified in Section 40 61 21 PROCESS CONTROL SYSTEM TESTING -2.02.

PART 3 EXECUTION

3.01 INSTALLATION

A. General:

- 1. General requirements for the installation of primary elements specified in this section are listed on INSTRUSPEC sheets.
- 2. Installation requirements are specified in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS -3.01.

B. Process Connections:

 General: Unless otherwise specified, process taps shall comply with Section 40 05 01 PIPING SYSTEMS. Process connections shall be arranged such that instruments may be readily removed for maintenance without disruption of process units or draining of large tanks or vessels. Unions or flange connections shall be provided as necessary to permit removal without rotating equipment.

APRIL 2022 LEVEL MEASUREMENT

ATTACHMENT E - TECHNICALS

- a. Where process taps are not readily accessible from instrument locations, an isolation valve shall be provided at the instrument.
- b. Isolation valves shall be provided for each instrument where multiple instruments are connected to one process tap.
- c. Pipe between the process connection and instruments shall be 1/2-inch stainless steel with treatment material for easy removal, as specified herein.
- 2. Safety Instruments: No valves shall be installed at pressure taps for safety instruments. Safety instruments shall not be connected to the same process tap as instruments used for control, indication, or recording except when annular chemical seals are used.
- 3. Root Valves: Root valves shall be provided at all process taps, except as follows:
 - a. Temperature taps, where valves are unnecessary.
 - b. Pump discharge pressure taps where no instrument is permanently installed. Isolation valves shall be provided.
 - c. Process taps for safety instruments.
 - d. Where gauge valves are provided.
 - e. Where chemical seals are used.
- 4. Gauge Valves: Gauge valves shall be provided for each pressure gauge tap except where chemical seals are used.

C. Tubing:

- Tubing shall be installed on supports spaced not more than 3 feet apart and shall run parallel of perpendicular to walls structural members, or intersections of vertical planes and the ceiling. Unless otherwise shown, tubing shall follow building surfaces closely or shall be carried in trays or conduit.
- 2. Tubing shall not be supported from piping or equipment except at process taps or connections to the device served. Tubes supported directly on concrete surfaces shall be spaced at least 1/8 inch from the concrete. Tubing support shall be one-hole malleable iron clamps with clamp backs as required. Bends shall be formed to uniform radii without flattening.
- 3. Ends of tubing shall be square-cut and de-burred before installation in fittings. Fittings shall be used for splices, connections, and turns near final connections. Bulkhead fittings shall be used when tubing enters a panel.

D. Electrical Connections:

1. Final connections between rigid raceway systems and instruments shall be made with jacketed flexible conduit with a maximum length of 2 feet.

3.02 TESTING

- A. Applicable testing requirements are specified in Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS-3.02.
- B. Testing requirements are specified in Section 40 61 21 PROCESS CONTROL SYSTEM TESTING.

APRIL 2022 LEVEL MEASUREMENT

ATTACHMENT E - TECHNICALS

3.03 PROCESS CONNECTIONS:

A. Process connection piping and tubing shall be tested in accordance with Section 40 05 01 PIPING SYSTEM.

3.04 TRAINING

A. Training requirements are specified in Sections 01 43 33 MANUFACTURERS FIELD SERVICES. Provide two training sessions, each with one-half hour for each type of level transmitter.

PART 4 APPENDIX - INSTRUSPECS

4.01 INSTRUSPECS

A. General requirements for instruments specified in this section are listed on INSTRUSPEC sheets herein. Application requirements are specified in the Instrument Index, and/or on the drawings.

Table A		
INSTRUSPEC		
Symbol	Instrument description	Instrument function
LFT	Flange Mounted Diaphragm Level Transmitter	Level Measurement

4.02 INSTRUMENT IDENTIFICATION: LFT

- A. Instrument Function: Level Measurement
- B. Instrument Description: Flange Mounted Diaphragm Level Transmitter
- C. Power Supply: As specified in paragraph 2.02
- D. Signal Input: Process
- E. Signal Output: As specified in paragraph 2.02
- F. Process Connection: 3-inch flange, ANSI B16.5, Class 150, raised face
- G. Product: Pressure Transmitter: Capacitance or piezoresistive.
 - 1. Wetted parts: Type 316 stainless steel or as specified in Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS -3.03.
 - 2. Range: 100:1.
 - 3. Accuracy: 0.075 percent of calibrated span.
 - 4. Static pressure rating: 2,000 psi.
 - 5. Indicator: LCD display.
 - 6. HART data communication protocol
 - 7. Acceptable Manufacturer:

APRIL 2022 LEVEL MEASUREMENT

ATTACHMENT E - TECHNICALS

- a. Rosemount 3051L.
- b. Yokogawa EJA210A or EJA220A.
- c. Accepted equal.

H. Execution:

- 1. Installation: Install in accordance with manufacturer's instructions and the Engineer's installation detail.
- 2. Safety instruments shall not be connected to the same process tap as instruments used for control, indication, or recording.
- 3. Pressure instruments for use with integral seals, or remote seals and capillary tubing provided by a single manufacturer, and components factory-assembled prior to shipping.

I. Seals:

- Diaphragm and Wetted Parts: Type 316L stainless steel unless otherwise specified in Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS.
- 2. Process Connection: 3-1/2 inch saddle style, pancake, or flush flanged as required by the application.
- 3. Upper Housing/Mounting Flange: Type 316L stainless steel
- 4. Lower Housing: Type 316 stainless steel
- 5. Temperature Limits: -40 to 300 degrees F
- 6. Acceptable Manufacturer:
 - a. Rosemount 1199.
 - b. Yokogawa EJA series.
 - c. Accepted equal.

J. Capillary option:

- 1. Seal Location: High pressure side of transmitter, direct mounting
- 2. Fill Fluid: DC 200 Silicone
- 3. Capillary Seal Connection Material: Type 316 stainless steel armored sleeving

K. Execution:

- 1. Installation: Install in accordance with manufacturer's instructions as specified on the drawings.
- 2. Calibration: Differential pressure transmitters in level service on pressurized tanks:
 - a. Install the diaphragm seals at the proper elevations.
 - b. Zero the transmitter on an empty tank open to the atmosphere.

4.03 INSTRUMENT IDENTIFICATION: LGH

A. Instrument Function: Level Measurement

APRIL 2022 LEVEL MEASUREMENT

ATTACHMENT E - TECHNICALS

- B. Instrument Description: Gage Head Level Transmitter
- C. Power Supply: As specified in paragraph 2.02
- D. Signal Input: Process
- E. Signal Output: As specified in paragraph 2.02
- F. Process Connection: Tank fittings
- G. Product Requirements: Gage head unit: Corrosion-resistant materials with constant tension spring and a decimal dial calibrated to 0.01 foot.
 - 1. Tape enclosed in pipe and fittings provided to permit mounting gage at ground level on side of tank.
 - 2. Manufacturer:
 - a. Varec Figure 2500 with Figure 8212 transmitter, Shand, Jur 92020 with Telepulse 300 transmitter,
 - b. Accepted equal.
 - 3. Float type: 316 stainless steel or polyethylene unless otherwise specified in Section 40 06 70-3.03.
 - 4. Float: Double guided with type 316 stainless steel guide wires held by a PVC coated steel anchor weight.

H. Execution:

- 1. Installation: Install in accordance with manufacturer's instructions as specified on the drawings.
- Calibration: In accordance with Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS -3.03. Switch set point and reset point adjusted as specified.

END OF SECTION

APRIL 2022 LEVEL MEASUREMENT

ATTACHMENT E - TECHNICALS

40 72 00 - 9

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE INTENTIONALLY LEFT BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS LEVEL MEASUREMENT

40 72 00 - 10

SECTION 40 73 00

PRESSURE, STRAIN, AND FORCE MEASUREMENT

PART 1 GENERAL

1.01 DESCRIPTION

- A. This section specifies requirements for instrumentation elements that quantitatively convert the measured variable energy into a form suitable for measurement and process measurement accessories. Application requirements are specified in Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS.
- B. This section specifies requirements for process pressure transmitters, associated indication devices, and accessories.
- C. This section specifies requirements for process pressure activated switches, devices, and accessories.
- D. This section specifies requirements for instrumentation elements which form a part of the process control systems specified in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS and Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS -3.03. Application requirements are specified in the instrument schedule, Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS 3.03.

1.02 QUALITY ASSURANCE

- A. Equipment furnished under this section shall be the products of firms regularly engaged in the design and manufacture of such equipment.
- B. Installation, calibration and testing of equipment furnished under this section shall be performed by qualified, skilled, Certified Technicians specified in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS, who are regularly engaged in such activities involving systems of similar complexity.
- C. References are listed in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS and are a part of this section as specified and modified.

1.03 ENVIRONMENTAL CONDITIONS

A. Equipment provided under this section shall be suitable for use in oxygen service and operation under ambient conditions described in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS 1.03.

PRESSURE, STRAIN, AND FORCE MEASUREMENT

APRIL 2022

ATTACHMENT E - TECHNICALS

1.04 CLEANING

A. Equipment provided under this section shall be factory cleaned for use in oxygen in accordance with Section 46 31 59 OXYGEN CLEANING

1.05 SUBMITTALS

- A. Submittals shall be provided as specified in Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS 1.03.
- B. Submittals shall be provided as specified in Sections 01 33 00 SUBMITTAL PROCEDURES and 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS, including:
 - 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. Referenced and applicable sections to be marked up and submitted include:
 - a. Section 01 43 33 MANUFACTURERS' FIELD SERVICES
 - b. Section 01 78 23 OPERATING & MAINTENANCE DATA
 - c. Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS
 - d. Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS
 - 2. 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.
 - 3. 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.
 - 4. 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.
 - 5. 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.
 - 6. Marked Contract Document Mechanical and/or Electrical Plan drawings, sections, and details showing sensor installation locations and details. Failure

PRESSURE, STRAIN, AND FORCE MEASUREMENT

APRIL 2022

ATTACHMENT E - TECHNICALS

to include copies of the relevant drawings with the submittal shall be cause for rejection of the entire submittal with no further review.

- 7. Marked product literature of all equipment and features to be provided.
 - a. Installation drawings for only the transmitters, sensors, and mounting accessories to be provided.
 - b. Electrical and signal connection drawings for only the transmitters and sensors to be provided.
- 8. List of miscellaneous items, cables, spare parts, that will be provided in accordance with INSTRUSPEC sheet requirements.
- 9. Marked product literature for surge protectors.
- C. Provide manufacturers calibration certification certificate.

PART 2 PRODUCTS

2.01 INSTRUMENTATION SPECIFICATION SHEETS (INSTRUSPEC)

- A. General requirements for instruments specified in this section are specified on the INSTRUSPEC sheets in the Appendix at the end of this section.
- B. Application requirements are specified in the Instrument Index, and/or on the drawings.

2.02 EQUIPMENT

A. General:

- In accordance with Section 01 33 00 SUBMITTAL PROCEDURES the General Conditions of the Contract Documents, drawings, information, and technical data for all equipment as, required in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS and this section shall be provided. All required product data for this section shall be included in one complete package.
- B. Process switches and devices shall comply with the following requirements:
 - 1. Contact outputs used for alarm actuation shall be normally-closed or normally-opened as required by the process condition to open to initiate the alarm.
 - 2. Contact outputs used to control equipment shall be normally-opened and shall close to start the equipment.
 - 3. Contacts monitored by solid state equipment such as programmable controllers or annunciators shall be hermetically sealed and rated for switching currents from 20 to 100 mA at 24 volts DC.
 - 4. Contacts, monitored by electromagnetic devices such as mechanical relays, shall be rated as NEMA ICS 2, designation B300.

PRESSURE, STRAIN, AND FORCE MEASUREMENT

- 5. Double barriers provided between switch elements and process fluids such that failure of one barrier will not permit process fluids into electrical enclosures.
- 6. Switch electrical enclosures rated as NEMA 250, Type 4 minimum.
- 7. Switch contacts located in Class I, Division 1 areas and monitored by solid-state circuits shall be made safe by intrinsic safety barriers as specified in paragraph 2.04.
- 8. Switch range shall be selected so that the specified set point is at least 30 percent but not more than 70 percent of the span, between the upper range limit and the lower range limit.
- C. Measuring elements and transmitters shall comply with the following requirements:
 - Measured parameter output indicators complying with paragraph 2.02 shall be provided with any transmitter that does not include an integral indicator. Indicators, whether integral or separate, shall be calibrated in process units, and engraved on the indicator scale plate.
 - 2. The two-wire type transmitters shall have operating power derived from the signal transmission circuit.
 - 3. Transmitters shall meet specified performance requirements with load variations within the range of 0 to 600 ohms with the power supply at a nominal 24 volts DC with the default range of 0 to 100% linearly corresponding to 4 to 20 mAdc.
 - 4. Transmitter output shall increase with increasing measurement.
 - 5. Time constant shall be adjustable from 0.5 to 5.0 seconds for transmitters used for flow, level transmitters used for flow measurement, or pressure measurement.
 - 6. Transmitter output shall be galvanically isolated via electro-mechanical or optical technology.
 - 7. Transmitter enclosures shall be rated NEMA 250, Type 4, unless otherwise specified.
 - 8. Transmitters located outdoors shall be provided with surge protectors:
 - a. Signal: Emerson/Rosemount Model 470 D, Emerson/EDCO SS64-036-2, CCI SPN-42 FS28 Series, or accepted equal.
 - b. AC Power: UL 1449, LED indicator, screw terminal connections, NEMA 4X. EDCO HSP121A or accepted equal.
 - 9. Two-wire transmitter located in a facility area classified as hazardous per the NFPA and the NEC shall be made safe by means of an intrinsic safety barrier as specified in paragraph 2.04.
 - 10. Four-wire transmitters shall be isolated from the process and power or provided with a loop-powered signal current isolator as specified in paragraph 2.05 connected in the output signal circuit

PRESSURE, STRAIN, AND FORCE MEASUREMENT

2.03 PROCESS PARAMETER OUTPUT INDICATOR

- A. Provide digital LED or LCD indicators that integral to the instrument housing where available from the manufacturer. Displays shall be scaled in engineering units, over the calibrated range of the instrument. Calibrate the indicator scale in process units.
- B. Analog output indicators shall be 2.5-inch milli-ammeter with 90-degree movement enclosed in a NEMA 7/9 rated meter case. Provide indicators with accuracy within two percent of span. Provide a diode to maintain loop continuity for indicator removal.

2.04 INTRINSIC SAFETY BARRIERS

A. Intrinsic safety barriers for two-wire transmitters shall be of the active, isolating, loop powered type. Barrier shall be Stahl Series 9000, Accepted equal.

2.05 SIGNAL CURRENT ISOLATOR

- A. Isolator shall provide galvanic isolation of milliampere transmission signals from transmitters. Isolator shall be housed in a NEMA 250, Type 4/7 conduit body and derive operating power from the signal input circuit.
- B. Input and output signals shall be 4 to 20 milliamperes, and error shall not exceed 0.1 percent of span. Input resistance shall not exceed 550 ohms with an output load of 250 ohms.
- C. Isolator shall be Moore Industries SCX 4-20madc to 4 20madc / 5.5VPL / -RF DIN rail mounted with maximum 250 ohm output impedance, or equal.

2.06 PRODUCT DATA

- A. Additional Information: The following product data shall be provided:
 - 1. Flow calculation for each differential-type flow element.
 - 2. Record documentation shall include the data sheets specified in this section.
- B. The following data provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
 - Operating and maintenance information as specified in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS-2.03. Include final reviewed submittal and separate record of all final configuration, jumper, and switch settings for each instrument.
 - 2. Test results as specified in Section 40 61 21-2.02.

PRESSURE, STRAIN, AND FORCE MEASUREMENT

APRIL 2022

ATTACHMENT E - TECHNICALS

PART 3 EXECUTION

3.01 INSTALLATION

- A. General requirements for the installation of primary elements specified in this section are listed on INSTRUSPEC sheets.
 - 1. General requirements for the installation of primary elements specified in this section are listed on INSTRUSPEC sheets.
 - 2. Installation requirements are specified in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS-3.01.

B. Process Connections:

- General: Unless otherwise specified, process taps shall comply with Section 40 05 01. Process connections shall be arranged such that instruments may be readily removed for maintenance without disruption of process units or draining of large tanks or vessels. Unions or flange connections shall be provided as necessary to permit removal without rotating equipment.
 - a. Where process taps are not readily accessible from instrument locations, an isolation valve shall be provided at the instrument.
 - b. Isolation valves shall be provided for each instrument where multiple instruments are connected to one process tap.
 - c. Pipe between the process connection and instruments shall be 1/2 inch stainless steel with treatment material for easy removal, as specified herein.
- 2. Safety Instruments: No valves shall be installed at pressure taps for safety instruments. Safety instruments shall not be connected to the same process tap as instruments used for control, indication, or recording except when annular chemical seals are used.
- 3. Root Valves: Root valves shall be provided at all process taps, except as follows:
 - a. Temperature taps, where valves are unnecessary.
 - b. Pump discharge pressure taps where no instrument is permanently installed. Isolation valves shall be provided.
 - c. Process taps for safety instruments.
 - d. Where gauge valves are provided.
 - e. Where chemical seals are used.
- 4. Gauge Valves: Gauge valves shall be provided for each pressure gauge tap except where chemical seals are used.
- 5. Flushing/Calibration Connection: Provide a tee and isolation valve between the root or gauge valve and the instrument or diaphragm seal.

C. Tubing:

 Tubing shall be installed on supports spaced not more than 3 feet apart and shall run parallel of perpendicular to walls structural members, or intersections of vertical planes and the ceiling. Unless otherwise shown,

PRESSURE, STRAIN, AND FORCE MEASUREMENT

APRIL 2022

ATTACHMENT E - TECHNICALS

- tubing shall follow building surfaces closely or shall be carried in trays or conduit.
- 2. Tubing shall not be supported from piping or equipment except at process taps or connections to the device served. Tubes supported directly on concrete surfaces shall be spaced at least 1/8 inch from the concrete. Tubing support shall be one-hole malleable iron clamps with clamp backs as required. Bends shall be formed to uniform radii without flattening.
- 3. Ends of tubing shall be square-cut and de-burred before installation in fittings. Fittings shall be used for splices, connections, and turns near final connections. Bulkhead fittings shall be used when tubing enters a panel.

D. Electrical Connections:

1. Final connections between rigid raceway systems and instruments shall be made with jacketed flexible conduit with a maximum length of 2 feet.

E. Outdoor Transmitters:

1. Transmitters mounted outdoors shall be provided with rain/sun hood per Drawing Details.

3.02 TESTING

- A. Applicable testing requirements are specified in Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS -3.02.
- B. Testing requirements are specified in Section 40 61 21 PROCESS CONTROL SYSTEM TESTING.

3.03 PROCESS CONNECTIONS

A. Process connection piping and tubing shall be tested in accordance with Section 40 05 01 PIPING SYSTEMS.

3.04 TRAINING

A. Training requirements are specified in Section 01 43 33 MANUFACTURERS FIELD SERVICES. Provide two training sessions, each with one-half hour for each type of level transmitter.

PART 4 INSTRUSPECS

4.01 INSTRUSPECS

A. General requirements for instruments specified in this section are listed on INSTRUSPEC sheets herein. Application requirements are specified in the Instrument Index, and/or on the drawings.

PRESSURE, STRAIN, AND FORCE MEASUREMENT

APRIL 2022

ATTACHMENT E - TECHNICALS

Table A			
INSTRUSPEC Symbol	Instrument description	Instrument function	
PG	Pressure gage	Pressure measurement	
PGT	Gage Pressure Transmitter	Pressure Measurement	
PS	Pressure Switch	Pressure Measurement	

4.02 INSTRUMENT IDENTIFICATION: PG

A. Instrument Function: Pressure measurement

B. Instrument Description: Pressure gage

C. Power Supply: N/A

D. Signal Input: N/A

E. Signal Output: N/A

F. Process Connection: 1/2-inch male NPT

- G. Product Requirements: Pressure gages shall be 4-1/2-inch premium grade, glycerin filled units with bourdon tube element, 270-degree milled stainless steel movement, phenolic case, and shatterproof glass window. Accuracy shall be 1 percent of span or better. All exposed metal parts shall be stainless steel. Pressure gage manufactures:
 - 1. Ashcroft Duraguage Figure 1279
 - 2. Ametek 1981L
 - 3. or equal.

H. Execution:

1. Installation: Install in accordance with manufacturer's instructions and the recommendations of API RP551 to the specified requirements.

Root valves shall be provided at all process pressure taps except taps made for safety instruments. Gage valves shall be provided at the instrument where the instrument is not within sight of the root valve or where two or more instruments are connected to a single tap.

Safety instruments shall not be connected to the same process tap as instruments used for control, indication, or recording. Unless otherwise specified, pressure instruments shall be located as close as practical to the process tap but shall be positioned to permit observation and maintenance. Pressure gages may be supported from the process tap if this location permits observation from the floor or a permanent work platform. Pressure instruments shall be installed in such a manner that blowout discs are not obstructed.

PRESSURE, STRAIN, AND FORCE MEASUREMENT

APRIL 2022

ATTACHMENT E - TECHNICALS

 Application/Calibration: Application, calibration, and set points shall be as specified in Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS -3.03.

4.03 INSTRUMENT IDENTIFICATION: PGT

- A. Instrument Function: Pressure Measurement
- B. Instrument Description: Gage Pressure Transmitter
- C. Power Supply: As specified in paragraph 2.02
- D. Signal Input: Process
- E. Signal Output: Analog transmission signal as specified in paragraph 2.02
- F. Process Connection: 1/2-inch female NPT flange adapter
- G. Product Requirements:
 - 1. Pressure Transmitter: Capacitance or piezoresistive type.
 - 2. Wetted Parts: Type 316 stainless steel or as specified in Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS -3.03.
 - 3. Range: 100:1.
 - 4. Accuracy: 0.075 percent of calibrated span.
 - 5. Static Pressure Rating: 2,000 psi.
 - 6. Indicator: LCD display.
 - 7. HART standard data communication protocol
 - 8. Acceptable Manufacturer:
 - a. Rosemount 3051CG.
 - b. Accepted equal.

H. Execution:

- 1. Installation: Install in accordance with manufacturer's instructions and the Engineer's installation detail.
- 2. Root valves provided at all process pressure taps.
- 3. Gauge valves provided at the instrument where the instrument is not within sight of the root valve or where two or more instruments are connected to a single tap.
- 4. Safety instruments shall not be connected to the same process tap as instruments used for control, indication, or recording.
- 5. Pressure instruments located as close as practical to the process tap and be positioned to permit observation and maintenance.
- 6. Pressure instruments shall not be supported from process piping.

PRESSURE, STRAIN, AND FORCE MEASUREMENT

APRIL 2022

ATTACHMENT E - TECHNICALS

7. Pressure instruments for use with integral seals, or remote seals and capillary tubing provided by a single manufacturer, and all components factory-assembled prior to shipping.

I. Seals:

- 1. Type: Diaphragm,
- 2. Process Connection: 3-1/2 inch saddle style, flush surface or inline style.
- 3. Diaphragm and Wetted Parts: Type 316L stainless steel unless otherwise specified.
- 4. Upper Housing and Mounting Flange: Type 316L stainless steel. Lower Housing: Type 316 stainless steel
- 5. Temperature Limit, High Side: -40 to 300 degrees F
- 6. Acceptable Manufacturer:
 - a. Rosemount 1199.
 - b. Accepted equal.
- J. Capillary option:
 - 1. Seal Location: High pressure side of transmitter, direct mounting.
 - 2. Fill Fluid: DC 200 Silicone
 - 3. Capillary Seal Connection Material: Type 316 stainless steel armored sleeving

4.04 INSTRUMENT IDENTIFICATION: PS

- A. Instrument Function: Pressure Measurement
- B. Instrument Description: Pressure Switch
- C. Signal Input: Process
- D. Signal Output: As specified in paragraph 2.02
- E. Process Connection: 1/2-inch female NPT
- F. Product Requirements:
 - Pressure switch shall consist of a pressure transducer and a precision switch.
 Pressure transducer shall be the diaphragm piston type with wetted materials as recommended by the switch manufacturer. Piston backed by a cylinder disc to permit 10 times over-range pressure without affecting calibration.
 - 2. Range spring and piston shall be isolated from process fluids by the diaphragm. Switch provided with two 3/4-inch conduit connections. Switch assembly housing shall be cast aluminum rated types 3, 4, and 7D per NEMA ICS6. Contractor shall select pressure transducer so that set point falls between 30 and 70 percent of maximum range.

PRESSURE, STRAIN, AND FORCE MEASUREMENT

APRIL 2022

ATTACHMENT E - TECHNICALS

- 3. Approximate set point and, if applicable, reset point indicated on calibrated scales. Repeatability and sensitivity shall be 1.0 percent of operating range. Unless otherwise specified, switches nonadjustable deadband type.
- G. Approved Manufacturers: SOR Inc. Static-O-Ring, Mercoid Series 1000, or equal.

H. Execution:

- 1. Installation: Install in accordance with manufacturer's instructions and to the specified requirements.
- 2. Application/Calibration: Application, calibration, and set points as specified in Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS -3.03.

PRESSURE, STRAIN, AND FORCE MEASUREMENT

4.05 INSTRUMENT IDENTIFICATION: PSI

- A. Instrument Function: Pressure Measurement
- B. Instrument Description: Indicating differential Pressure Switch
- C. Power Supply: 120 volts AC, 60-Hertz nominal
- D. Signal Input: N/A
- E. Signal Output: As specified in paragraph 2.02
- F. Process Connection: N/A
- G. Product Requirements: Differential pressure switch shall be a diaphragm element magnetically coupled helix pressure indicator with photocell type switch unit. Set point indicated on the dial and front adjustable. Differential pressure indicator provided with three-valve manifold as specified in paragraph 4.04.
- H. Approved Manufacturers: Dwyer Photohelic, or equal.
- I. Execution:
 - 1. Installation: Install in accordance with manufacturer's instructions and to the specified requirements.
 - 2. Root valves shall be provided at all process pressure taps. Unless otherwise specified, pressure instruments located as close as practical to the process tap but positioned to permit observation and maintenance.
 - 3. Pressure instruments shall not be supported from process piping and installed in such a manner that blowout discs are not obstructed.
- J. Application/Calibration: Application, calibration, and set points as specified in Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS -3.03.

END OF SECTION

PRESSURE, STRAIN, AND FORCE MEASUREMENT

SECTION 40 74 00 TEMPERATURE MEASUREMENT

PART 1 GENERAL

1.01 DESCRIPTION

- A. This section specifies requirements for instrumentation elements that quantitatively convert the measured variable energy into a form suitable for measurement and process measurement accessories. Application requirements are specified in Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEM.
- B. This section specifies requirements for process temperature transmitters, associated indication devices, and accessories.
- C. This section specifies requirements for process temperature activated switches, devices, and accessories.
- D. This section specifies requirements for instrumentation elements which form a part of the process control systems specified in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS and Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEM. Application requirements are specified in the instrument schedule, Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEM.

1.02 QUALITY ASSURANCE

- A. Equipment furnished under this section shall be the products of firms regularly engaged in the design and manufacture of such equipment.
- B. Installation, calibration and testing of equipment furnished under this section shall be performed by qualified, skilled, Certified Technicians specified in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS, who are regularly engaged in such activities involving systems of similar complexity.
- C. References are listed in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS and are a part of this section as specified and modified.

1.03 ENVIRONMENTAL CONDITIONS

A. Equipment provided under this section shall be suitable for use for oxygen service and operation under ambient conditions described in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS.

APRIL 2022 ATTACHMENT E - TECHNICALS

1.04 CLEANING

A. Equipment provided under this section shall be factory cleaned for use in oxygen in accordance with Section 46 31 59 OXYGEN CLEANING.

1.05 SUBMITTALS

- A. Submittals shall be provided as specified in Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEM.
- B. Submittals shall be provided as specified in Sections 01 33 00 SUBMITTALPROCEDURES and 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS, including:
 - 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. Referenced and applicable sections to be marked up and submitted include:
 - a. Section 01 43 33 MANUFACTURERS' FIELD SERVICES
 - b. Section 01 78 23 OPERATING AND MAINTENANCE DATA
 - c. Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS
 - d. Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEM
 - e. Section 40 61 21 PROCESS CONTROL SYSTEM TESTING

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. 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. Marked Contract Document Mechanical and/or Electrical Plan drawings, sections, and details showing sensor installation locations and details. Failure to include copies of the relevant drawings with the submittal shall be cause for rejection of the entire submittal with no further review.

APRIL 2022 ATTACHMENT E - TECHNICALS

- 4. Marked product literature of all equipment and features to be provided.
 - a. Installation drawings for only the transmitters, sensors, and mounting accessories to be provided.
 - b. Electrical and signal connection drawings for only the transmitters and sensors to be provided.
 - c. List of miscellaneous items, cables, spare parts, that will be provided in accordance with INSTRUSPEC sheet requirements.
- 5. Marked product literature for surge protectors.
- C. Provide manufacturers calibration certification certificate.

PART 2 PRODUCTS

2.01 INSTRUMENTATION SPECIFICATION SHEETS (INSTRUSPEC)

- A. General requirements for instruments specified in this section are specified on the INSTRUSPEC sheets in the Appendix at the end of this section.
- B. Application requirements are specified in the Instrument Index, and/or on the drawings.

2.02 PRODUCT DATA

A. General:

- In accordance with Section 01 33 00 SUBMITTALPROCEDURES the General Conditions of the Contract Documents, drawings, information, and technical data for all equipment as, required in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS and this section shall be provided. All required product data for this section shall be included in one complete package.
- B. Process switches and devices shall comply with the following requirements:
 - 1. Contact outputs used for alarm actuation shall be normally-closed or normally-opened as required by the process condition to open to initiate the alarm.
 - 2. Contact outputs used to control equipment shall be normally-opened and shall close to start the equipment.
 - 3. Contacts monitored by solid state equipment such as programmable controllers or annunciators shall be hermetically sealed and rated for switching currents from 20 to 100 mA at 24 volts DC.
 - 4. Contacts, monitored by electromagnetic devices such as mechanical relays, shall be rated as NEMA ICS 2, designation B300.
 - 5. Double barriers provided between switch elements and process fluids such that failure of one barrier will not permit process fluids into electrical enclosures.
 - 6. Switch electrical enclosures rated as NEMA 250, Type 4 minimum.
 - 7. Switch contacts located in Class I, Division 1 areas and monitored by solid-state circuits shall be made safe by intrinsic safety barriers as specified in paragraph 2.04.

APRIL 2022 ATTACHMENT E - TECHNICALS

- 8. Switch range shall be selected so that the specified set point is at least 30 percent but not more than 70 percent of the span, between the upper range limit and the lower range limit.
- C. Measuring elements and transmitters shall comply with the following requirements:
 - 1. Measured parameter output indicators complying with paragraph 2.02 shall be provided with any transmitter that does not include an integral indicator. Indicators, whether integral or separate, shall be calibrated in process units, and engraved on the indicator scale plate.
 - 2. The two-wire type transmitters shall have operating power derived from the signal transmission circuit.
 - 3. Transmitters shall meet specified performance requirements with load variations within the range of 0 to 600 ohms with the power supply at a nominal 24 volts DC with the default range of 0 to 100% linearly corresponding to 4 to 20 mAdc.
 - 4. Transmitter output shall increase with increasing measurement.
 - 5. Time constant shall be adjustable from 0.5 to 5.0 seconds for transmitters used for flow, level transmitters used for flow measurement, or pressure measurement.
 - 6. Transmitter output shall be galvanically isolated via electro-mechanical or optical technology.
 - 7. Transmitter enclosures shall be rated NEMA 250, Type 4, unless otherwise specified.
 - 8. Transmitters located outdoors shall be provided with surge protectors:
 - a. Signal: Emerson/Rosemount Model 470 D, Emerson/EDCO SS64-036-2, CCI SPN-42 FS28 Series, or accepted equal.
 - b. AC Power: UL 1449, LED indicator, screw terminal connections, NEMA 4X. EDCO HSP121A or accepted equal.
 - 9. Two-wire transmitter located in a facility area classified as hazardous per the NFPA and the NEC shall be made safe by means of an intrinsic safety barrier as specified in paragraph 2.04.
 - 10. Four-wire transmitters shall be isolated from the process and power or provided with a loop-powered signal current isolator as specified in paragraph 2.05 connected in the output signal circuit.

2.03 PROCESS PARAMETER OUTPUT INDICATOR

- A. Provide digital LED or LCD indicators that integral to the instrument housing where available from the manufacturer. Displays shall be scaled in engineering units, over the calibrated range of the instrument. Calibrate the indicator scale in process units.
- B. Analog output indicators shall be 2.5-inch milli-ammeter with 90-degree movement enclosed in a NEMA 7/9 rated meter case. Provide indicators with accuracy within two percent of span. Provide a diode to maintain loop continuity for indicator removal.

2.04 INTRINSIC SAFETY BARRIERS

A. Intrinsic safety barriers for two-wire transmitters shall be of the active, isolating, loop powered type. Barrier shall be Stahl Series 9000, Accepted equal.

APRIL 2022 ATTACHMENT E - TECHNICALS

2.05 SIGNAL CURRENT ISOLATOR

- A. Isolator shall provide galvanic isolation of milliampere transmission signals from transmitters. Isolator shall be housed in a NEMA 250, Type 4/7 conduit body and derive operating power from the signal input circuit.
- B. Input and output signals shall be 4 to 20 milliamperes, and error shall not exceed 0.1 percent of span. Input resistance shall not exceed 550 ohms with an output load of 250 ohms.
- C. Isolator shall be Moore Industries SCX 4-20madc to 4-20madc / 5.5VPL / -RF [DIN rail mounted with maximum 250 ohm output impedance, or equal.

2.06 PRODUCT DATA

- A. Additional Information: The following product data shall be provided:
 - 1. Flow calculation for each differential-type flow element.
 - 2. Record documentation shall include the data sheets specified in this section.
- B. The following data provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
 - Operating and maintenance information as specified in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS. Include final reviewed submittal and separate record of all final configuration, jumper, and switch settings for each instrument.
 - 2. Test results as specified in Section 40 61 21 PROCESS CONTROL SYSTEM TESTING.

PART 3 EXECUTION

3.01 INSTALLATION

A. General:

- 1. General requirements for the installation of primary elements specified in this section are listed on INSTRUSPEC sheets.
- 2. Installation requirements are specified in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS.

B. Process Connections:

- General: Unless otherwise specified, process taps shall comply with Section 40 05 01. Process connections shall be arranged such that instruments may be readily removed for maintenance without disruption of process units or draining of large tanks or vessels. Unions or flange connections shall be provided as necessary to permit removal without rotating equipment.
 - a. Where process taps are not readily accessible from instrument locations, an isolation valve shall be provided at the instrument.
 - b. Isolation valves shall be provided for each instrument where multiple instruments are connected to one process tap.

APRIL 2022 ATTACHMENT E - TECHNICALS

- c. Pipe between the process connection and instruments shall be 1/2-inch stainless steel with treatment material for easy removal, as specified herein.
- 2. Safety Instruments: No valves shall be installed at pressure taps for safety instruments. Safety instruments shall not be connected to the same process tap as instruments used for control, indication, or recording except when annular chemical seals are used.
- 3. Root Valves: Root valves shall be provided at all process taps, except as follows:
 - a. Temperature taps, where valves are unnecessary.
 - b. Pump discharge pressure taps where no instrument is permanently
 - c. installed. Isolation valves shall be provided.
 - d. Process taps for safety instruments.
 - e. Where gauge valves are provided.
 - f. Where chemical seals are used.
- 4. Gauge Valves: Gauge valves shall be provided for each pressure gauge tap except where chemical seals are used.

C. Tubing:

- 1. Tubing shall be installed on supports spaced not more than 3 feet apart and shall run parallel of perpendicular to walls structural members, or intersections of vertical planes and the ceiling. Unless otherwise shown, tubing shall follow building surfaces closely or shall be carried in trays or conduit.
- 2. Tubing shall not be supported from piping or equipment except at process taps or connections to the device served. Tubes supported directly on concrete surfaces shall be spaced at least 1/8 inch from the concrete. Tubing support shall be one-hole malleable iron clamps with clamp backs as required. Bends shall be formed to uniform radii without flattening.
- 3. Ends of tubing shall be square-cut and de-burred before installation in fittings. Fittings shall be used for splices, connections, and turns near final connections. Bulkhead fittings shall be used when tubing enters a panel.

D. Electrical Connections:

1. Final connections between rigid raceway systems and instruments shall be made with jacketed flexible conduit with a maximum length of 2 feet.

3.02 TESTING

- A. Applicable testing requirements are specified in Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEM.
- B. Testing requirements are specified in Section 40 61 21 PROCESS CONTROL SYSTEM TESTING.

APRIL 2022 ATTACHMENT E - TECHNICALS

3.03 PROCESS CONNECTIONS:

A. Process connection piping and tubing shall be tested in accordance with Section 40 05 01 PIPING SYSTEMS.

3.04 TRAINING

A. Training requirements are specified in Section 01 43 33 MANUFACTURERS' FIELD SERVICES.

PART 4 INSTRUSPECS

4.01 INSTRUSPECS

A. General requirements for instruments specified in this section are listed on INSTRUSPEC sheets herein. Application requirements are specified in the Instrument Index, and/or on the drawings.

Table A			
INSTRUSPEC Symbol	Instrument description	Instrument function	
TMP	Temperature Transmitter	Temperature measurement	
TRE	Resistance temperature insertion type RTD	Temperature measurement	

4.02 INSTRUMENT IDENTIFICATION: TMP

- A. Instrument Function: Temperature Measurement
- B. Instrument Description: Temperature Transmitter
- C. Power Supply: As specified in paragraph 2.02
- D. Signal Input: Process temperature monitored by RTD
- E. Signal Output: Analog transmission signal as specified in paragraph 2.02
- F. Process Connection: Integral or remote mounting to sensor and thermowell, as specified in Section 40 71 00 FLOW MEASUREMENT.
- G. Product Requirements:
 - 1. Temperature Transmitter: 2-wire device, powered from the PLC analog input power supply.
 - 2. Temperature Limits: 0-160°F.
 - 3. Humidity Limits: 0-100% RH.
 - 4. Accuracy: 0.25°F + 0.02% span, using 100 Ohm Platinum RTD.
 - 5. Output: One isolated 4-20 mA into a maximum of 600 ohms.
 - 6. Sensor update time: 0.5 seconds.

APRIL 2022 ATTACHMENT E - TECHNICALS

- 7. Failure mode: transmitter shall have a configurable failure mode to drive the analog signal either high (>21 mA) or low (<3.75 mA) in the event of microprocessor failure.
- 8. Rating: NEMA 4X or as specified in 40 06 70 Instrument Index.
- 9. Indicator: LCD display.
- 10. Acceptable Manufacturer:
 - a. Rosemount 3144P.
 - b. Central Station Steam CSTMP Series.
 - c. Accepted equal.

H. Execution:

1. Installation: Install in accordance with manufacturer's instructions and the Engineer's installation detail.

4.03 INSTRUMENT IDENTIFICATION: TRE

- A. Instrument Function: Temperature measurement
- B. Instrument Description: Resistance temperature detector element, inserting type
- C. Power Supply: N/A
- D. Signal Input: Process
- E. Signal Output: 100 ohms nominal at 0 degrees C, resistance temperature coefficient of 0.385%/degree C
- F. Process Connection: 1/2-inch male NPT
- G. Product Requirements:
 - 1. Temperature element shall be tip sensitive, three-wire platinum resistance temperature detector (RTD) in 1/4-inch ASTM A269, Type 316 stainless steel sheath with watertight connection head.
 - 2. Time constant in agitated water shall not exceed 8 seconds. RTD shall comply with ASTM E1137, tolerance Grade A
 - 3. RTDs for installation in wells shall be provided with spring loading device and union coupler. Union shall extend out beyond pipe lagging.
 - 4. Three-wire lead configuration for ambient temperature compensation shall be provided. RTD extension cable conductors shall be shielded triads as specified in Section 26 05 19 LOW-VOLTAGE ELECTRICAL CONDUCTORS AND CABLES.
 - Bushings and wells for temperature elements shall comply with ASME B40.200 and unless otherwise specified shall be machined from ASTM A276, Type 316 stainless steel bar stock. Union couplers shall be provided for all temperature elements.

H. Execution:

1. Installation: Temperature elements shall be installed in accordance with the manufacturer's instructions.

APRIL 2022 ATTACHMENT E - TECHNICALS

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS

SECTION 40 76 00 PROCESS GAS ANALYTICAL MEASUREMENT

PART 1 GENERAL

1.01 DESCRIPTION

A. This section specifies requirements for process gas analyzer indicating transmitters.

1.02 REFERENCES

A. References shall be as specified in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS.

1.03 SUBMITTALS

- A. Submittals shall be provided as specified in Section 01 33 00 SUBMITTAL PROCEDURES, including:
 - 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. Referenced and applicable sections to be marked up and submitted include:
 - a. Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEMS

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. 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. Marked Contract Document Mechanical and/or Electrical Plan drawings, sections, and details showing sensor installation locations and details. *Failure*

APRIL 2022

PROCESS GAS ANALYTICAL MEASUREMENT

ATTACHMENT E - TECHNICALS

- to include copies of the relevant drawings with the submittal shall be cause for rejection of the entire submittal with no further review.
- 4. Marked product literature of all equipment and features to be provided.
- 5. Installation drawings for the analyzer, sensor, and mounting accessories to be provided.
- 6. Electrical and signal connection drawings for the analyzer and sensor to be provided.
- 7. List of miscellaneous items, cables, spare parts, replenishment parts, and gases that will be provided in accordance with INSTRUSPEC sheet requirements.
- 8. List of spare parts and calibration materials to be provided.
- 9. Provide manufacturers' calibration certificate.

1.04 ENVIRONMENTAL CONDITIONS

A. Refer to Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. A. The Owner and Construction Manager believe the candidate manufacturers listed in the INSTRUSPEC sheets included in this Section 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.

2.02 GENERAL

- A. Process gas analyzers shall comply with the following requirements:
 - 1. Measured parameter output indicators shall be calibrated in process engineering units.
 - 2. Two-wire, three-wire and four-wire analyzers shall provide 4 to 20 milliampere (mA) output signal. Two-wire transmitter shall derive operating power from the current output signal. Three-wire transmitter shall require an external 24 V DC power supply; the power supply common and the current output return shall share the same wire. Four-wire transmitter shall require external 24 V DC or 120 V AC power supply; there shall be no electrical connection between the current output signal and the power supply.
 - 3. Transmitter output signal shall support an external load of a minimum of 500 ohms.
 - 4. Transmitter output signal shall be galvanically isolated from the process, the analyzer case, and external power supply to prevent ground loops. If output signal is not galvanically isolated then loop-powered current signal isolator as

APRIL 2022

PROCESS GAS ANALYTICAL MEASUREMENT

ATTACHMENT E - TECHNICALS

- specified herein and connected in series with the output signal shall be provided.
- 5. Analyzers located outdoors shall be provided with surge protectors as specified in herein.
- 6. Transmitter output shall linearly increase with increasing process measurement, except where specified as "reverse action" in the Instrument Index
- 7. Electrical parts of analyzer transmitter and/or primary element mechanisms shall be housed in enclosures meeting NEMA 250, Type 4X requirements.
- 8. Electrical equipment and analyzer transmitters located outdoors or in areas specified as corrosive shall have enclosures meeting NEMA 250, Type 4X requirements.
- 9. Transmitters located in a classified hazardous area per the NFPA and the NEC, shall be manufacturer approved and labelled for classified hazardous area installations. Provide intrinsic safety barriers if required by the manufacturer to meet approval of installation for classified hazardous area installations, as specified in herein.
- 10. One analyzer transmitter shall be provided for each sensor, unless otherwise noted.

2.03 PRODUCT DATA

- A. The following data shall be provided in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
 - Operating and maintenance information as specified in Section 40 61 13 PROCESS CONTROL SYSTEM GENERAL PROVISIONS. Include final reviewed submittal and separate record of all final configuration, jumper, and switch settings for each analyzer.
 - 2. Test results as specified in Section 40 61 21 PROCESS CONTROL SYSTEM GENERAL TESTING.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Installation requirements are specified herein.
 - 1. Provide O2 analyzer as specified in the Kika Court ARVF vault. The sensor or analyzer sample line shall be connected to the common PVC discharge header of the air release valves upstream of the carbon filter.

3.02 TESTING

A. Testing requirements are specified in Section 40 61 21 PROCESS CONTROL SYSTEM GENERAL TESTING.

APRIL 2022

PROCESS GAS ANALYTICAL MEASUREMENT

ATTACHMENT E - TECHNICALS

3.03 TRAINING

A. Provide two training sessions, each with one hour per type of analyzer.

3.04 INSTRUMENTATION SPECIFICATION (INSTRUSPEC) SHEETS

- A. General requirements for instruments specified in this section are listed on INSTRUSPEC sheets herein. Application requirements are specified in the Instrument Index, and/or on the drawings.
- B. INSTRUSPEC sheets for the analyzers listed in the following Table A are included in this paragraph:

Table A: List of Process Gas Analyzer Indicating Transmitters				
INSTRUSPEC Symbol	Analyzer Description	Instrument Function		
O2	Oxygen Detector 25%	Ambient air monitor for oxygen		

- 3.05 NOT USED
- 3.06 NOT USED
- 3.07 NOT USED
- 3.08 NOT USED

3.09 02 INSTRUMENT SPECIFICATION - INSTRUSPEC

- A. Instrument Identification: 02
- B. Instrument Description: A complete, factory provided unit including sensors, analyzer/transmitters, sample pump with filter, and enclosure with beacon that measures concentrations for multiple gases in ambient air via electrochemical and/or infrared technologies. Sensors and analyzer/transmitter shall be compatible with the environmental classification(s).
- C. Power Supply: 120 VAC.
- D. Signal Output:
 - 1. 4 to 2 mA.
 - 2. Two SPDT programmable relay outputs rated for 2 Amps at 24 VDC/VAC.
 - One SPDT monitor fault relay output rated for 2 Amps at 24 VDC/VAC.
- E. Product Requirements
 - 1. Sensor and analyzer/transmitter shall be from the same manufacturer.
 - 2. Sensor type: Zirconium Oxide sensor cell

APRIL 2022

PROCESS GAS ANALYTICAL MEASUREMENT

ATTACHMENT E - TECHNICALS

- 3. Sensor life: 8-10 years
- 4. Analyzer/transmitter shall have an integral 3-digit backlit LCD display with joystick operated menus.
- 5. The unit assembly shall be explosion proof.
- 6. The unit assembly shall be approved by Factory Mutual.
- 7. Performance Parameters (typical shown; may vary depending on gas and sensor):
 - a. Oxygen Range: 0 25%.
 - b. Temperature Range: 40 F to 140 F.
 - c. Zero Drift: <5% per year.
 - d. Span Drift: <10T per year.
 - e. Repeatability: ±1% full scale.
 - f. Linearity: ±10% full scale.
 - g. Response Time: <30 seconds.
 - h. Humidity: 15% 95% RH, non-condensing.
 - i. Any alarm condition activates beacon.
- 8. Calibration Kit: Provide manufacturer's recommended calibration kit consisting of the following:
 - a. Provide two cylinders of zero and span gas for each type of gas monitored; one pair of zero and span gas shall be used by the Contractor for initial calibration, the second pair shall be delivered to the owner.
 - b. Flow regulator(s) with tubing.
 - c. Carrying case.
 - d. Five hydrophobic filters.
 - e. Controller for configuration, one for all analyzers.
 - f. Provide two years of onsite calibration services including gases, regulators and tubing needed to provide those services.
- 9. PureAire 99020
- 10. Or equal.

F. Execution:

- 1. Installation: System shall be installed in accordance with manufacturer's recommendations.
- 2. Provide sample line and vent line to location specified.
- 3. Configure alarm contacts to open upon alarm for the following:
 - a. Trouble or flow failure.
 - b. Separate gas level/concentration alarm(s).
- 4. Application/Calibration: Provide manufacturers' calibration certificate.

APRIL 2022

PROCESS GAS ANALYTICAL MEASUREMENT

ATTACHMENT E - TECHNICALS

3.10 SIGNAL CURRENT ISOLATOR

- A. Isolator shall provide galvanic isolation of milliampere transmission signals from the transmitters. Isolator shall be housed in a NEMA 250, Type 4/7 conduit body and derive operating power from the signal input circuit.
- B. Input and output signals shall be 4 to 20 milliamperes, Error shall not exceed 0.1 percent of span. Input resistance shall not exceed 550 Ohms with a output load of 250 Ohms.
- C. Isolator shall be Moore Industries SCX 4-20madc to 4-20madc / 5.5VPL/-RF or equal.

3.11 INTRINSIC SAFETY BARRIERS

A. Intrinsic safety barriers for two-wire transmitters shall be of the active, isolating. Loop powered type. Barriers shall be Measurement Technology LTD Type MT3042 or accepted equal.

END OF SECTION

APRIL 2022

PROCESS GAS ANALYTICAL MEASUREMENT

ATTACHMENT E - TECHNICALS

SECTION 43 05 13 RIGID EQUIPMENT MOUNTS

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

- This section specifies minimum requirements for rigid equipment mounts. Completed equipment mounts shall consist of equipment pads, equipment anchors, and mounting plates (baseplates, soleplates, or fabricated steel frames) set in grout.
- 2. Equipment mounts shall conform to the requirements specified in the Equipment Mounting Schedule included in this specification. Where equipment mounting requirements are not specifically identified in the Equipment Mounting Schedule, the default mounting configuration for equipment shall consist of Pad Anchored Equipment Pads per Standard Detail M7007, mounting plates leveled within 0.005 inch/foot, anchored to the equipment pad with cast-in-place equipment anchors per Standard Detail M7002, equipment anchor sleeve length is 10 times the bolt diameter, and the mounting plate is grouted in position using non-shrink grout.
- 3. If a conflict exists between this section and requirements of individual equipment manufacturers, the more restrictive requirements shall prevail.
- 4. Requirements for non-rigid equipment mounts (vibration isolation systems) are specified in individual equipment specifications. Rigid equipment mounts conforming to the requirements of this Section shall be furnished for the equipment pad and other equipment mounting components supporting the vibration isolation system.
- 5. Alignment of equipment installed on rigid equipment mounts is specified in Section 43 05 14 MACHINE ALIGNMENT.

B. Definitions:

- 1. Specific equipment mounting terminology used in this section conforms to the following definitions:
 - a. Baseplate: A mounting plate configured with a top plate and a perimeter edge of the mounting plate that is below the top plate. Baseplates have a cavity between the top plate and a horizontal plane at the bottom edge of the perimeter of the mounting plate.
 - b. Soleplate: A machined or pre-formed mounting plate with a uniform horizontal surface across the entire underside of the mounting plate, excepting shear lugs/keys, grout pour holes, vent holes, and attachment hardware (nuts, bolts, tapped holes, etc.). Soleplates have a top plate but lack the perimeter bottom edge that extends below the underside of the top plate that is a defining feature of baseplates.
 - c. Fabricated Steel Frame: An equipment mounting plate constructed of rolled steel shapes and plates welded into a frame. Fabricated steel frames do not have top plates.

APRIL 2022

RIGID EQUIPMENT MOUNTS

ATTACHMENT E - TECHNICALS

- d. Equipment Pad: Concrete foundation (block or slab) supporting and elevating mounting plates above the supporting structural floor slab or local grade.
- e. Mounting Pads: Milled/machined areas of baseplates, soleplates, and fabricated steel frames where the feet or mounting surfaces of mounted equipment and drivers are bolted to the baseplate, soleplate, or fabricated steel frame.
- f. Leveling Blocks: Steel blocks temporarily placed under baseplates, soleplates, or fabricated steel frames at leveling positions (at equipment anchors) for the purpose of leveling baseplates, soleplates, or fabricated steel frames prior to grouting.
- g. Shims: Thin stainless steel plates of uniform thickness used for fine adjustment of level. Shims are used on top of leveling blocks for mounting plate leveling or used between equipment drivers and baseplates, soleplates, or fabricated steel frames for equipment alignment.
- h. Wedges: Pairs of uniformly tapered metal blocks that are stacked with the tapered surfaces reversed (relative to the other wedge) so that the top and bottom surfaces of the wedges are parallel. Wedges are used between equipment pads and baseplates, soleplates, or fabricated steel frames for the purpose of leveling mounting plates.
- i. Mounting Stud: Threaded rod or bolts anchored to baseplates, soleplates, or fabricated steel frames for the purpose of mounting equipment or ancillary devices onto baseplates, soleplates, or fabricated steel frames.
- j. Reinforcement Dowels or Reinforcement Hooks: Steel reinforcement rods embedded in concrete, across a cold joint, for the purpose of transferring loads or force across the joint.
- k. Leveling Position: A location on the top of a concrete equipment pad where leveling tools and equipment will be temporarily installed or used for the purpose of leveling baseplates, soleplates, and fabricated steel frames prior to grouting.
- I. Grout Manufacturer: Refers to the manufacturer of the grout product used for installation of rigid equipment mounts.
- m. Grout Manufacturer's Technical Representative(s): Refers to the technical representative(s) of the Grout Manufacturer. The Grout Manufacturer's Technical Representative shall not be an employee of the Contractor.

1.02 QUALITY ASSURANCE

A. References:

- 1. This section contains references to the following documents. Referenced documents 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.
- References to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid. 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

APRIL 2022

RIGID EQUIPMENT MOUNTS

ATTACHMENT E - TECHNICALS

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	
ACI 318, Appendix D	Building Code and Commentary, Anchorage to Concrete	
ANSI/HI 1.4	Centrifugal Pumps – Installation, Operation and Maintenance	
ANSI/HI 2.4	Vertical Pumps – Installation, Operation and Maintenance	
API Recommended Practice 686	Recommended Practices for Machinery Installation and Installation Design	
ASTM E329	Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction	
ASTM F593	Stainless Steel Bolts, Hex Cap Screws, and Studs	
ASTM F1554	Anchor Bolts, Steel, 36, 55 and 105 ksi Yield Strength	
MIL-PRF-907E	PRF-907E Anti-Seize Thread Compound, High Temperature	
SSPC	Society for Protective Coatings Specifications, Vol. 2	
IBC	International Building Code (including local amendments)	

B. Quality Control By Contractor:

- To demonstrate conformance with the specified requirements for rigid equipment mounts, the Contractor shall provide the services of an independent testing laboratory that complies with the requirements of ASTM E329. The testing laboratory shall sample and test materials installed as part of rigid equipment mounts as specified in this Section. Costs of testing laboratory services shall be borne by the Contractor.
- 2. Where epoxy grout is specified in individual equipment specifications, the Contractor shall furnish the services of a grout manufacturer's technical representative who has been factory trained by the grout manufacturer. The grout manufacturer's technical representative shall perform training and quality control of epoxy grout installation for rigid equipment mounts as specified in this section.
- C. Special Inspection for Equipment Anchors: Equipment anchors shall comply with special inspection requirements, where specified, on the plans and in Division 05 of the specifications.

1.03 SUBMITTALS

- A. The following information shall be provided in accordance with the submittal requirements specified in Section 01 33 00 SUBMITTAL PROCEDURES.
 - A copy of this specification section, including addendum updates, (referenced sections need not be included for this Section) with each paragraph checkmarked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks shall denote full

APRIL 2022

RIGID EQUIPMENT MOUNTS

ATTACHMENT E - TECHNICALS

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 shall be sufficient cause for rejection of the entire submittal with no further consideration. Copies of this specification section shall be numbered and marked (specification number and equipment number) for inclusion (filing) with submittal materials furnished for individual equipment specifications.

- 2. Name, employer, a copy of the employee's Qualified Millwright card or other equivalent certificate of journeyman qualifications for millwrights who will install rigid equipment mounts, as specified in paragraph 3.02 Leveling.
- Certificates or other documentation issued by the epoxy grout manufacturer that demonstrates that the grout manufacturer's technical representative has been factory trained on installation of epoxy grout for equipment mounts, as specified in paragraph 1.02 Quality Assurance.
- 4. Shop drawings for equipment pads, equipment anchors, and baseplate, soleplate or fabricated steel frame details. Shop drawings shall depict size and location of equipment pads and reinforcement; equipment drains; equipment anchor, size, location, and projection; expansion joint locations; elevation of top of grout and grout thickness; elevation of top of baseplate, soleplate, or mounting block; size and location of electrical conduits; and any other equipment mounting features embedded in equipment pads. Shop drawings for equipment pads, equipment anchors, and baseplate, soleplate, or fabricated steel frames shall be numbered and marked (specification number and equipment number) for inclusion (filing) with the associated equipment submittal requirements.

PART 2 PRODUCTS

2.01 GENERAL

- A. Equipment mounts shall conform to the requirements specified in the Equipment Mounting Schedule.
- B. Equipment and drivers shall be rigidly mounted on a common mounting plate and grouted into place on a concrete equipment pad unless alternate requirements are specified in the Contract Drawings or the Equipment Mounting Schedule in this section. Unless otherwise specified in the individual equipment specification, mounting plates shall be anchored to equipment pads with a layer of grout between the equipment pad and the mounting plate.

APRIL 2022

RIGID EQUIPMENT MOUNTS

ATTACHMENT E - TECHNICALS

2.02 EQUIPMENT PADS

A. Materials:

- 1. Equipment pads shall be reinforced concrete as shown on the drawings. If not shown, use Standard Details M7006, M7007, M7008, and M7009.
- 2. Minimum dimensions for equipment pads are shown on structural drawings where the equipment pad is required to provide a minimum mass for vibration dampening.

B. Equipment Pad Drainage:

- 1. Equipment pads shall be furnished with 2-inch drains.
- 2. Locate equipment pad drains at drainage outlets from equipment or mounting plates
- 3. Route equipment drainage outlets or mounting plate drainage outlets to equipment pad drains
- 4. Route equipment pad drains to the floor drainage collection system.
- 5. Drainage piping for equipment pads shall be routed below the finished floor elevation.

APRIL 2022 ATTACHMENT E - TECHNICALS RIGID EQUIPMENT MOUNTS

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS RIGID EQUIPMENT MOUNTS 43 05 13 - 6

610 I Page

Equipment Mounting Schedule

Equipment Number	Specification Section	Specification Title	Equipment Pad Detail	Mounting Plate Leveling Tolerance (inch/foot)	Equipment Anchor Type	Equipment Anchor Sleeve Length	Grout Type	Application Notes
Default Config.	Various	Various	M7007	0.005	M7002	10D	Non- shrink	Default equipment mounting configuration for all equipment not otherwise specified in this schedule
Freestanding floor- mounted electrical panels and equipment	Various	Various	M7006	Not applicable	M7004	Not required	Not required	

APRIL 2022 ATTACHMENT E - TECHNICALS RIGID EQUIPMENT MOUNTS

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 RIGID EQUIPMENT MOUNTS
ATTACHMENT E - TECHNICALS 43 05 13 - 8

Equipment	Equipment Mounting Schedule							
Equipment Mounting System	Equipment Pad Detail	Mounting Plate Leveling Tolerance (inch/foot)	Equipment Anchor Bolt Detail	Equipment Anchor Sleeve Length	Grout Type	Application Notes		
Default	M7007	0.005	M7002	10D	Non- shrink	The default equipment mounting configuration, unless this schedule or the equipment specifications specify another mounting configuration.		
Group F	M7006	Not Applicable	M7004	Not required	Not required	(Freestanding floor-mounted electrical panels and equipment)		

2.03 EQUIPMENT ANCHORS:

A. Equipment Anchor Materials:

- 1. Equipment anchors shall be all thread rod with heavy hex welded nuts, heavy hex bolts, Post-installed anchors (wedge, sleeve, undercut, expansion, and adhesive anchors), or adjustable canister anchors as specified in the Equipment Mounting Schedule.
- 2. Post-installed anchors (wedge, sleeve, undercut, expansion, and adhesive anchors) shall conform to the requirements of Division 05 of the specifications.
- 3. Adjustable canister anchors shall be cast-in-place pre-manufactured adjustable anchor inserts. Adjustable canister anchors shall provide a minimum of 6 inches of vertical bolt height adjustment and lateral adjustment of the anchor bolt while maintaining the anchor bolt in a true vertical orientation. Adjustable canister anchors shall be Jakebolts as manufactured by Unisorb, Heavy Duty Adjustable Anchors as manufactured by Deco, Rowan Adjustable Canister Anchor Bolt, or approved equal.
- 4. Equipment anchor materials shall conform to the following table for the area exposure condition where the equipment is installed.

Area Exposure	Equipment Anchor Materials
Indoor, Dry	304 Stainless, ASTM F593, Cond. CW
Indoor, Wet	304 Stainless, ASTM F593, Cond. CW
Outdoor	304 Stainless, ASTM F593, Cond. CW
Submerged, Immersed	316 Stainless, ASTM F593, Cond. CW
Process Corrosive	316 Stainless, ASTM F593, Cond. CW
Chemical Corrosive	316 Stainless, ASTM F593, Cond. CW

B. Equipment Anchor Design:

- 1. The size (diameter) of anchors for clamping/fastening mounting plates to equipment pads shall be as specified by the equipment manufacturer.
- Equipment anchor size, embedment, and edge distance shall comply with the current version of the California Building Code and shall be sufficient to resist the maximum lateral and vertical forces specified in Specification Listing Seismic/Structural Requirements For The Project, Section 01 73 24 DESIGN REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS AND NON-BUILDING STRUCTURES.
- 3. The Contractor shall furnish equipment anchor calculation submittals for compressed air and compressed oxygen storage tanks, pressure vessels, and oxygen generation equipment. Equipment anchor calculations shall be furnished as product data and submitted with equipment submittals. Equipment anchor calculations shall be sealed by a registered structural or civil engineer licensed in the State of California.

C. Equipment Anchor Tension:

- 1. Equipment anchors consisting of Post-installed anchors shall be tightened to manufacturer's recommendations.
- Bolt torque values required to produce the specified bolt tension based on well lubricated plain finish national coarse thread bolts are presented in the following table. Revise bolt torque values per equipment manufacturer's recommendations for alternate thread patterns, thread lubrication, bolt material, or bolt finish.

Bolt Diam. (in)	3/8	1/2	5/8	3/4	7/8	1	1-1/8	1-1/4	1-1/2
Final bolt torque for 15,000 psi bolt stress (ft*lbs)	8	15	30	50	80	125	180	250	400

3. Prior to leveling and grouting mounting plates, grouted equipment anchors (standard detail M7003) shall be pull tested to the values specified in the following table.

Anchor Diam. (in)	3/8	1/2	5/8	3/4	7/8	1	1-1/8	1-1/4	1-1/2
Pull test load (kips)	2.1	3.8	6.1	9.1	13	17	22	28	43

D. Anchor Sleeves:

- Equipment anchors shall be fitted with sleeves as specified in the Equipment Mounting Schedule. Sleeve length for equipment anchors shall be 15 times the bolt diameter unless otherwise specified in the Equipment Mounting Schedule. Sleeves may be installed at the Contractor's option if not specified in the Equipment Mounting Schedule.
- 2. Adjust equipment anchor length/embedment depth shown in Standard Detail M7002 and Standard Detail M7003 if sleeves are not required.
- 3. Anchor sleeves shall be flexible polyurethane foam, steel cylinder/tubes, or ribbed plastic sleeves.

APRIL 2022

RIGID EQUIPMENT MOUNTS

4. Fill steel cylinders/tubes and ribbed plastic sleeves with a flexible room temperature vulcanizing (RTV) sealant prior to embedment/installation.

2.04 MOUNTING PLATES

A. General:

- 1. All baseplates, soleplates, and fabricated steel frames shall have edges of surfaces bearing on grout rounded to a radius of not less than 0.25 inch.
- 2. Perimeter corners of baseplates, soleplates, or fabricated steel frames shall be rounded to a radius of not less than 1.0 inch to avoid producing stress risers on the grouted foundation.
- 3. Grout pouring holes (minimum 2.5 inches in diameter for cementitious non-shrink grout) shall be provided in all baseplates and soleplates and all baseplates and soleplates shall have air release holes.
- 4. Mounting holes for equipment anchors shall be drilled through baseplates, soleplates, and fabricated steel frames.
- 5. Mounting holes for equipment anchors shall be drilled. Mounting holes shall not be burned out and they shall not be open slots.
- Terminations requiring connections to baseplates and soleplates shall be acorn
 nuts welded to the underside of the baseplate or soleplate or nuts welded to the
 underside of the baseplate or soleplate and plugged with cork, plastic plugs or
 grease.
- 7. Where fasteners terminate only into the baseplate, soleplate, or fabricated steel frame, threaded lengths (tapped or embedded in mounting plates) shall be not less than the bolt diameter.
- 8. Where baseplates, soleplates, or fabricated steel frames are leveled using jackscrews, jackscrew threads shall be tapped in thickened pads or otherwise in sufficient metal to provide ease in adjusting level.
- 9. Mounting pads and/or mounting surfaces for baseplates, soleplates, and fabricated steel frames shall be milled flat after all welding and stress relieving and shall be coplanar within 0.0005 inch per foot in all directions. Baseplates shall be pre-grouted prior to milling.
- 10. Baseplates, soleplates, and fabricated steel frames shall provide common support for the equipment and driver (and flywheel, if one is specified).
- 11. Baseplates, soleplates, and fabricated steel frames for equipment with drivers 20 horsepower and greater shall be furnished with transverse alignment (horizontal) positioning jackscrews for alignment of equipment drivers on horizontal surfaces of baseplates.
- 12. Alignment/positioning jackscrews shall be in perpendicular directions in a horizontal plane at the mounting position for each corner or foot of the equipment driver. (Additional jackscrews shall be provided for transverse alignment of the flywheel, if flywheels are specified in the equipment specification.)
- 13. Where specified in individual equipment specifications; baseplates, soleplates, and fabricated steel frames shall be fitted with RK Fixators as manufactured by Unisorb, or approved equal.
 - a. Fixators shall be installed at mounting surfaces for drivers.

APRIL 2022

RIGID EQUIPMENT MOUNTS

615 I Page

b. Fixators shall be a three-piece wedge leveling adjustment device incorporating a spherical washer assembly to provide true level height adjustment at each mounting surface for the equipment driver.

B. Fabricated Steel Frames:

- 1. Fabricated steel frames shall be plate or fabricated structural steel mounting plates with thickened steel mounting pads for bolting equipment to the mounting plate.
- Fabricated steel frames shall be rectangular in shape, excepting fabricated steel frames for centrifugal refrigeration machines and pumps which may be T- or Lshaped fabricated steel frames to accommodate the equipment driver and accessories.
- 3. Fabricated steel frames for split case pumps shall include supports for suction and discharge elbows, if required by the specified configuration.
- 4. Perimeter members shall be I-beams or C-channel with a minimum depth equal to 1/10 of the longest dimension of the fabricated steel frame. Beam depth need not exceed 14 inches provided that the deflection and misalignment is kept within acceptable limits as determined by the manufacturer.
- 5. Fabricated steel frames shall be furnished with mounting pads welded to the fabricated steel frame.
- 6. Surfaces of fabricated steel frames in contact with grout shall be sandblasted to white metal per SSPC SP-5.
- 7. Apply a high-strength epoxy primer as specified in paragraph 2.06 within 8 hours of sandblasting the fabricated steel frame.

C. Baseplates:

- 1. Baseplates shall be welded steel, cast steel, or cast iron with thickened mounting pads for bolting equipment to the baseplate.
- 2. Internal stiffeners shall be provided on all cast and fabricated baseplates and shall be designed to allow free flow of grout from one section of the baseplate to another.
- 3. The minimum acceptable opening in cross bracing and stiffeners shall be 2 inches high by 6 inches wide.
- 4. All welds shall be continuous and free from skips, blowholes, laps and pockets.
- 5. Baseplates shall be pre-grouted at the factory after all welding has been completed and prior to machining the mounting pads on the baseplate. Baseplates that have not been pre-grouted at the factory shall be pre-grouted in the field by removing the equipment from the baseplate, inverting the baseplate, and pre-grouting as specified in this Section.
- 6. The underside of baseplates shall be sandblasted to white metal per SSPC SP-5 prior to pre-grouting.
- 7. Pre-grouting shall be completed within 8 hours of sandblasting.
- 8. Pre-grouting shall fill the underside of the baseplate to the bottom edges of the baseplate.
- 9. Cast iron baseplates shall be sealed to prevent surface bleeding prior to shipment to the project site.

D. Plate Steel Soleplates:

APRIL 2022

RIGID EQUIPMENT MOUNTS

- 1. Plate steel soleplates shall be not less than 1.0 inch thick for equipment with drivers greater than 30 horsepower.
- 2. Plate steel soleplates shall be furnished with grout keys/lugs or stiffeners on the underside of the soleplate.
- 3. Excepting grout keys, grout pour holes, vent holes, and attachment hardware (nuts, bolts, tapped holes, etc.) the underside of plate steel soleplates shall be a flat uniform horizontal surface.
- 4. The underside of plate steel soleplates shall be scribed with the words "THIS SIDE DOWN" using welding rod material prior to milling the mounting pads for equipment or mounting surfaces.
- 5. Plate steel soleplates without grout pouring holes are acceptable provided that no dimension of the soleplate (width or length) exceeds 18 inches.
- 6. Surfaces of plate steel soleplates in contact with grout shall be sandblasted to white metal per SSPC-SP-5 prior to shipment to the project site.
- 7. Apply a high-strength epoxy primer as specified in paragraph 2.06 within 8 hours of sandblasting the underside of plate steel soleplates.
- 8. Where equipment is fabricated or cast with feet or mounting surfaces that are not fastened to a common baseplate or soleplate, as in dry-pit bottom-suction pumps, the equipment may be supported on individual concrete piers or equipment pads in lieu of mounting on a common equipment pad and soleplate. In such instances, the equipment shall be supported at the feet or mounting surfaces on individual plate steel soleplates, which shall be leveled and grouted into place on the individual piers or equipment pads as specified in this section. Where multiple soleplates are installed for an equipment installation, soleplates shall be installed coplanar within 0.002 inch/foot.

E. Polymer Concrete Soleplates:

- 1. Polymer Concrete Soleplates shall be pre-cast soleplates consisting of polymer concrete with stainless steel inserts for equipment mounting.
- 2. Mounting surfaces on Polymer Concrete Soleplates shall be coplanar within 0.002 inch/foot. Polymer Concrete Soleplates shall be furnished with a uniform horizontal surface over the entire underside of the mounting plate.
- 3. Excepting grout keys, grout pour holes and vent holes, the underside of soleplates shall provide a flat uniform horizontal surface.
- 4. Polymer Concrete Soleplates shall be PoxyBase as manufactured by Basetek, Chembase as manufactured by Goulds, or approved equal.

F. Corrosion Resistant FRP Baseplates:

- 1. Corrosion Resistant FRP Baseplates shall be pre-formed fiber reinforced plastic fabrications.
- 2. Corrosion Resistant FRP Baseplates shall be products of the manufacturer of the equipment that is mounted on the baseplate.

2.05 GROUT FOR EQUIPMENT PADS

A. Cementitious Nonshrink Grout: Where non-shrink grout is specified in the Equipment Mounting Schedule, Cementitious Non-shrink Grout, specified in Section 03 62 13 NON-METALLIC NON-SHRINK GROUT, may be used for setting bearing surfaces of

APRIL 2022

RIGID EQUIPMENT MOUNTS

ATTACHMENT E - TECHNICALS

baseplates, soleplates, or fabricated steel frames. Where the term non-shrink grout or cementitious grout is used in the context of details and specifications for equipment mounting it shall mean Cementitious Non-shrink Grout as specified in Section 03 62 13 NON-METALLIC NON-SHRINK GROUT. Training and quality control by the grout manufacturer's technical representative is not required for rigid equipment mounts installed with cementitious non-shrink grout.

2.06 EPOXY PRIMER

A. Epoxy primer shall be a high-strength, lead free, chrome free, and rust inhibiting two-component epoxy primer specifically designed for use on metal substrates and in conjunction with epoxy grout. The epoxy primer's bond strength to sandblasted metal shall not be less than 1500 psi. Epoxy primer shall be Phillybond Phillyclad 1000 Series, or approved equal.

2.07 ANTI-SEIZE/ANTI-GALLING COMPOUND

A. Anti-seize or anti-galling compound shall be a molybdenum disulfide and graphite combination in aluminum complex base grease conforming to MIL-PRF-907E. Acceptable products include Jet Lube 550 by Jet Lube, Inc., E-Z Break by LA-CO, or approved equal.

2.08 PRODUCT DATA

- A. The following information shall be provided in accordance with the product data requirements specified in Section 01 33 00 SUBMITTAL PROCEDURES:
 - 1. Equipment anchor calculations demonstrating compliance with paragraph 2.03 Equipment Anchors.
 - 2. Results of grout strength tests, as specified in paragraph 3.02 Grouting.
 - 3. Completed Rigid Equipment Mount Installation Inspection Checklist Forms (43 05 13-A), as specified in paragraph 3.02 Epoxy Grout Quality Control.

PART 3 EXECUTION

3.01 GENERAL

A. General Requirements:

- 1. Roughen the underside of soleplates and fabricated steel frames and wipe with a residue-free solvent as recommended by the epoxy primer manufacturer before placement of the baseplate, soleplate, and fabricated steel frames on the equipment pad for leveling. Roughen surfaces of mounting plates that will be in contact with grout by power tool cleaning. Cleaning shall be performed by power wire brushing, power sanding, power grinding, power tool chipping or power tool descaling. Cleaning shall impart a minimum profile of 1.0 mil.
- 2. Prior to placement on the equipment pad for leveling, exposed grout surfaces of pre-grouted baseplates shall be roughened and wiped with a residue-free solvent as recommended by the manufacturer of the epoxy grout used for pre-grouting.

APRIL 2022

RIGID EQUIPMENT MOUNTS

ATTACHMENT E - TECHNICALS

- 3. Prepare the underside of corrosion-resistant FRP baseplates and polymer concrete baseplates per the baseplate manufacturer's recommendations prior to placement of the baseplate on the equipment pad for leveling.
- 4. Grout for equipment mounting shall be as specified in the Equipment Mounting Schedule.
- 5. Grouting for installation of equipment on equipment pads shall take place prior to connecting any field piping or electrical and instrumentation systems.
- 6. Unless the Construction Manager accepts an alternate installation procedure in writing, baseplates, soleplates, and fabricated steel frames shall be leveled and grouted with the equipment removed.
- 7. Pumps shall be installed in accordance with this section and ANSI/HI 1.4 or ANSI/HI 2.4, as appropriate for the type of pumping equipment installed.
- 8. Connecting piping with flexible connections and/or expansion joints shall be anchored such that the intended function of these joints is maintained in the piping system without imposing strain on the equipment connections.

B. Alternate Piping Connections:

- 1. Where an equipment manufacturer's installation requirements include a rigid connection between the machine and connecting piping systems, the Contractor shall delete any flexible coupling (including equipment connection fittings) shown on the drawings and install the equipment in the following manner, in lieu of installing the flexible coupling:
 - a. The equipment pad shall be installed as shown on the detail specified in the Equipment Mounting Schedule.
 - b. The baseplate, soleplate, or fabricated steel frames supporting the equipment shall be installed, leveled, and grouted in place as specified in this section.
 - c. The equipment shall be installed and aligned in place as specified in Section 43 05 14 MACHINE ALIGNMENT.
 - d. The piping shall be installed and aligned to the equipment connections and the field piping connections without welding one of the joints for one section of pipe between the equipment connection and the field piping and all valving. All flanged joints shall be bolted up and pressure-tested.
 - e. All piping shall be fully supported by supports designed to accept their full weight and thrust forces.
 - f. The final sections of piping shall be aligned with the equipment and field connections without the use of jacks, chain falls, or other devices to force it into alignment.
 - g. The final piping joints shall be welded only after the previous steps have been completed and accepted by the Construction Manager.

3.02 INSTALLATION

A. Concrete Equipment Pad Preparation:

- 1. Roughen the top of the equipment pad after the concrete has reached its 28-day compressive strength.
- 2. Remove all laitance and defective or weak concrete.
- 3. Roughened surface profile shall be 0.25 inch amplitude, minimum.

APRIL 2022

RIGID EQUIPMENT MOUNTS

ATTACHMENT E - TECHNICALS

- 4. Expose broken aggregate without dislodging unbroken aggregate from the cement matrix and without fracturing concrete and aggregate below the concrete surface.
- 5. Roughen using a light-duty (15 pounds or less), hand-held chipper with a chisel type tool.
- 6. Abrasive blast, bush-hammer, jack hammers with sharp chisels, heavy chipping tools, or needle gun preparation of concrete surfaces to be grouted are not acceptable.
- 7. Demonstrate removal of defective or weak concrete to the Construction Manager prior to leveling.
- 8. The chipped surface of the concrete shall be such that the final elevation of the equipment pad provides the grout manufacturer's recommended thickness between the surface of the equipment pad and the lower baseplate flange, underside of the soleplate, or underside of the fabricated steel frame.
- 9. All dust, dirt, chips, oil, water, and any other contaminants shall be removed and the surface protected with plastic sheeting until grout is installed.
- 10. Concrete equipment pad surfaces that have been finished smooth and level for use as leveling positions shall be protected from damage during chipping activities. Alternatively, leveling positions may be restored on chipped surfaces. Leveling positions shall be restored by installing leveling blocks or leveling plates for jackscrews on a high compressive strength epoxy putty (Philadelphia Resins, Phillybond Blue 6A, or equal). Leveling blocks and leveling plates shall be installed level on the epoxy putty.

B. Leveling:

- 1. Except where union rules require installation by another trade, all equipment and machinery shall be mounted and leveled by a Qualified Millwright.
- 2. Use precision surveying equipment for leveling.
- 3. Machinists' spirit levels will not be permitted for leveling purposes for any baseplate, soleplate, or fabricated steel frame with a plan dimension greater than 4 feet.
- 4. Baseplates, soleplates, and fabricated steel frames shall be leveled to the tolerance specified in the Equipment Mounting Schedule or as otherwise required by the equipment manufacturer, if more stringent.
- 5. An anti-seize or anti-galling compound specified in paragraph 2.07 shall be applied to all equipment anchor threads prior to beginning baseplate, soleplate, or fabricated steel frame leveling.
- All baseplates, soleplates, and fabricated steel frames shall be leveled against steel surfaces (jackscrew plates, leveling blocks, leveling nuts, support plates, or other steel surfaces). Use of other materials for leveling purposes is strictly and specifically prohibited.
- 7. Leveling equipment and tools shall be stainless steel leveling blocks and shims, steel wedges, or jackscrews bearing on leveling plates.
- 8. Leveling nuts may be used for leveling baseplates, soleplates, and fabricated steel frames weighing less than 200 pounds (including the weight of the equipment if leveled with the equipment on the mounting plate).
- 9. Leveling blocks shall be stainless steel, 4 inches square and 1.5 inches thick with an open-ended slot terminating in the center for the equipment anchor.

APRIL 2022

RIGID EQUIPMENT MOUNTS

- 10. Leveling blocks shall be machined flat on all horizontal surfaces and placed under the baseplate or soleplate at each equipment anchor.
- 11. Shims shall be pre-cut stainless steel, slotted for removal after grouting. Leveling blocks and shims shall be coated with a light oil just prior to beginning the leveling and grouting work. Shims shall be placed so the tabs on the shims are easily accessible.
- 12. Clamp baseplates, soleplates, or fabricated steel frames in position (after leveling) by installing the equipment anchor nuts and washers.
- 13. Bolt tension to fix the position of mounting plates during grouting shall be 30 to 60 percent of the final clamping force applied to clamp the mounting plate to the equipment pad.
- 14. Prior to grouting, verify that the correct level and position of the baseplate, soleplate, or fabricated steel frame has been maintained after clamping it to the equipment pad.

C. Grouting:

- 1. Design forms for a minimum of 6 inches hydrostatic head above the final elevation of the grout.
- 2. Install grout expansion joints at 4 to 6 foot intervals, perpendicular to the centerline of baseplates. Design expansion joints in accordance with the grout manufacturer's written instructions.
- 3. Coat forms with three coats of paste wax on all areas of the forms that will be in contact with the grout.
- 4. Wax forms before assembly.
- 5. Prevent accidental application of wax to surfaces where the grout is to bond.
- 6. Remove any foreign material, such as oil, sand, water, wax, grease, etc., from concrete surfaces that will contact grout before forms are installed.
- 7. Forms shall be liquid tight. Seal any open spaces or cracks in forms, or at the joint between forms and the foundation using sealant, putty, or caulking compound.
- 8. Vertical and horizontal edges of the grout shall have 45-degree chamfers as specified in equipment pad details. The 45-degree perimeter chamfer strip shall be located at the final elevation of the grout.
- 9. Match chamfers in concrete portions of the equipment pad.
- 10. Install block outs at all leveling positions to allow removal of leveling equipment and leveling nuts to be backed off after the grout has cured.
- 11. Coat jackscrews with a light oil or other acceptable bond-breaking compound prior to grouting.
- 12. Final elevation of grout on fabricated steel frames shall be at the top of the lower flange of the perimeter I-beams or C-channel.
- 13. Top of grout elevation for baseplates and soleplates shall be at least 0.125 inch but not more than 0.5 inch above the bottom or underside of the perimeter edge of the baseplate or soleplate.
- 14. Seal equipment anchor sleeves to protect the sleeved length of the anchor from contact with grout.
- 15. Wrap exposed portions of equipment anchors with duct tape to protect them from grout splatter and to prevent bonding to grout.

APRIL 2022

RIGID EQUIPMENT MOUNTS

- 16. Adjust ambient temperature to maintain mounting plate, foundation, and grout temperatures to grout manufacturer's recommended temperature.
- 17. Mix grout for equipment mounting in accordance with the grout manufacturer's written recommendations.
- 18. Epoxy grout shall be placed in a manner that avoids air entrapment, using a head box to pour grout into the grout holes.
- 19. Place grout at one end of the baseplate or soleplate and work grout toward the opposite end to force the air out from beneath the baseplate or soleplate.
- 20. Pour grout through a head box into grout pouring holes.
- 21. When the head box is moved to the next grout hole, a 6 inch standpipe shall be placed over the grout hole and filled with grout.
- 22. Use of vibrating tools and/or jarring (rapping or tapping) forms to facilitate grout flow is not permitted during placement of epoxy grout.
- 23. Never allow the grout in the head box to fall below the top of the baseplate or soleplate once the grout has made contact with the baseplate or soleplate.
- 24. Grout placement shall be continuous until all portions of the space beneath the baseplate, soleplate, or fabricated steel frame have been filled.
- 25. Prepare subsequent batches of grout prior to depleting the preceding batch.
- 26. Maintain grout height in standpipes after the space under the baseplate, soleplate, or fabricated steel frame has been filled.
- 27. When the grout has started to take an initial set (typically this is determined by a noticeable increase in temperature and no flow of grout at the vent holes) the standpipes shall be removed and excess grout cleaned from all surfaces.
- 28. Check for leaks throughout grout pours. Leaks shall be repaired immediately to prevent formation of voids.
- 29. Check baseplate, soleplate, or fabricated steel frame level and elevation before the grout sets.
- 30. Cure grout in accordance with the grout manufacturer's written instructions.
- 31. Where specified in the individual equipment specifications, a grout sample shall be taken for each equipment pad.
 - a. Samples shall be placed in a cylinder of sufficient size to yield three 2-inch cubes as test samples.
 - b. Samples shall be tagged with project name, date, time, the equipment number, and ambient temperature at the time of placement.
 - c. Place samples next to the foundation of the equipment being grouted and cure for 48 hours.
 - d. Test grout samples in accordance with the grout manufacturer's recommendations.
 - e. Grout samples shall be tested by the independent testing laboratory specified in paragraph 1.02 Quality Control by Contractor.
 - f. Test results shall be reported directly to the Construction Manager.

D. Completion:

 Upon acceptance by the Construction Manager and the equipment manufacturer's representative and after the grout has reached sufficient strength, grout forms and block outs at leveling positions shall be removed. Leveling blocks and shims or

APRIL 2022 RIGID EQUIPMENT MOUNTS

ATTACHMENT E - TECHNICALS

- wedges and support plates shall be removed, and leveling nuts and jack screws shall be backed off to allow the grout to fully support the baseplate, mounting block, or soleplate. Take care not to damage the grout during removal of extended shimming material or leveling equipment and tools.
- 2. The equipment anchor nuts shall be tightened, using calibrated indicating torque wrenches, to develop the full bolt tension specified in paragraph 2.03 Equipment Anchor Tension.
- 3. Equipment anchor nuts shall be tightened in increments of not more than 25 percent of the final torque value in an alternating pattern to avoid stress concentration on the grout surface. After tightening equipment anchor nuts to final values, apply additional wax, grease, or mastic to all exposed portions of the equipment anchor beneath the baseplate, soleplate, or mounting block.
- 4. After applying additional wax or mastic to exposed portions of equipment anchors, block outs (pockets) for access to leveling nuts, leveling blocks and shims, or wedges shall be filled with the grout material installed under baseplates, soleplates, or fabricated steel frames and pointed after the equipment anchor nuts have been tightened to final values. Jackscrews shall be removed and holes in the baseplate, soleplate, or fabricated steel frames filled with a flexible sealant (silicone rubber) or a short cap screw.
- 5. Check for baseplate, soleplate, or fabricated steel frame movement (soft foot) by individually loosening and re-tightening each equipment anchor. movement at each equipment anchor shall be measured and recorded during loosening and retightening and shall not exceed 20 micrometers (0.001 inch). Vertical movement shall be measured using a magnetic-based dial indicator on the baseplate, soleplate, or fabricated steel frame referenced to the epoxy grout surface of the equipment pad or other approved method. Soft foot conditions shall be sufficient cause for removal and reinstallation of grout and baseplates, soleplates, or fabricated steel frames.
- 6. Check for grout voids by tapping along the upper surfaces of the baseplate, soleplate, or mounting block. Grout voids shall be sufficient cause for removal and reinstallation of grout and baseplates, soleplates, or fabricated steel frames. Grout voids shall be marked. At the discretion of the Construction Manager, grout voids may be repaired as specified in Chapter 5, Section 3.16 of API RP 686.

3.03 FINAL INSPECTION

A. The Construction Manager will conduct a final inspection with the Contractor for conformance to requirements of this section.

END OF SECTION

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS RIGID EQUIPMENT MOUNTS

SECTION 43 05 14 MACHINE ALIGNMENT

PART 1 GENERAL

1.01 DESCRIPTION

A. This section specifies requirements for alignment of directly coupled mechanical equipment weighing 1,000 pounds or more and/or greater than 100 horsepower furnished or modified under this contract. Equipment direct coupled to the motor with drivers 100 horsepower and less and belt or chain driven machinery are specifically exempted from the requirements of this section.

1.02 QUALITY ASSURANCE

- A. General: All equipment shall be aligned using laser alignment equipment to the tolerances specified by the subject equipment manufacturer or the criteria specified in this section, whichever is more stringent.
- B. Alignment Criteria: Unless otherwise specified by more stringent manufacturers' requirements, all mechanical equipment affected by this section shall be aligned to the following criteria:

Maximum Tol	Maximum Tolerable Misalignment							
Speed, rpm, maximum		rt Couplings ween flex planes ≤ 4")	Spacer Shafts (angle at each flex plane in mils/inch or projected offset in mils/inch of					
	Offset (mils)	Angularity (mils/inch)	spacer length)					
600 and less	5.0	1.0	1.8					
900	3.0	0.7	1.2					
1200	2.5	0.5	0.9					
1800	2.0	0.3	0.6					
3600	1.0	0.2	0.3					
7200	0.5	0.1	0.15					

Notes:

- 1 Soft foot (machine frame distortion) shall be not more than 2.0 mils for any speed.
- 2 Separately mounted equipment connected by offset universal joints are exempted from the offset and angularity requirements, but all units must be installed and leveled as specified in this section.
- C. Alignment Equipment: Alignment equipment used to perform the work required under this section shall employ laser alignment techniques to achieve the required tolerances. The equipment shall be computer based and its software shall be compatible with current Windows® based spreadsheets and databases. The equipment shall employ a hand-held field computer using a graphic interface to determine actual alignment and necessary corrective action to bring equipment into required tolerance. The link between field measurement components and the computer shall be through cable, infrared, or wireless transmission.

APRIL 2022

MACHINE ALIGNMENT

ATTACHMENT E - TECHNICALS

43 05 14 - 1

1.03 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 Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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
Shaft Alignment Handbook	Shaft Alignment Handbook, Third edition, John Piotrowski, Marcel
-	Dekker Inc.

PART 2 PRODUCTS

2.01 EQUIPMENT (NOT USED)

2.02 ITEMS TO BE FURNISHED TO OWNER

- A. The following shall be furnished to the Owner upon completion of all alignment work for the project or appropriate portion thereof and prior to substantial completion of the project or portion thereof:
 - 1. All alignment records, in both hard copy and in computer memory. The hard copy shall be signed and dated by the technician performing the alignment work and shall be witnessed by the Construction Manager.

PART 3 EXECUTION

3.01 GENERAL

A. After machine base grouting as specified under Section 43 05 13 RIGID EQUIPMENT MOUNTS, all machines mounted on baseplates or soleplates specified above shall be aligned as specified under this section.

APRIL 2022 ATTACHMENT E - TECHNICALS MACHINE ALIGNMENT

43 05 14 - 2

626 I Page

B. Alignment work shall be performed by journeyman millwrights skilled in this type of work under the supervision of a technician trained in the use of the laser alignment by the manufacturer or vendor of the alignment equipment. The use of untrained laborers, carpenters or apprentices for this work will not be acceptable.

3.02 PROCEDURE

A. Sequence: Machines supported on integral feet or support pads shall be leveled, grouted and aligned in the following order: driven machine; intermediate bearings or machines; and driver. Under certain circumstances, such as a diesel engine driving a generator, it may be preferable to reverse this order and set the driver first. The Contractor shall submit a written request for a reversal of the alignment order to the Construction Manager and the Construction Manager must approve any change in alignment order in writing before it will be allowed.

B. Alignment:

- 1. All machines shall be rough aligned without any connections to piping, electrical and instrumentation systems. Upon completion of all field connections, alignment shall be rechecked to demonstrate no change. If change has occurred, the Contractor shall eliminate any external forces affecting machine alignment.
- 2. Next, soft foot (machine frame distortion) shall be measured and brought to within the permissible tolerances (see paragraph 1.02 Alignment Criteria). Thereafter, the alignment shall be rechecked and the alignment process repeated if necessary to bring all machinery to final alignment tolerances.

3.03 VERIFICATION

- A. Factory Personnel: Where required by other sections in this project manual, factory authorized installation technicians representing the equipment manufacturer shall witness final alignment work. After completion of all alignment work, acceptance of the work shall be documented in writing by factory installation technicians.
- B. Verification: All alignment work shall be independently checked using the shaft and coupling spool method described in the Shaft Alignment Handbook. All final results of the alignment work shall be subject to inspection and verification by the Construction Manager.

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS MACHINE ALIGNMENT

43 05 14 - 3

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS MACHINE ALIGNMENT 43 05 14 - 4

SECTION 43 05 21 COMMON MOTOR REQUIREMENTS FOR EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

- 1. Squirrel cage type, AC induction motors, up to 500 HP, for up to 4 poles (3,600 or 1,800 rpm nominal), or up to 250 HP for over 6 poles (1,200 rpm or slower) shall be per NEMA MG1, Small or Medium.
- 2. Special purpose motors with features or ratings which are not specified herein, are specified in the particular equipment specifications.

1.02 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.

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- Premium-Efficiency, 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
Department of Energy	Energy Policy and Conservation Act, Final Rules EERE-2010-BT-STD-0027-0117
UL 1004	Electric Motors

1.03 DEFINITIONS

A. Terminology used in this Section conforms with NEMA MG-1. Motors covered in this specification are those defined in NEMA MG1 as Small (Fractional) and Medium (Integral) AC induction motors.

COMMON MOTOR REQUIREMENTS FOR EQUIPMENT

ATTACHMENT E - TECHNICALS

43 05 21 - 1

APRIL 2022

1.04 ADMINISTRATIVE REQUIREMENTS

A. Unit Responsibility: Where Unit Responsibility is specified in the driven equipment sections of these specifications, the motor supplier shall coordinate with the provider of the driven equipment to verify that the motor provided under this section is fully compatible with and meets the specified performance requirements for that equipment.

1.05 SUBMITTALS

A. Action Submittals:

- 1. Procedures: Section 01 33 00 SUBMITTAL PROCEDURES.
 - a. Copy of this Section, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements.
 - b. Check-marks (✓) to denote full compliance with a paragraph as a whole. Underline deviations and denote by a number in the margin to the right of the identified paragraph. The remaining portions of the paragraph not underlined will signify compliance. Include a detailed, written justification for each deviation.
 - c. Failure to include a copy of the marked-up specification sections with justification(s) for any requested deviation will cause rejection of the entire submittal with no further consideration.
- 2. Motor Data Sheets specified in this Section and Division 01.
 - a. Motors in conformance with IEEE 841: Manufacturers to complete IEEE Standard 841 Data Sheet for AC Induction Motors.
 - b. Motors not in conformance with IEEE 841: Motor supplier to complete Form 43 05 21-A contained in Section 01 99 90 REFERENCE FORMS with required factory data.
 - c. Motor Speed-Torque curve, where specified.
- 3. Routine Factory test data for polyphase motors.
 - a. High-potential test.
- 4. Factory test data, from required dynamometer tests, where specified.
- 5. Vibration level when measured in accordance with NEMA MG 1, for all IEEE 841 motors, and where elsewhere specified.
- 6. Motor heating curve, where specified,
- 7. Motor mounting, outline, dimensions, and weight.
- 8. Motor bearing and winding RTDs (resistance temperature detector), where specified.
- 9. Motor winding thermostat or thermistor, where specified.
- 10. Motor winding space heaters, where specified.
- 11. Motor nameplate data.
- B. Informational Submittals:

COMMON MOTOR REQUIREMENTS FOR EQUIPMENT

APRIL 2022

ATTACHMENT E - TECHNICALS

- 1. Procedures: Sections 01 33 00 SUBMITTAL PROCEDURES and 01 78 23 OPERATION AND MAINTENANCE DATA.
- 2. Submittal requirements for operation and maintenance manuals as per requirements of Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.06 QUALITY ASSURANCE

- A. Factory Testing: All polyphase motors shall be factory tested in conformance with routine tests per NEMA MG1 and IEEE 112. Provide the following tests:
 - 1. Measurement of winding resistance.
 - 2. No-load readings of current and speed at normal voltage and frequency.
 - 3. Current input at rated frequency with rotor at standstill.
 - 4. High potential test.
- B. Where specified for use in corrosive or hazardous locations, motor testing shall additionally be per IEEE 841. Test report shall be certified by the motor manufacturer's test personnel and submitted to the Engineer.
 - 1. For motors larger than 100 horsepower, test and submit results for the following:
 - a. Routine tests per NEMA MG1 and IEEE 112. Provide tests as noted in paragraph 1.07 Factory Testing. Test report shall be certified by the motor manufacturer's test personnel and submitted to the Engineer.
 - b. For motors larger than 200 horsepower, efficiency and power factor by Test Method B, IEEE 112. Submit Form B and B-2.

1.07 DELIVERY, STORAGE AND HANDLING

A. Procedures shall be in accordance with Section 01 61 00 COMMON PRODUCT REQUIREMENTS.

1.08 SPECIAL WARRANTY

- A. Provide warranty in accordance with Section 01 77 00 CLOSEOUT PROCEDURES.
- B. Submit warranties in writing to include 100 percent full payment coverage for parts and labor for repair or replacement of the motor (s) during the warranty period.

PART 2 PRODUCTS

2.01 PERFORMANCE/DESIGN CRITERIA

- A. Service Conditions:
 - 1. Ambient Temperature: -25-degree C to +40 degree C.
 - 2. Altitude: 0 to 500 feet above sea level minimum.

COMMON MOTOR REQUIREMENTS FOR EQUIPMENT

APRIL 2022

ATTACHMENT E - TECHNICALS

- 3. Derate motors for higher ambient temperature and for higher altitude with motor size based on brake-horsepower.
- B. Design Requirements:
 - 1. Operation: Continuous.
 - 2. Compliance: Energy Policy Act of 1992 (EPAct), Final Rule 2014.
 - 3. Tolerance: +/- 10-percent of rated voltage at rated frequency; +/- 5-percent of rated frequency at rated voltage.
 - 4. Standard design: NEMA Design B.
- C. Service Factor (percent of additional horsepower):
 - 1. 1.15 for Sine-wave motors.
 - 2. Dual rating: 1.15 Sine-wave and 1.0 Inverter Duty for Inverter Duty motors.
- D. Motor Efficiency: NEMA Premium™ efficiency electric motor, single-speed, polyphase, 1-500 horsepower, 3600-rpm 2-pole, 1800-rpm 4-pole, and 1200-rpm 6-pole (1-250 HP), squirrel cage induction motors, NEMA Design B, continuous rated. NEMA Standards Publication MG 1 2011, in Table 12-12.

Table 12-12
Full-Load Efficiencies for 60 HZ Premium Efficiency Electric Motors
Rated 600 Volts or Less (Random Wound)

			0	pen Motors				
	2 Pole		4 Pole		6 Pole		8 Pole	
НР	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency
1	77.0	74.0	85.5	82.5	82.5	80.0	75.5	72.0
1.5	84	81.5	86.5	84.0	86.5	84.0	77.0	74.0
2	85.5	82.5	86.5	84.0	87.5	85.5	86.5	84.0
3	85.5	82.5	89.5	87.5	88.5	86.5	87.5	85.5
5	86.5	84.0	89.5	87.5	89.5	87.5	88.5	86.5
7.5	88.5	86.5	91.0	89.5	90.2	88.5	89.5	87.5
10	89.5	87.5	91.7	90.2	91.7	90.2	90.2	88.5
15	90.2	88.5	93.0	91.7	91.7	90.2	90.2	88.5
20	91.0	89.5	93.0	91.7	92.4	91.0	91.0	89.5
25	91.7	90.2	93.6	92.4	93.0	91.7	91.0	89.5
30	91.7	90.2	94.1	93.0	93.6	92.4	91.7	90.2
40	92.4	91.0	94.1	93.0	94.1	93.0	91.7	90.2
50	93.0	91.7	91.5	93.6	94.1	93.0	92.4	91.0
60	93.6	92.5	95.0	94.1	94.5	93.6	93.0	91.7
75	93.6	92.4	95.0	94.1	94.5	93.6	94.1	93.0
100	93.6	92.4	95.4	94.5	95.0	94.1	94.1	93.0

COMMON MOTOR REQUIREMENTS FOR EQUIPMENT

APRIL 2022

ATTACHMENT E - TECHNICALS

Table 12-12
Full-Load Efficiencies for 60 HZ Premium Efficiency Electric Motors
Rated 600 Volts or Less (Random Wound)

	Open Motors							
	2 Pole		4 Pole		6 Pole		8 Pole	
HP	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency
125	94.1	93.0	95.4	94.5	95.0	94.1	94.1	93.0
150	94.1	93.0	95.8	95.0	95.4	94.5	94.1	93.0
200	95.0	94.1	95.8	95.0	95.4	94.5	94.1	93.0
250	95.0	94.1	95.8	95.0	95.8	95.0	95.0	94.1
300	95.4	94.5	95.8	95.0				
350	95.4	94.5	95.8	95.0				
400	95.8	95.0	95.8	95.0				
450	96.2	95.4	96.2	95.4				
500	96.2	95.4	96.2	95.4				
1	77.0	74.0	85.5	82.5	82.5	80.0	75.5	72.0
1.5	84.0	81.5	86.5	84.0	87.5	85.5	78.5	75.5
2	85.5	82.5	86.5	84.0	88.5	86.5	84.0	81.5
3	86.5	84.0	89.5	87.5	89.5	87.5	85.5	82.5
5	88.5	86.5	89.5	87.5	89.5	87.5	86.5	84.0
7.5	89.5	87.5	91.7	90.2	91.0	89.5	86.5	84.0
10	90.2	88.5	91.7	90.2	91.0	89.5	89.5	87.5
15	91.0	89.5	92.4	91.0	91.7	90.2	89.5	87.5
20	91.0	89.5	93.0	91.7	91.7	90.2	90.2	88.5
25	91.7	90.2	93.6	92.4	93.0	91.7	90.2	88.5
30	91.7	90.2	93.6	92.4	93.0	91.7	91.7	90.2
40	92.5	91.0	94.2	93.0	94.1	93.0	91.7	90.2
50	93.0	91.7	94.5	93.6	94.1	93.0	92.4	91.0
60	93.6	92.5	95.0	94.1	94.5	93.6	92.4	91.0
75	93.6	92.4	95.4	94.5	94.5	93.6	93.6	92.4
100	94.1	93.0	95.4	94.5	95.0	94.1	93.6	92.4
125	95.0	94.1	95.4	94.5	95.0	94.1	94.1	93.0
150	95.0	94.1	95.8	95.0	95.8	95.0	94.1	93.0
200	95.4	94.5	96.2	95.4	95.8	95.0	94.5	93.6
250	95.8	95.0	96.2	95.4	95.8	95.0	95.0	94.1
300	95.8	95.0	96.2	95.4				
350	95.8	95.0	96.2	95.4				

APRIL 2022 ATTACHMENT E - TECHNICALS COMMON MOTOR REQUIREMENTS FOR EQUIPMENT

Table 12-12
Full-Load Efficiencies for 60 HZ Premium Efficiency Electric Motors
Rated 600 Volts or Less (Random Wound)

	Open Motors									
2 Pole			4 Pole	4 Pole		6 Pole				
HP	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency		
400	95.8	95.0	96.2	95.4						
450	95.8	95.0	96.2	95.4						
500	95.8	95.0	96.2	95.4						

2.02 MATERIALS

A. Motor Frames:

- 1. TEFC motors shall be cast iron.
- 2. Aluminum frame motors are not permitted.

B. Stator Windings:

- 1. Shall be copper with Class F minimum insulation not to exceed Class B temperature rise of 80-degree C at rated load and with Design B torque /current characteristics for all Medium (Integral) motors.
- 2. Small (fractional) motors shall be supplied with Class F insulation where available.
- C. Rotor material shall be aluminum or copper.
- D. Fans shall be non-sparking fan blades.
- E. Motor leads shall be non-hygroscopic.

2.03 MOTOR TYPES

- A. General Requirements for motors 1/2 horsepower through 500 horsepower:
 - 1. Three phase, squirrel cage, with copper windings.
 - 2. Rated for full voltage starting and continuous duty.
 - 3. Rating shall be:
 - a. 460 Volts, three-phase, 60-Hertz, as shown on the contract drawings.
 - 4. General Purpose Type motors, which may also be called Type 1 per the project equipment specifications shall be:
 - a. Open Drip Proof Motors, shall be as defined per NEMA MG1, self-cooled by convection air.
 - b. Weather-Protected Type I Motors (WP-I), shall be as defined per NEMA MG1, similar to ODP construction with addition of screens to prevent entry

COMMON MOTOR REQUIREMENTS FOR EQUIPMENT

APRIL 2022

ATTACHMENT E - TECHNICALS

- of rain, snow, and particles, or objects into the motor. Suitable for clean indoor and protected outdoor installations.
- c. Weather Protected Type II Motors (WP-II) shall be as defined per NEMA MG1, with maximum protection from entry of airborne particles, moisture and high velocity air. Suitable for unprotected outdoor installations.
- 5. Severe Duty Type Motors, which may also be called Type 2 per the project equipment specifications, shall be in accordance with IEEE 841.
 - Totally Enclosed Fan-Cooled Motors (TEFC) shall be defined per NEMA MG1.
 - b. Enclosure: totally enclosed, fan cooled, with external fan blowing air to the motor frame cooling fins for cooling.
 - c. Applications: severe duty and most outdoor installations.

B. Motors Less Than 1/2 Horsepower:

- 1. Type shall be:
 - a. Squirrel cage, capacitor start with Class F insulation and copper windings.
 - b. Fan motors rated 1/8 horsepower or less: split-phase or shaded-pole type.
- 2. Rating shall be:
 - a. 115Volts, single phase, 60 Hz.
 - b. 208 Volts, single phase, 60 Hz.
 - c. 230 Volts, single phase, 60 Hz.

2.04 COMPONENTS

- A. Inverter-Fed Polyphase Motors per NEMA MG1 Part 31:
 - 1. Applications: variable torque or constant torque loads, for vertical or horizontal motors with variable frequency drive controllers (VFD).
 - 2. Features shall include:
 - a. Insulation design to meet 2000-Volt peak at a minimum of 0.1 micro-second rise time.
 - b. Built-in motor winding protection as specified.
 - c. Electrically insulated bearings or,
 - d. Provide Electro Static Technology's AEGIS Shaft Grounding Ring for Bearing Protection or equal. The shaft grounding ring shall be solidly bonded per manufacturer's recommendations.

B. Thermal Protection:

- 1. Inverter duty motors:
 - a. Motors up to 50 horsepower:
 - b. Protection to be NEMA Type 2 bi-metallic thermal switch (Klixon) type.
 - c. Motor Nameplate: Marked "OVER TEMP PROT 2" in accordance with NEMA MG 1 12.43.
- 2. Motors larger than 50 horsepower up to and including 250 horsepower:

COMMON MOTOR REQUIREMENTS FOR EQUIPMENT

APRIL 2022

ATTACHMENT E - TECHNICALS

- a. Unless another form of thermal protection is specified in the driven equipment specification, provide a NEMA Type 1 temperature sensing device embedded in the motor winding which is sensitive to motor running over temperature.
- b. Sensor: Wired to a temperature relay in a NEMA 4 box located near or on the motor, or to the variable frequency drive controller.
- c. Motor Nameplate: Marked "OVER TEMP PROT 1" in accordance with NEMA MG 1 12.43.

C. Motor Nameplates:

- 1. Materials: Engraved or stamped stainless steel.
- Features shall be as follows:
 - a. NEMA Standard MG 1 motor data.
 - b. Permanently fastened to the motor frame.
 - c. ABMA bearing identification number for motors meeting IEEE 841.
 - d. NEMA nominal efficiency for all motors.
 - e. NEMA nominal and minimum efficiency for motors meeting IEEE 841.
 - f. UL frame temperature limit code for explosion proof motors.
 - g. Space heater data.
 - h. Over Temperature Protection Type Number.
 - i. Temperature device rating and alarm and shutdown setpoint.
 - j. Provide motor nameplates for motors with space heaters located in Class I, Division 2, Groups C, and D areas in accordance with NEC 501.125(B).

D. Conduit Boxes:

- 1. Provide oversized boxes, with split construction with threaded hubs and petroleum-resistant gaskets.
- 2. Conduit boxes can be rotated in order to permit installation in any of four positions 90 degrees apart.
- 3. Provide grounding lug located within the conduit box for ground connection.
- 4. Provide separate conduit boxes for temperature devices and space heaters.
- 5. Separate terminal box for any signal leads (RTD, thermistor, vibration transmitter, etc.).

E. Bearings:

- 1. Provide oil or grease lubricated ball bearings, angle contact roller bearings for axial thrust loads, and cylindrical bearings for radial-only loads.
- 2. Rated for a minimum L-10 life of 50,000 hours for direct-connected loads.
- 3. Cartridge type bearings will not be accepted.
- 4. Fitted with lubricant fill and drain or relief fittings.
- 5. Belt loads not to exceed forces calculated from NEMA MG 1 Table 14-1 and 14-1A.

COMMON MOTOR REQUIREMENTS FOR EQUIPMENT

APRIL 2022

ATTACHMENT E - TECHNICALS

- F. Bearing lubrication shall be either grease or oil as per the requirements in either 1 or 2:
 - 1. Grease lubricated bearings:
 - a. Shall be for electric motor use only.
 - b. Grease shall be capable of higher temperatures associated with electric motors and shall be compatible with Polyurea-based greases.
 - c. Provide grease fittings, similar to Alemite™ type (or equivalent).
 - d. Shielded bearings with regreasable provisions are permissible.
 - 2. Provide oil lubricated bearings with externally visible sight glass to view oil level.

G. Lifting Eyes:

- 1. Provide lifting eyes with a safety factor of 5.
- 2. Provide one lifting eye for motors more than 50 pounds.
- 3. Provide two lifting eyes for motors over 150 pounds.

2.05 FINISHES

- A. Paint Finish:
 - 1. Provide standard manufacturer paint finish.
 - 2. Provide motors with semi-gloss finish, scratch and heat resistance electric motor paint.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Delivery Inspection:
 - 1. Inspect driven equipment-motor assembly and components immediately upon delivery and unloading at the job site for damages.
 - 2. Take photos of damage(s) if any, to substantiate the delivery inspection report.

3.02 INSTALLATION

- A. Grounding of Motors: Connect the motor feeder cable (green) to the grounding lug terminal in the conduit terminal box.
- B. Supplemental Grounding of Motors: Provide for motors fed from VFDs, all motors above 100 horsepower, and all motors in classified areas, where feasible.
 - 1. Bond the motor frame to the grounding grid/electrode system to provide supplemental grounding.
- C. Field Coating of Motors: Refer to the driven equipment specification section for coating requirements.

COMMON MOTOR REQUIREMENTS FOR EQUIPMENT

APRIL 2022

ATTACHMENT E - TECHNICALS

3.03 FIELD QUALITY CONTROL

A. Field Testing:

- 1. Measure winding insulation resistance of motors to no less than 10-megohm with a 1000-Vac megohmmeter.
- 2. Perform motor phases current imbalance testing for motors 20 horsepower and larger.
- 3. Test motors for proper rotation prior to connection to the driven equipment.
- 4. Perform thermographic survey per NETA ATS, for motors over 100 horsepower.

B. Field Inspection:

- 1. Compare equipment nameplate data with drawings and specifications.
- 2. Inspect physical and mechanical condition.
- 3. Inspect anchorage, alignment, and grounding.
- 4. Verify the installation of breather/drain fittings as specified herein.
- 5. Check for proper connections of space heaters, winding and RTDs and or thermostats.
- 6. Visually check for correct phase and ground connections.

3.04 SYSTEM STARTUP

- A. Commissioning Test: Provide where specified or shown on the drawings.
 - 1. Provide assistance during the commissioning test of the motor driven equipment.

3.05 CLOSEOUT ACTIVITIES

A. Operation and Maintenance: Provide the operation and maintenance manual of the motor(s). Include testing result information in the O&M manual.

END OF SECTION

COMMON MOTOR REQUIREMENTS FOR EQUIPMENT

SECTION 43 23 03

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

- 1. This section, when referenced in the detailed specification section, provides minimum requirements applicable to centrifugal pumping equipment furnished under this contract. More restrictive requirements, where found in individual pump specifications, supersede requirements of this section.
- 2. "Detailed pump specification," "detailed specification," "individual pump specification," "referencing section," or words of similar import in this section, mean the specification section where the requirements for specific pump performance are presented. "Pumping unit," whenever and wherever used, means the complete pumping assembly, including driver (whether engine, turbine, or motor) and includes accessories such as variable-speed drives required for motor operation, gear reducers, intermediate shafting and bearings, flywheels, and supports for equipment furnished with the pump.
- 3. For a subset of pumps, a number of provisions of this section are required. These requirements (refer to paragraphs 1.05 and 1.07 in this section) are in addition to requirements applicable to pumps. The subset of pumps is defined as pumping equipment meeting any of the following criteria:
 - a. All pumping unit specifications where the words "custom-engineered" appear in the title of the specification section
 - b. Where a particular Section 43 23 03 provision is cited in the detailed section
- B. Definitions: The following definitions apply for classifying pumps specified in this and referencing sections:
 - 1. General: Terminology and definitions in this section follow those established in American National Standards Institute (ANSI)/Hydraulic Institute (HI) 9.1 through 9.5, unless otherwise noted.
 - Solids Bearing Liquids: Liquids to be pumped containing, or assumed to contain, solids that require appropriate pump design considerations and/or materials of construction. Solids-bearing liquids are liquids with settleable solids exceeding 50 milligrams per liter (mg/L) and include wastewater, stormwater, primary effluent, return sludge, return activated sludge (RAS), trickling filter circulation, and similar services.
 - 3. Clear Liquids: Liquids to be pumped mostly free of deleterious solids. Potable water, heat reservoir, raw water, secondary effluent pumping, and similar services are clear liquids.
 - 4. Efficiency: For the purposes of this section and sections referencing this section, efficiency, as related to pumps, is the ratio of the pump output power (water horsepower [hp]) divided by the pump input power (brake horsepower) required to deliver the total head, with meanings as defined in ANSI/HI 1.2.3.8

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

- and ANSI/HI 2.2.3.8. For column-type pumps, efficiency is computed inclusive of inlet, bowl, column, and discharge head losses.
- 5. Net Positive Suction Head, 3-Percent Reduction (NPSH3): For the purposes of this section and sections referencing this section, NPSH3 means the value of net positive suction head (NPSH) resulting in a reduction of 3 percent in the developed pump discharge head when the pump is tested in accordance with procedures established by ANSI/HI. NPSH3 is the successor designation to net positive suction head required (NPSHR). Where NPSHR is used in the contract documents it means NPSH3.
- 6. NPSH Margin: For the purposes of this section and sections referencing this section, "NPSH margin," wherever used, means net positive suction head available (NPSHA) divided by the candidate pump's NPSH3 for the specific operating condition in question.
- 7. POR: Preferred operating region as defined in ANSI/HI 9.6.3.
- 8. AOR: Allowable operating region as defined in ANSI/HI 9.6.3.

1.02 TYPE

A. Provisions and requirements contained in this section apply specifically to centrifugal pumps, both vertical and horizontal, commonly falling into the generic types covered by ANSI/HI 1.1 through 1.4, and 2.1 through 2.4. This section does not apply, except by specific reference, to positive-displacement pumps of any type.

1.03 REFERENCES

- A. This section contains references to the following documents. They are a part of this section and any referencing 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. The following order of precedence prevails in the event of conflict between the requirements of this section or any referencing section and those of the listed documents (in the order of primacy):
 - 1. The referencing section
 - 2. This section
 - 3. The referenced document
- B. Unless otherwise specified, references to documents mean the documents in effect at the time of advertisement for bids or invitation to bid (or on the effective date of the agreement if there were no bids). References to documents mean the replacement documents issued or otherwise identified by the organization if referenced documents have been discontinued, 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 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.

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

Reference	Title
ABMA 9	Load Ratings and Fatigue Life for Ball Bearings
ABMA 11	Load Ratings and Fatigue Life for Roller Bearings
AISC	American Institute of Steel Construction—Manual of Practice
ANSI/API 610	Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries (also referenced as ISO 13709-2009)
ASME B46.1	Surface Texture, Surface Roughness, Waviness and Lay
ANSI/HI 1.1-1.6	Rotodynamic (Centrifugal) Pumps
ANSI/HI 2.1-2.4	Rotodynamic (Vertical) Pumps
ANSI/HI 9.1-9.5	Pumps – General Guidelines for Types, Applications, Definitions, Sound Measurements and Documentation
ANSI/HI 9.6.1	Rotodynamic Pumps—Guideline for NPSH Margin
ANSI/HI 9.6.2	Centrifugal and Vertical Pumps for Allowable Nozzle Loads
ANSI/HI 9.6.3	Rotodynamic Pumps (Centrifugal and Vertical) Guideline for Allowable Operating Region
ANSI/HI 9.6.4	Rotodynamic Pumps—Vibration Measurements and Allowable Values
ANSI/HI 9.6.6	Rotodynamic Pumps for Pump Piping
ANSI/HI 9.6.8	Rotodynamic Pumps—Guideline for Dynamics of Pumping Machinery
ANSI/HI 9.8	Pump Intake Design
ANSI/HI 11.6	Submersible Pump Tests
ANSI/HI 14.6	Rotodynamic Pumps for Hydraulic Performance Acceptance Tests
API 686/PIP REIE 686	Recommended Practices for Machinery Installation and Installation Design
ASME B18.8.2	Taper Pins, Dowel Pins, Straight Pins, Grooved Pins, and Spring Pins (Inch Series)
ASME Code	ASME Boiler and Pressure Vessel Code
ASTM A27	Steel Castings, Carbon, for General Application
ASTM A36	Carbon Structural Steel
ASTM A148	Steel Castings, High Strength, for Structural Purposes
ASTM A322	Steel Bars, Alloy, Standard Grades
ASTM A564	Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes
ASTM A571	Austenitic Ductile Iron Castings for Pressure-Containing Parts Suitable for Low-Temperature Service
ASTM A995	Standard Specification for Castings, Austenitic-Ferritic (Duplex) Stainless Steel, for Pressure-Containing Parts, Grades 2A, 3A, or 6A
ASTM B148	Aluminum-Bronze Sand Castings
AWWA C213	Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
AWWA C550	Protective Epoxy Coatings for Valves and Hydrants

APRIL 2022 ATTACHMENT E - TECHNICALS GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

Reference	Title
NSF/ANSI 61	Drinking Water System Components – Health Effects
IEC 61298-2	Process Measurement and Control Devices. General Methods and Procedures for Evaluating Performance Tests Under Reference Conditions
ISO 1940-1:2003	Mechanical Vibration—Balance quality requirements for rotors in a constant (rigid) state—Part 1: Specification and verification of balance tolerances
ISO 9001	Quality Management Systems—Requirements, 3rd Edition (2000)
ISO 10816-1	Mechanical Vibration—Evaluation of Machine Vibration by Measurement on Non-rotating Parts—Part 1: General Guidelines, Annex B, Table B.1. Class I, II or II, as applicable. For the purposes of this specification, Annex B of ISO 10816, Part 1 forms a part of this specification and ISO 10816, Part 1.
ISO 10816-3	Mechanical Vibration—Evaluation of Machine Vibration by Measurement on Non-rotating Parts—Part 3: Industrial machines with nominal power above 15 kW and nominal speeds between 120 r/min and 15000 r/min when measured in situ, Annex A, Table A.1 and A.2. For the purposes of this specification, Annex A of ISO 10816, Part 3 forms a part of this specification and ISO 10816, Part 3.
ISO 10816-6	Mechanical Vibration—Evaluation of Machine Vibration by Measurement on Non-rotating Parts—Part 6: Reciprocating machines with power ratings above 100 kW, Annex A, Table A.1, machine vibration classification number 3. For the purposes of this specification Annex A of ISO 10816, Part 6 forms a part of this specification and ISO 10816, Part 6.
ISO 10816-7	Mechanical Vibration—Evaluation of Machine Vibration by Measurement on Non-rotating Parts—Part 7: Rotordynamic Pumps for Industrial Applications, Including Measurements on Rotating Shafts, Annex A, Tables A-1 and A-2 Category II as applicable. For the purposes of this specification, Annex A of ISO 10816, Part 7 forms a part of this specification and ISO 10816, Part 7.
MIL STD 167-2	Mechanical Vibrations of Shipboard Equipment (Reciprocating Machinery and Propulsion System and Shafting)

1.04 DESIGN REQUIREMENTS, ALL PUMPS

A. General:

1. Conform equipment furnished under sections referencing this section to the objective of paragraph 6.1.1, ANSI/API 610, and ensure that the equipment and "auxiliaries" are designed for at least a 20-year service life and 3 years of "uninterrupted operation." Select all components associated with the rotating elements in the drive train, including equipment supports and supports for rotating elements, that are designed to function without damage or disassembly at reverse rotational speeds up to 130 percent of maximum operational speed during flow reversals through the pump. Ensure that the

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

- complete pumping unit operates without overload on any component at any point along the pump's entire full-speed operating curve. Furnish pumps required by virtue of the specified operating conditions to operate against a closed valve or throttled for any period of time exceeding 5 seconds with drivers sized to operate continuously at the power requirement for that condition even though the power requirements at the rated condition may be less.
- 2. With the exception of submersible pumps and the inlet connection for pumps designed to operate in open forebays or wetwells, ensure that pump connection nozzles are designed for the loads and moments stipulated in ANSI/HI 9.6.2. Where ANSI/HI 9.6.2 does not cover a specific pump type or category, or where that document is silent on allowable nozzle loads or a particular type of nozzle load (e.g., thermal pipe strain), have the Contractor furnish documentation from the manufacturer attesting to the limitations on loads and moment forces that can be tolerated on each connection and recommended connection details to be used.

B. Pump Selection:

- 1. Proven Designs:
 - a. Ensure that pumps furnished under sections referencing this section are proven designs that have been in similar conditions of service with no objectionable performance characteristics for a period of not less than 5 years. Have the Contractor furnish a detailed list of installations with contact information supporting qualification under this requirement with the information required under paragraph 1.08. To satisfy this requirement, ensure that the listed pump is of the same size volute or bowl, discharge case and nozzle size, and impeller design (including number of vanes) and is operating under similar conditions of pumped fluid, head, capacity, speed, rotation, and NPSHA.
 - b. The Contractor may propose alternative equipment that cannot meet the requirement for a proven design under this paragraph, subject to additional documentation requirements and under the following conditions:
 - The proposed design has been in successful operation under similar conditions of volute or bowl, discharge case and nozzle size, impeller design (including number of vanes), pumped fluid, head, capacity, rotation, and NPSHA, but at a higher speed for a period of not less than 3 years.
 - 2) The proposed design has been in operation in designs where both larger and smaller nozzle size pumps have been in service for a period of not less than 5 years, and impeller design (including number of vanes, plus or minus one vane in pumps with four or more vanes), pumped fluid, head, capacity, speed, and NPSHA are similar to that for the proposed installation and within one synchronous speed higher or lower than that indicated in the detailed specification.
 - 3) In addition to the installation list required under this paragraph, provide dimensional drawings, bill of materials, and historical (certified) shop test results for candidate pumps documenting performance including, but not limited to head, capacity, speed, and NPSHR, and limit of stable

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

- hydraulic operation based on the onset of suction recirculation, if available. Results should match or bracket the specified performance and two or more candidate pump results may be required.
- c. If the proposed pump is not a proven design under either of the above paragraphs, have the Contractor demonstrate, by operation of a test pump in a fully equipped hydraulic test facility, that the proposed pump in the size and at the speed proposed with the proposed impeller design will have acceptable operating characteristics under the conditions specified for the proposed installation. Set up the test pump and perform a witnessed demonstration prior to designing, fabrication, and testing of any of the equipment proposed for the specific installation.
- 2. General Performance Criteria: Ensure that pumps furnished under this section and any referencing section operate without loss of head due to cavitation or vibration over the entire specified range of flow and head conditions and are specifically selected for NPSH margin requirements detailed in paragraph 1.04 NPSH margin limitations. Pump selections that do not provide the specified margin will be rejected.
- 3. General Design Criteria:
 - a. Select pumps furnished under sections referencing this section that are designed in accordance with applicable portions of ANSI/HI 1.1–1.4, 2.1–2.4, 9.6.2, 9.6.3, 9.6.4, 9.6.6, and 9.6.8 and the requirements of this section. Select pumps that are specifically designed to pump the fluid described in the detailed specification and to operate without clogging or fouling caused by material in the pumped fluid at any operating condition within the range of service specified. Clogging or fouling conditions may be of any cause, demonstrated by a 5 percent or greater capacity drift within 2 hours of sustained operation.
 - b. Unless otherwise noted or specified, slope pump head capacity curves in one continuous curve within the specified operating conditions. Do not permit points of reverse slope inflection capable of causing unstable operation within the specified zone of continuous-duty operation. Pumps with head/capacity curves with a reverse inflection are specifically prohibited if these characteristics will cause unstable operation within the specified range of operating conditions and where startup/shutdown conditions entail operation against a slow opening/closing valve.
 - c. Ensure that column-type (vertical-turbine, vertical-column solids-handling, and mixed-flow) pumps have bells selected to provide intake velocity of not less than 3.5 feet per second (ft/s) or more than 4.0 ft/s when operating at the maximum specified flow or the flow resulting from the lowest specified operating head at maximum speed, whichever is greatest ("peak flow"). Select pump discharge column sizes to limit the calculated average velocity at peak flow to no more than 12 ft/s.
 - d. Ensure that pumps specified to operate at constant-speed function without loss of head or capacity due to cavitation or excessive vibration over the entire specified range of flow and head conditions defined by the region bounded by Condition Points A, B, and C and any other continuous-duty operating condition specified in the detailed specification referencing this

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

- section, and select pumps to place Condition Point C in the detailed specification within the POR, or a modified POR if stipulated in the detailed pump specification.
- e. Ensure that pumps specified to operate at variable-speed function without loss of head or capacity due to cavitation or excessive vibration over the entire specified range of flow and head conditions defined by the region bounded by Condition Points A, B, and C and any other continuous-duty operating condition specified in the detailed specification referencing this section. Ensure that unless otherwise specified in the section referencing this section, acceptance criteria include the following:
 - Ensure that Operating Condition Point C and any other continuous-duty operating point specifically required in the detailed specification reside within the region defined by the POR, or in a modified POR if stipulated in the detailed pump specification.
 - 2) Unless otherwise noted in the detailed specification referencing this section, Operating Condition Point A may reside in the area outside the POR; Condition Point C will be located within the POR, or in a modified POR if stipulated in the detailed pump specification; and Condition B will preferably be located within the POR, or within 5 BEPQ percentage points (in terms of flow) outside the POR so long as Condition Point C resides in the POR or the stipulated modified range.

4. POR:

- a. Unless otherwise specified, the POR for a given pump is as defined in ANSI/HI 9.6.3.
- b. The detailed specifications may stipulate a narrower POR than indicated in ANSI/HI 9.6.3.
- c. Do not let suction-specific speed (Nss) exceed 8,500, unless otherwise indicated in the detailed specifications.
- d. For high-Nss pumps (greater than 8,500) and other conditions as determined by the Engineer, a narrower stable operating region may be defined in the detailed specifications and then identified in ANSI/HI 9.6.3 for the POR. The detailed specifications take precedence over this section.
- e. The detailed specification sections identify the duty points that must be within a pump's POR and those that may be within the AOR and take precedence over this section.

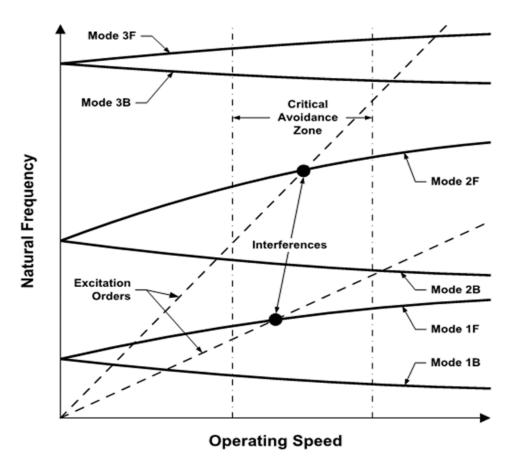
C. Critical Speeds and Natural Frequencies:

1. General: The criteria of this paragraph applies to pumps, provided that the foundation and support details provided at the time of pump design are accurate. Repair or replace pumps exhibiting adverse behavior after installation from resonance, vibration, or fatigue at no cost to the City. The criteria apply to the equipment in "like-new" condition as well as the "as-worn" condition (i.e., when parts, individually and as a composite, reach the manufacturers' maximum tolerances). Critical speed and natural frequency data submittal requirements depend upon the pump:

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

- a. For the more critical pumps that are covered under paragraph 1.05, the Contractor is required to submit analytical reports confirming requirements on critical speeds and natural frequencies prior to pump fabrication as specified in that paragraph
- b. Unless otherwise specified, for constant-speed pumps and variable-speed pumps with suction size less than 6 inches diameter, no critical speed submittal is required
- 2. Lateral Rotor and Structural Dynamics:
 - a. Ensure that the complete pumping unit, composed of the entire rotating group and related frames, supports, enclosures, housings, and casings, is free from critical speeds from 15 percent below to 25 percent above the operating speeds required to achieve the specified performance characteristics (critical avoidance zone). A critical speed is defined as any damped natural frequency with a logarithmic decrement less than +0.3 that has an interference with a primary excitation order in the critical avoidance zone. Analyze backward rotation for rubber-bearing vertical-column pumps. The critical avoidance zone, interferences, and possible critical speeds can be illustrated on a natural frequency map as presented in the figure below. In the figure, three natural frequencies are shown with forward and backward modes. Only two of those modes, 1F and 2F, have interferences with primary excitation orders. Whether these are critical speeds is determined by the value of log decrement at the intersection. Note that higher order modes, such as 2F, have the same log decrement criterion as the first mode.

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS



- b. Process sensitivities are such that operation at infinitely variable speed within the specified operational conditions is an absolute requirement. Any remedy imposing a locked-out speed interval or intervals will not be considered an acceptable remedy for identified critical speeds. Acceptable remedies include combinations of adjustments in rotor geometry or materials, and the substitution of energy-absorbing couplings. Other remedies may be considered so long as they are justified in writing and the proposal is sealed and signed by the design professional retained by the manufacturer to perform the system mass elastic system analyses.
- 3. Torsional rotordynamics and combined shaft stress:
 - a. Ensure that the complete rotating group is free from critical speeds from 15 percent below to 25 percent above the operating speeds required to achieve the specified performance characteristics (critical avoidance zone). A critical speed is defined as any damped natural frequency with a logarithmic decrement less than plus 0.3 that has an interference with a primary excitation order in the critical avoidance zone.
 - b. If efforts to remove torsional critical speeds are unsuccessful, perform a combined shaft stress analysis to demonstrate that the response does not adversely affect the entire rotating group fatigue life. Ensure that the combined shaft stress analysis considers any speed in the critical avoidance zone and during startup, shutdown, or motor control transients if synchronous motors are specified.

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022 ATTACHMENT E - TECHNICALS

- c. For constant-torque applications, ensure that the pump-rotating group is free from torsional response that produces combined (steady plus alternating torque induced) stresses exceeding 50 percent of the material's fatigue limit or 30 percent of the material's elastic limit (but no more than 18 percent of the material's ultimate tensile strength) if relevant fatigue data for the selected material are not available.
- d. For variable-torque applications (including variable-speed pumps, vertical pumps, and pumps with large overhung loads) ensure that the pump rotating group is free from torsional response that produces combined (torsional steady and alternating) peak shear stresses at points of stress concentration (calculated in accordance with the requirements of paragraph 1.04E.3 Torosional Shaft Stresses) that exceed 50 percent of the material's fatigue limit or 4 percent of the material's ultimate tensile strength (as per United States Military Standard [MIL STD] 167-2) if relevant fatigue data for the selected material are not available.
- e. Document the source of fatigue data used in lieu of elastic or ultimate strength ratios in the analysis report submittal.
- D. Impeller clearances, vane-passing frequency, and impeller keyways.
 - 1. Ensure that the radial clearance between the tip of the impeller vane and diffuser or volute vanes is not less than 3 percent and 6 percent, respectively, of impeller diameter. Select a pump that is designed so that internal geometry does not cause uneven flow distribution at impeller vane inlets.
 - 2. Ensure that impeller vane combinations are not an even multiple of diffuser vanes in column-type pumps.
 - 3. Cut impeller keyways for multistage column-type pumps at differing positions and provide equal angular spacing on the impeller shaft to avoid multiple simultaneous vane-passing pulses.

E. Component design criteria:

- 1. General:
 - a. Unless otherwise specified, ensure that combined stresses in steel frames and supports does not exceed those permitted by the American Institute of Steel Construction (AISC) Manual of Practice. Ensure that combined stresses in cast, forged, rolled, or fabricated pressure-retaining components, frames, and supports does not exceed that allowed for the given material in Section VIII, Division 1 of the American Society of Mechanical Engineers (ASME) Code. Ensure that design pressures for pressure-retaining parts are not less than 50 percent greater than the pump's shutoff head at the manufacturer's listed maximum operating speed. Ensure that the pump casing strain at any head on the full-speed operating curve (including allowances for increases caused by specified multistage applications) do not result in distortions at the bearing housings greater than the maximum allowable by the bearing manufacturer to provide the specified bearing life.
 - b. The term "combined stresses" in this section means the sum of operating stresses, including stresses induced by dynamic and static forces as

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

developed via the analysis procedures stipulated in this section. Static forces (x, y, z, and moments in planes) include the relevant maximum nozzle loads specified in ANSI/HI 9.6.2 or as stipulated by the pump manufacturer. Dynamic forces include both steady-state and transient stresses induced by operating conditions within the zone of operation established by the specified operating conditions.

2. Anchorage and Equipment Mounts:

- a. The Contractor shall hold the pump manufacturer responsible for the design of the anchor-bolting system and equipment supports for each separately mounted component furnished under the detailed specification. Conform anchorage and equipment support requirements for pumps to the requirements of Section 43 05 13 RIGID EQUIPMENT MOUNTS.
- b. Select anchor bolts and connecting bolts for pumps and assemblies supported by other assemblies furnished under this section, or sections referencing this section, that are designed in accordance with Section 01 73 24 DESIGN REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS AND NON-BUILDING STRUCTURES. Ensure that all operation and maintenance (O&M) manuals for pumps and assemblies contain criteria for anchor and baseplate bolt torque values.
- c. Ensure that equipment mounts for vertical (column- and volute-type) pumps weighing more than 1,000 pounds, with discharge nozzles 6 inches in diameter and greater, employ soleplates conforming to the requirements of Section 43 05 13 RIGID EQUIPMENT MOUNTS. Provide soleplate mounting conforming to Section 43 05 13 RIGID EQUIPMENT MOUNTS for separately supported components in the pump drive system. Fabricated steel supports regardless of design, and the nature of the structural shapes used for such proposed supports, will not be accepted.
- d. Select soleplates that are designed to span openings for equipment connections and provide access to maintenance points. Ensure that soleplates are of sufficient section to key, not less than 1 inch, into the supporting grout provided for bonding the soleplate to the structure. Provide soleplates of sufficient size to bolt the pump base to the soleplate without encumbering the anchor bolts required for clamping the soleplate to the structure.
- e. Select equipment mounts for horizontal pumps that are designed in accordance with Section 43 05 13 RIGID EQUIPMENT MOUNTS and ANSI/HI 1.3.8-2013, and ensure that they provide common support for the pump and motor (and flywheel, if one is specified). Conform baseplate bolting to assumptions contained in ANSI/HI 9.6.2.
- f. Use tapered dowel pins when required in the detailed specification to record the final position of machine bases on soleplates or pump baseplates. Where specified, harden and machine-ground dowel pins, conforming to the requirements of ANSI/ASME B18.8.2. Conform holes for tapered dowels to the requirements set forth in Appendix A of ANSI/HI B18.8.2.
- 3. Torsional Shaft Stresses:

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

a. Calculate shaft stresses using the following equation and the stress concentration factors in the tables below:

$$S = S_{cf} \times \frac{G \times D \times \Delta_{\Theta}}{2 \times L}$$

where:

S = stress, pounds per square inch (psi)

 S_{cf} = stress concentration factor, dimensionless

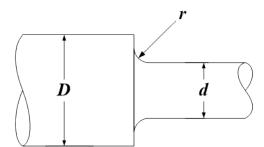
D = minimum shaft diameter at point of concentration, inches

 Δ_{Θ} = twist in shaft between adjacent masses, radians

L = effective length between masses, inches

G = shear modulus of shaft material, psi

b. Ensure that the S_{cf} to be applied at changes in shaft diameter is as follows:



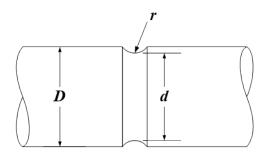
Shaft diameter ratio D/d = 1.05

r/d	Scf a
0.0025	2.67
0.0100	1.84
0.0200	1.58
0.0300	1.47
0.0400	1.39
0.0500	1.34
0.1000 and greater	1.22

Shaft diameter ratio D/d = 1.50

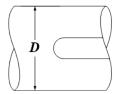
Citate diameter rae	10 27 01 1100
r/d	Scf a
0.0025	4.05
0.0100	2.54
0.0200	2.07
0.0300	1.85
0.0400	1.72
0.0500	1.62
0.1000 and	1.40
greater	

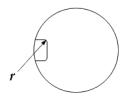
c. Ensure that the S_{cf} to be applied at circumferential shaft grooves is as follows:



Shaft diameter rat	tio D/d = 1.05	Shaft diameter rat	io D/d = 1.30
r/d	Scf a	r/d	Scf a
0.0025	3.73	0.0025	5.04
0.0100	2.34	0.0100	2.82
0.0200	1.92	0.0200	2.24
0.0300	1.74	0.0300	1.99
0.0400	1.64	0.0400	1.84
0.0500	1.57	0.0500	1.73
0.1000 and greater	1.39	0.1000 and greater	1.49

d. Ensure that the S_{cf} to be applied at the roots of keyways is as follows:





r/D	S _{cf} ^a
0.0025	4.35
0.0100	3.20
0.0200	2.64
0.0300	2.43
0.0400	2.32
0.05 00	2.25
0.1000 and greater	2.12

a. Base values of S_{cf} between data points in the tables above upon a straight line interpolation.

APRIL 2022 ATTACHMENT E - TECHNICALS GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

- 4. Shaft Deflection: Select pump shafts installed on volute-type pumps to provide sufficient stiffness to operate without distortion or damaging vibration throughout the range of service specified. Limit shaft deflection at the face (impeller side) of the shaft seal to no more than 2 mils at any operating condition within the zone described by the specified continuous-duty operating conditions. Calculate deflection at the shaft seal as required by provisions set forth in ANSI/HI 1.3.
- 5. Bearings: Unless otherwise specified, select anti-friction bearings for pumps for a minimum L–10 life of 50,000 hours in accordance with ABMA 9 or 11. Ensure that anti-friction bearings for custom-engineered pumps have bearings selected for an L–10 life of 100,000 hours in accordance with ABMA 9 or 11. Select bearings for other elements in the rotating system such as motors, intermediate shaft bearings, and flywheel bearings using the same criteria as specified for the pump. Base bearing selection upon the worst combination of continuous-duty operating conditions specified, and include both steady-state and transient loads. Provide calculations supporting the selection of bearing sizes as Product Data.
- 6. Bearing Isolators: Unless otherwise specified, fit pump and motor bearings with bearing isolators, specifically selected for the size and type of bearing. Provide bearing isolators that are the labyrinth, non-fretting type designed to expel contaminants by centrifugal force and prevent the escape of lubricants. Provide vapor-block capability. Ensure that the bearing seals are Inpro/Seal, or an approved equal.
- 7. Pump Shaft Seals: Unless otherwise specified in the detailed specification, pump shaft seals must be mechanical seals as specified in Section 43 05 11 GENERAL REQUIREMENTS FOR EQUIPMENT.

F. NPSH Margin Limitations:

1. General:

- a. Select pumps furnished under this section and sections referencing this section for NPSH margin limitations using the criteria set forth in this section. Base NPSH3 characteristics for the candidate pump upon documented test data not more than 5 years old. Perform testing on a pump not more than two nominal pump diameters larger or smaller than the proposed pump with an impeller of the same geometry as that proposed for the pump to be used for the subject application, and operating at either the same speed as the pump for the proposed application or a speed that provides plus or minus 10 percent of the impeller inlet velocity if reduced-speed testing is used. For very large pumps that cannot be accommodated in the manufacturer's test pit, the use of a model pump, sized in accordance with ANSI/HI 14.6, Appendix K, is acceptable. The Contractor shall document the basis for pump selection based upon NPSH margin limitations as set forth in this paragraph.
- b. The detailed specification sections provide NPSHA information for anticipated operating conditions for each application. This information is generally referenced to a specific elevation, stated in terms of project datum. The Contractor is responsible for requiring the pump manufacturer to adjust the NPSHA information in the specification section to the elevation

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

of the pump impeller eye for the specific pump model and size proposed for the application. NPSH3, as used in the following paragraphs, means the NPSH3 at the impeller eye, determined in accordance with ANSI/HI 11.6 or 14.6, as applicable for the proposed pump. Have the Contractor require the pump manufacturer to document the method used to determine NPSH3 for the proposed pump and justifying compliance with the NPSH margin limitations established under this paragraph for each specified operating condition in material submitted under paragraph 1.08. Include in the documentation justification of the NPSH3 tests used to develop NPSH3 characteristics, including the following:

- 1) Date, test procedure, and test logs of original NPSH3 information used to project requirements for the pump selected for the application
- 2) Test pump size, impeller diameter, impeller model, eye diameter, and speed
- 3) Calculations projecting NPSH3 test information to NPSH3 curve information for the pump proposed for the application
- 4) Calculations demonstrating compliance with the NPSH margin requirements established in this paragraph
- c. The Contractor shall submit the manufacturer's margin calculations justifying the proposed pump selection with the material required under paragraph 1.08. The NPSH margin ratios specified in this paragraph are the minimum acceptable margin ratios. If the proposed pump requires greater margin ratios to operate within the specified operating conditions without loss of head due to cavitation, then it is the responsibility of the Contractor to bear costs associated with achieving the required margin ratio by lowering the elevation of the pump setting, lowering the elevation of the structure, or through other means. Subject any such adjustments to review and acceptance by the Engineer if necessary.
- d. Individual restrictions are applicable to NPSH margin depending upon the type of pumping equipment and the fluid to be pumped as set forth in ANSI/HI 9.6.1, Table 9.6.1.4.5. Under no circumstances may the absolute value of the NPSH3 margin be less than 3.5 feet.

G. Electric Motors:

- 1. General:
 - a. Pumps must be electric-motor driven unless otherwise specified. Select all motors to be non-overloading at any operating point along the pump's full-speed operating curve, including points located beyond specified operating conditions. Ensure that all vertical motors are solid-shaft construction. Hollow-shaft motors will not be accepted. Ensure that motors furnished with pumps specified for operation at variable-speed inverter-duty types conform to the requirements of Section 43 05 21 COMMON MOTOR REQUIREMENTS FOR EQUIPMENT and are compatible with the variable-speed equipment furnished with the pump.
 - b. Protect motor bearings with bearing isolators as specified in paragraph 1.04.
- 2. Motors for Custom-Engineered Pumps:

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

- a. In addition to the information submitted under the requirements of Section 43 05 21 COMMON MOTOR REQUIREMENTS FOR EQUIPMENT, have the Contractor provide certified reed-frequency calculations for both the motor rotor and frame for vertical motors driving custom-engineered pumps with the data to be submitted under paragraph 1.08. Upon completion of construction of motors for custom-engineered pumps, give each rotor and frame and the completed assembly a pump test to confirm reed-frequency calculations in the dynamic analysis modeling work performed under paragraph 1.05. Provide the results of the bump test, certified by the chief engineer or individual in responsible charge of the test facility, as an information submittal under paragraph 1.08.
- b. Ensure that all vertical motors meet motor face dimension tolerances as follows:

Motor face bolt circle diameter, inches	Motor face runout, inches
12	0.002
16.5–24.5	0.002
30–42	0.003
42 and larger	0.005

c. Ensure that the motor face register concentricity, referenced to the shaft centerline, is not greater than 0.002 inch if the motor is furnished without jack screws. Ensure that the motor shaft total indicated runout (TIR) does not exceed 0.002 inch.

Balance:

- a. Ensure that motors rated 50 hp or greater and motors driving customengineered pumps are precision-balanced, conforming to a balance grade of G2.5 per International Organization for Standardization (ISO) 1940-1.
- b. Have the Contractor provide certified balance logs attesting to achieving these requirements and submitted as required by paragraph 1.08. Have the chief engineer or person in charge of the test facility sign the balance logs.

1.05 ADDITIONAL DESIGN REQUIREMENTS

- A. Scope: The following paragraphs present requirements that apply to only some pumps on the project. In each of the paragraphs, the first sub-paragraph titled "General" explains when the paragraph applies.
- B. Critical Speed Analysis and System Design:
 - 1. General: The requirements of this paragraph apply to pumping equipment in detailed specifications where the words "custom-engineered" appear in the title of the specification section, and elsewhere when the referencing specification section stipulates. Apply the analyses to the equipment in "like-new" condition, as well as the "as-worn" condition (i.e., when parts, individually and as a composite, reach the manufacturers' maximum tolerances). For the purpose of these analyses, define worn conditions as two times the new condition

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

clearance unless specified less by the manufacturer and specifically accepted by the Engineer.

2. Requirements:

- a. Subject the complete pumping unit (including rotating elements, frames, and supports) and related structural elements (including pump, motor, and bearing supports) to structural, lateral, and torsional dynamic analyses to identify and eliminate critical speeds as defined in paragraphs 1.04C.2.a Lateral rotor and structural dynamics and 1.04C.3.aTorosional rotordynamics and combined shaft stress.
- b. Select the complete pumping unit rotating group including pump, motor, intermediate shafting and flywheel rotors (if specified), and other elements in the power train (or powered via the power train) that are designed and manufactured to limit torsional stresses.
- c. overhung shaft pumps and between bearings pumps operating in single-volute casings shall be subject to analysis for shaft deflection in accordance with the terms of this section.
- d. Ensure that the structural, lateral, and torsional dynamic analyses are together termed the pumping equipment's "mass elastic design." Ensure that no fabrication work on any component for the equipment specified under this section and any referencing section are started until the mass elastic design has been completed and has been reviewed by the Engineer.
- e. If the Contractor proposes the use of alternative methods for the required analyses, submit documentation justifying the substitution. Include in the documentation justification that product results will be equivalent to that specified and with an equivalent level of accuracy. Also include the location and description of projects of an equivalent size where the procedure has been employed and the length of time these projects have been in actual service.

3. Professional Qualifications:

- a. Have the Contractor require the manufacturer of the pumping equipment to retain the services of an independent professional engineering firm, employing a qualified design professional who has been engaged in performance of the required mass elastic design analyses on equipment of similar size and complexity. Ensure that the design professional has not been in the employ of any pump manufacturer. Have the design professional's firm submit a notarized certification attesting to having no contractual arrangements with the proposed pump manufacturer. The pump manufacturer's internal engineering organizations, regardless of qualifications, are specifically prohibited from doing this work. This provision, however, is not to be construed as relieving the Contractor of overall responsibility for this portion of the work.
- b. Ensure that the mass elastic design is the product of a design professional, registered to practice mechanical engineering in at least one of the states composing the United States, who has been responsible for the design of not less than five systems similar to that specified in the detailed specification section. Ensure that the design professional has been

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

engaged in this type of analysis and directly supervise the performance of the work and be responsible for analysis of results and recommendations for any corrections to the specific rotating system and the associated frames and supports. Have the Contractor submit the design professional's qualifications as a part of the initial submittal information required under this section.

- c. The City and Engineer believe that the following firms are capable of providing services that will satisfy the requirements of this paragraph. This statement, however, is not to be construed as an endorsement of a particular firm; do not assume that a named firm's standard service will comply with the requirements of this section. Candidate firms performing these analyses satisfactorily in the past include:
 - 1) DynaTech Engineering Incorporated, Auburn, California
 - 2) Engineering Dynamics Incorporated, Houston, Texas
 - 3) No Bull Engineering (Corbo, Malanoski & Associates), Brandon, Vermont
- d. The Contractor may propose a firm other than those listed. However, before a substitute firm can perform the analyses, submit the proposed firm's qualifications, the qualifications of personnel proposed for assignment to this project, along with examples of analyses performed on similar pumping equipment using procedures similar to those specified in this section, for review by the Engineer. Examples include the types of graphical displays required under this section as well as a complete report describing the analyses performed and the recommendations arising out of the analysis results. The Engineer retains the right to reject any proposed firm with justification.
- 4. Reports, calculations, and recommendations: Ensure that all reports, calculations, and recommendations resulting from the required analyses bear the design professional's original signature and professional registration seal. Submit all reports, recommendations, and calculations produced under this paragraph under the requirements of this section, as follows:
 - a. Following completion of the pumping equipment's mass elastic design, have the Contractor require the design professional to prepare a plain-English "Executive Summary" report with a narrative including a description and assumptions about the proposed operating system, detailed description of the analysis process, results of analyses and findings, detailed recommendations for modification of the pumping unit (defined in paragraph 1.01A Scope), if any, and sufficient graphical depictions to describe the information to a lay reader. Detailed calculations and extensive data reports are not to be submitted at this time and will cause the entire report to be rejected, if included. Submit this Executive Summary for review and acceptance prior to pump or component fabrication. Have the Executive Summary report state that analysis procedures have complied fully with the requirements of this section and that the proposed system will meet of the requirements set forth herein for limitations in stresses, deflection, and fatigue limits. Have the design professional affirm in writing that requirements of this section have been achieved or

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022 ATTACHMENT E - TECHNICALS

- specifically state where exceptions have been taken, with justification citing recognized authorities for taking such exceptions. Ensure that the reports are signed and sealed by the design professional, as specified, and that they are notarized.
- b. Following review and approval of the Executive Summary report, have the Contractor require the design professional to review and address any comments from the Engineer and incorporate changes that may be required. Subsequently, have the Contractor direct the design professional to issue a complete "Final Report" with a revised Executive Summary report, recommendations binding on the manufacturer, calculations, data, and other supporting information. Have the format and documentation for this report follow the requirements of ANSI/HI 9.6.8 Appendix G Level 3 as indicated in the detailed specifications. Have the Contractor submit this report as an information submittal.
- c. Upon completion and receipt of certified results of the bump tests required for the motor rotor, frame, and assembly specified under paragraph 1.04G.2, have the design professional review the data and submit a "Supplemental Report," as product data, either accepting the test results or recommending alterations to assembly structures to adjust for differences between calculated values used for the original analyses and actual values determined subsequent to motor fabrication.
- d. Upon completion of installation and as a part of the initial test procedures specified under Section 01 45 33 SPECIAL INSPECTION, OBSERVATION, AND TESTING, have the design professional responsible for the mass elastic design visit the site and inspect the installed equipment. Prior to the initiation of any field tests, have the design professional issue a report attesting that the equipment, as installed, conforms to the recommendations contained in the report setting forth the results of the mass elastic system design or recommendations for remedies should the supplied equipment contain features or characteristics deviating from the original recommendations and calculations.
- e. During initial testing of the equipment, ensure that the design professional is prepared with necessary monitors, instruments, and recorders, and have him/her conduct an in situ torsional vibration test on one of the installed pumping units, to be selected by the Engineer, to confirm the torsional natural frequency results of the original mass elastic system design. Conduct the torsional vibration test with transducers suitable for narrowband spectrum analysis, including strain gauges, magnetic or optical pulse demodulation, or shaft position encoders. If the torsional vibration test should reveal any anomalies that cause the equipment to be out of compliance with the requirements of this section, have the design professional conduct torsional vibration tests on other like pumping units and submit a comprehensive report, sealed and signed as specified above, detailing the reasons for failure to comply with these specifications and recommendations for attaining compliance. Have the design professional consider feasible options for compliance and provide detailed descriptions of the modifications required to achieve the required performance. Have

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

the Contractor implement those recommendations accepted by the Engineer at no cost to the City.

5. Methodology:

- a. Lateral Rotor and Structural Dynamic Analyses:
 - 1) Include in the analyses procedure the following features based on a Level 3 analysis prescribed in ANSI/HI 9.6.8-2014:
 - a) The procedure considers speeds required to operate the equipment within the envelope of continuous-duty operating conditions specified in paragraph 1.04C.2.a Lateral rotor and structural dynamics.
 - b) The procedure includes liquid influences (wet conditions) including Lomakin effects, impeller-diffuser destabilizing forces, and added mass due to entrained fluid in the calculation of natural frequencies and forced response for pump types.
 - c) The procedure produces Campbell diagrams for the proposed operating conditions depicting potential sources of excitation to check interference with relevant natural frequencies from both lateral and structural analyses. Primary excitation orders to be considered during the analysis include 1 and 2 times running speed, vane-passing frequencies for the pump impeller/cutwater-diffuser vane combinations, and any unique harmonic of running speed produced by the pumping system, up to, and including, not less than 6 times operating speed.
 - d) For pump types except column pumps, the procedure considers the effect of support stiffness on natural frequencies. The range of stiffness to be considered is not to be less than 4 orders of magnitude. Results are provided in a critical-speed map (graph of natural frequencies versus stiffness similar to Figure 9.6.8.6.2.1.3 in ANSI/HI 9.6.8-2014) and indicate the expected values of stiffness.
 - e) For column-type pumps only, the procedure considers the effect on critical speeds subject to variations in assumed coefficients from new values for seal and wearing ring clearances, bearing clearances, and impeller destabilizing forces. Unless specifically accepted by the Engineer, the range in variation of component characteristics (either clearances or forces) is 2 times as-new values. Forced response is also calculated at new and 2 times as-new values (or approved deviation) using rotor unbalance (10 percent of weight at each impeller position) and hydraulic unbalance at not less than five operating conditions within the envelope of continuous-duty operating conditions specified in (a). Response to unbalance is assessed by the design professional relative to acceptable bearing loads and deflections of the rotating group.
 - f) Ensure that the mathematical calculation tools to be employed for the analyses and the procedures to be used are as follows:

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

- (1) Build the mathematical model of the rotating group on a dedicated rotordynamics code employing finite-element beam theory. Do not use general-purpose finite-element, transfer matrix, or lumped-parameter program for this purpose. Construct the model specifically to contain axisymmetric models of the rotor and, with column-type pumps only, the casing. Use this model to determine the damped natural frequencies and, if required, the forced response of the rotating group.
- (2) Use a general-purpose finite-element code such as NASTRAN or ANSYS to construct three-dimensional models of the casing and housing structures supporting the rotating group. Use this model to determine the natural frequencies of the support structures and casing as well as the pump-bearing frames. Include representative sections of piping and structural supports such as piers and baseplates in the model.
- (3) Adjust the rotating group axisymmetric model, preferably by changing component materials or sizes, or by changing component type, until the output frequencies or static deflections agree with the models constructed under (2).
- (4) Use the three-dimensional models constructed under (2) to determine if the foundation of the pumping unit is rigid or flexible as per Figures 9.6.8.3.1a, 9.6.8.3.1b, and 9.6.8.3.1c in ANSI/HI 9.6.8-2014.
- 2) Include in the Final Report graphic presentations, preferably in three dimensions, of frame and shaft distortion and rotor group performance at any identified critical speeds within the pump's operating range.
- b. Torsional Dynamic Analysis:
 - The methodology used for the torsional rotordynamic analysis of the rotating group and evaluation of shaft combined stresses is based on a Level 2/3 analysis in ANSI/HI 9.6.8-2014 and includes the following features:
 - a) The procedure considers speeds required to operate the equipment within the envelope of continuous-duty operating conditions specified in paragraph 1.04C.3.aTorosional rotordynamics and combined shaft stress.
 - b) The mathematical model of the rotating group is built on a dedicated rotordynamics code employing finite-element beam theory or a general-purpose finite-element program. Do not use a transfer matrix or lumped-parameter code for this purpose. The computer program used for the torsional analysis must be field-calibrated at not less than five similar installations.
 - c) Verify the computer analysis results by hand calculations for the fundamental frequency and mode shape.
 - d) Ensure that primary excitation orders to be considered in the analysis are 1 and 2 times running speed, vane-passing frequencies for the pump impeller/cutwater-diffuser vane combinations, line- and twice-line frequency, motor-pole frequency,

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

- torsional harmonics from reciprocating engine drivers (up to, and including, 6 times operating speed), and harmonics as defined in (f) if variable-frequency drives (VFDs) are specified.
- e) Produce a Campbell-type interference diagram showing the relationship between operating range, natural frequencies, and primary excitation orders, with any critical speeds clearly identified.
- If critical speeds are predicted to occur in the critical avoidance zone specified in paragraph 1.04C.3.aTorosional rotordynamics and combined shaft stress, perform a damped, steady-state forcedresponse analysis to demonstrate satisfactory fatigue life as defined further in that paragraph, as applicable. Ensure that forcing function magnitudes used for the analysis are not less than 1 percent of the maximum transmitted torque at the speed of intersection. Justification of the source and magnitude of any damping incorporated in the analysis is required. Include in the analysis evaluation of control pulse frequencies induced by VFDs or engine power-stroke frequencies, if provided as part of the specified system. Include in the analysis report a statement produced by the VFD manufacturer detailing control-pulse frequencies generated by the equipment between 1 and 24 times motor running speed. Consider any torque harmonic greater than 1 percent of steady torque a primary excitation order.
- 2) Physical adjustments to obtain the required characteristics must be preferably by changes in component dimensions, and secondarily by providing torsionally resilient dampening devices such as fluid-damped couplings or metallic couplings such as manufactured by Bibby and Holset. Do not use couplings or dampeners using rubber or similar elastic materials.
- 3) If synchronous drives are specified in the mass-elastic design, include in the analysis a time-integration study showing transient peak stresses resulting from startup, shutdown, and motor control transients. Provide tomographic diagrams, colorimetrically displaying stresses at positions in the rotating group shafting, including roots at changes in section and keyways or other stress concentrating locations, with the analysis report. Indicate in the diagrams the operating speeds identified that produce the peak stresses, specific for speeds inducing identified peak stresses at keyways, changes in section, and at connections to other components. Combine the reported stresses incorporating identified loads from torsional, lateral, and hydraulic sources.
- C. Cans for Column Pumps: (Not Used)
- 1.06 QUALITY ASSURANCE: ALL PUMPS
 - A. Quality Certification: Ensure that all manufacturers and manufacturing sites proposed by the Contractor for supply of equipment furnished under this section and sections referencing this section hold current certification under ISO 9001. Application for certification under ISO 9001 is not deemed as an acceptable

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

substitute for current certification. Provide documentation of the manufacturer's ISO 9001 certification and the manufacturer's written quality assurance/quality control (QA/QC) program.

B. Unit Responsibility: Have the Contractor assign unit responsibility to the pump manufacturer in conformance with the requirements of Section 43 05 11 GENERAL REQUIREMENTS FOR EQUIPMENT.

C. Performance Confirmation:

1. Hydrostatic Tests: Subject all pressure-sustaining parts to factory hydrostatic tests. Unless otherwise specified, conform hydrostatic tests to the requirements of ANSI/HI 11.6 for submersible pumps and ANSI/HI 14.6 for dry pit pumps. Unless otherwise indicated in the detailed specifications, hold castings at the test pressure for the duration indicated in ANSI/HI 11.6 and 14.6. For process pumps designed in accordance with ANSI/API 610, hydrostatic testing must comply with the requirements of paragraph 8.3.2 of ANSI/ANSI/API 610. Ensure that test results are certified correct by the chief engineer or individual in responsible charge of the manufacturing facility.

2. Performance Guarantee:

- a. Unless specified otherwise in the detailed specification, have pump performance (flow and head, efficiency, and NPSH3) guaranteed by the pump manufacturer to the criteria specified under this paragraph.
- b. Ensure that equipment performance documentation, including test data, where tests are specified, includes sufficient test points (not less than eight) to document hydraulic performance along the complete head/capacity curve from shutoff to maximum capacity, and covers full-speed operating points specified in the detailed specification section referencing this section. Ensure that tests conducted at specified operating conditions are the inlet throttled to produce the NPSHA indicated for that specific condition in the detailed specification. Perform NPSH3 tests for not less than four full-speed operating conditions, but not less than specified operating conditions and at the best efficiency point (BEPQ).
- c. Conform test procedures to those set forth in ANSI/HI 14.6 acceptance grade 1U, and as specifically detailed in these specifications. However, any increase in flow or head permitted under acceptance grade 1U cannot result in overload (nameplate basis, S. F. = 1.0) of the specified motor power rating at any location on the pump's head/capacity curve. Conduct performance tests at the specified maximum speed. Affinity relationship-predicted test results will not be accepted. For column-type pumps, include in the performance documentation curves showing both bowl efficiency and overall efficiency (including inlet, bowl, column, and discharge head losses) at maximum operating speed for the application.
- d. Ensure that acceptance criteria for head and capacity test results, based upon the rated condition specified in the detailed specification, are as required in ANSI/HI 11.6 and 14.6, acceptance grade 1U, with the above-stated limitation with respect to motor power overload.

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

- e. Ensure that acceptance criteria for NPSH3 at any specified operating condition are the values proposed by the Contractor in the curves submitted under paragraph 1.08, and duly accepted by the Engineer, with a tolerance of plus 0, minus unlimited, with the exception that Nss, as calculated for the specific pump, does not exceed the limitation established under paragraph 1.04B. If the NPSH3 data result in an increase in Nss, have the manufacturer confirm that the stable operating region for the pump corresponds to the POR as defined in ANSI/HI 9.6.3, and that the operating conditions specified to be within the POR are within the stable operating region for the pump. In addition, have the manufacturer identify the onset of suction recirculation and confirm that the onset of suction recirculation is outside of the specified operating range.
- f. Include in the guarantee a statement to the effect that the pump will operate within the operating regions specified in the detailed specification. Put the guarantee in writing, and have the chief engineer or individual in responsible charge of the test facility sign it. Under no circumstances should deviations from specified operating conditions result in overload of the driver furnished with the equipment, nor should such deviations result in power requirements greater than the driver's nameplate (1.0 service factor) rating.

3. Non-Witnessed Tests:

- a. Unless specified otherwise, performance-test pumps in accordance with ANSI/HI 14.6, Acceptance Grade 1U, with the above restrictions on motor power overload. Include in the factory tests test data for each full-speed performance requirement (Condition Points A and B specified in the detailed specification) and any other points stipulated for this test procedure in the detailed specification. Conduct these tests with the pump inlet throttled to provide the specified NPSHA. For large-column pumps, model performance testing with reduced NPSHA, pursuant to paragraph 1.07B.4, may be used. If specified in the detailed specification, include shaft vibration and case noise in the test data at the full-speed operating conditions.
- b. Duplicate the test setup in the manufacturer's test facility as closely as possible to the inlet conditions in the proposed installation, using temporary baffles and other means, within the limitations of the test facility. Where centrifugal pumps are furnished with inlet elbows, inlet adapters or inlet reducers as a part of the manufacturer's scope of supply, test the pumps with the elbow, adapter, or reducer fitted to the pump and apply specified performance criteria to the complete pump assembly, including losses through any elbow, adapter, or reducer. Where submersible pumps are to be furnished with inlet nozzles and/or discharge elbows or adapters, test the pumps with these components fitted to the pumps. Apply the specified performance requirements to the complete pumping assembly including any inlet nozzles, and discharge elbows or adapters. Include in the certified test data separate readings for inlet and discharge head for each data point.
- c. Take not less than eight test points, including not less than three within plus or minus 8 percent (in terms of rated flow) of the rated condition (Condition

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

- Point A) and not less than two test points within plus or minus 4 percent of the pump's BEP at the test speed. In addition, one test point is sufficient to define head and power requirements at shutoff head.
- d. Perform NPSH3 tests in accordance with ANSI/HI 14.6, paragraph 14.6.5.8.2.1, Type 1 Test except that not less than four tests should be performed at the test motor speed to completely cover the range of operating conditions specified in the detailed specification. Ensure that one of the test points is at BEP flow to confirm the test pump's Nss. Ensure that translation of test results to specified operating conditions is in accordance with ANSI/HI 14.6, paragraph 14.6.6.1.1 so long as the exponent used can be supported by certified test data performed on a pump of the same type, size, speed, and specific speed as that of the proposed pump. Include NPSH3 tests at both the proposed and test speeds in test data justifying the exponent, test points at BEP, and at least three other points on the test pump head/capacity curve at least 15 percentage points removed from the BEP. Use the results of the NPSH3 tests to confirm the NPSH margins for each specified operating condition as specified in paragraph 1.04F. Perform NPSH3 tests for column type (axial, mixed-flow, and verticalturbine) pumps using the open sump/water level or closed tank/tank pressure methods described in ANSI/HI 14.6, Table 14.6.5.8.2.1. Perform NPSH3 tests for submersible wastewater pumps using the method described in Figure 11.6.8 in ANSI/HI 11.6. Extend all NPSH3 tests from 50 percent to 140 percent of best efficiency flow at full speed, or to not less than 10 percent (in terms of flow) past the flow at Operating Condition B, whichever is greater. For a given pump, if the manufacturer can provide documentation that the upper flow limit of the AOR on the right side of the pump curve is less than 140 percent of best efficiency flow, the AOR may be used as the limit for the NPSH3 test. Cause for rejection is failure to achieve specified performance or performance proposed in accepted submittal documents (capacity and head, efficiency, or NPSH3), whichever is more restrictive. Acceptance tolerances are as set forth in paragraph 1.06C.2 Performance Confirmation; Performance guarantee.
- e. Ensure that all test procedures are in strict conformance with the referenced standards. However, prediction of performance of a trimmed impeller from test data of the larger impeller will not be permitted. If trimming is required, re-test the pump. Do not allow deviations from specified operating conditions, though allowed by the referenced standards, to result in overload of the driver furnished with the equipment, nor allow such deviations to result in power requirements greater than the driver's nameplate (1.0 service factor) rating.
- f. Have the Contractor furnish the Engineer with not less than 2 weeks' advance written notice of the date and place of the non-witnessed tests.
- g. Have all test results, including test logs and generated curves, certified correct by the chief engineer or individual in responsible charge of the manufacturer's test facility, and submit in accordance with paragraph 1.08.

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

1.07 QUALITY ASSURANCE: ADDITIONAL REQUIREMENTS

A. Scope:

- 1. In addition to the requirements under paragraph 1.06 applicable to pumps, the following are required for the subset of larger and custom-engineered pumps defined in paragraph 1.01A Scope. Contractors are advised that the results of NPSH3 will be used by the Engineer to determine if the tested pumps conform to the POR requirements set forth in paragraph 1.04. Failure to meet these requirements will likely require remanufacture of the pumps or rework of one or more of the pump components to achieve the required and necessary pump stability characteristics. Ensure that all costs associated with such remanufacture or rework and retesting are borne by the Contractor.
- 2. Ensure that performance curves submitted under paragraph 1.08, once accepted by the Engineer, become a warranty on the part of the Contractor to provide equipment that will provide performance characteristics that accurately duplicate the characteristics presented in the submitted and accepted curves. Ensure that factory test results confirm performance within the tolerances set forth in ANSI/HI 14.6.3, Acceptance Grade 1U for the specified rated condition and Grade 2B for other specified full-speed operating conditions. Ensure that NPSH3, as determined by certified factory test results, does not cause the pump's Nss to exceed the limit specified in this section or the detailed specification. The manufacturer may propose a pump with a higher Nss, provided that documentation showing that the onset of suction recirculation is to the left of the pumps specified operating region. Submit documentation of the procedures used to determine the onset of suction recirculation.

B. Performance Testing:

1. Witnessed Tests:

- a. Subject all custom-engineered pumps, and other pumps where required by the detailed specification, to a witnessed factory performance test and NPSH3 tests in accordance with the provisions of this portion of the specifications.
- b. Have the Contractor furnish the Engineer with not less than 2 weeks' advance written notice of the date and place of the witnessed tests.

2. Performance Tests:

- a. Conform factory performance tests to the requirements of ANSI/HI 14.6, Acceptance Grade 1U. Include in the factory tests test data for each full-speed performance requirement (Condition Points A and B specified in the detailed specification) and any other points stipulated for this test procedure in the detailed specification. Conduct these tests with the pump inlet throttled to provide the specified NPSHA or as otherwise detailed in the accepted test plan. For large-column pumps, model performance testing with reduced NPSHA, pursuant to paragraph 1.07B.4 Performance Testing; Model tests, may be used. Include shaft vibration and case noise at full speed in the test data.
- b. Duplicate the test setup in the manufacturer's test facility as closely as possible the inlet conditions in the proposed installation, using temporary

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

baffles and other means. Where centrifugal pumps are furnished with inlet elbows, inlet adapters, or inlet reducers as a part of the manufacturer's scope of supply, test the pumps with the elbow, adapter, or reducer fitted to the pump. Ensure that specified performance criteria apply to the complete pump assembly, including losses through any elbow, adapter, or reducer. Where submersible pumps are to be furnished with inlet nozzles and/or discharge elbows or adapters, test the pumps with the inlet nozzles or adapters. Ensure that the specified performance requirements apply to the complete pumping assembly, including any inlet nozzles, discharge elbows, or adapters. Ensure that NPSHA does not exceed that specified in the detailed specification during any performance test. Include separate readings for inlet and discharge head for each data point in certified test data.

- c. Take not less than eight test points, including not less than four within plus or minus 8 percent (on the basis of rated flow) of the rated condition (Condition Point A) and not less than two test points within plus or minus 4 percent of the pump's BEP at the test speed. In addition, one test point is sufficient to define head and power requirements at shutoff head, and one test point is sufficient to define flow at Condition Point B.
- 3. NPSH3 Tests: Perform NPSH3 tests to confirm the data used to establish NPSHA margin for each specified operating condition as specified in paragraph 1.04F. Perform NPSH3 tests for submersible wastewater pumps using the method described in Figure 11.6.8 in ANSI/HI 11.6. Extend all NPSH3 tests from 30 percent to 140 percent of best efficiency flow at full speed, or to the upper limit of the AOR as defined by the manufacturer, whichever is less. Cause for rejection is failure to achieve guaranteed performance or performance proposed in accepted submittal documents, whichever is the more restrictive (capacity and head, efficiency or NPSH3). Ensure that tolerances and restrictions are as set forth in paragraph 1.06C.3 Performance Confirmation; Non-witnessed tests, above, for non-witnessed tests.

4. Model Tests:

- a. Where allowed in the detailed specification or upon specific application with adequate justification by the manufacturer, confirmation of performance of large pumps may be demonstrated by testing the prototype at reduced speed or by testing a model of the prototype pump. Perform NPSH3 tests to confirm the data used to establish NPSHA margin for each specified operating condition as specified in paragraph 1.04F. Cause for rejection is failure to achieve guaranteed performance (capacity and head, efficiency or NPSH3). Perform physical model testing at qualified, commercial facilities, with at least 10 years of continuous-duty operation. Conduct all tests in accordance with ANSI/HI 1.6 or 2.6. with the following restrictions:
 - 1) Ensure that if the prototype is tested at reduced speed, the ratio of test speed to prototype speed is not less than 0.66:1.
 - 2) Ensure that model test ratios are not less than 0.33:1, model to prototype.

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

- 3) Ensure that impellers for model tests are not less than 12 inches in diameter.
- 4) Subject impellers for prototype pumps to a model-to-prototype profile comparison using templates ratioed from the impeller used for the completed and accepted model test. Compare impeller profiles for the x, y, and z planes. If model testing is proposed for any or of the specified tests, have the Contractor include the proposed methodology for profile confirmation as a part of the submittal material required under paragraph 1.08. Perform impeller profile comparison with a representative of the Engineer present. Ensure that all costs associated with travel and subsistence of the Engineer's representative are borne by the Contractor.
- 5) Ensure that acceptance criteria, based upon projected prototype performance from model test results using ANSI/HI-approved affinity relationships, areas set forth above under paragraph 1.06C.3 Performance Confirmation: Non-witnessed tests.
- 6) Apply the restrictions set forth above for witnessed tests.
- b. Have the Contractor furnish the Engineer with not less than 2 weeks' advance written notice of the date and place of the model tests.
- 5. Test Certification and Reporting: Certify correct and have notarized by an officer of the pump manufacturer all test results, including test logs and generated curves. Have the Contractor submit test results as product data.

C. Confirmation of Passage Geometry:

- 1. For solids-handling pumps, subject the design waterway passages and mating passages between rotating and stationary portions of such passages to confirmation that no mismatch of exiting and entering angles or angular discontinuities exist in pumps furnished under specification sections containing the words "custom-engineered" in the title, and that are not proven designs in accordance with paragraph 1.04B. Ensure that the confirmation process employs CFD modeling techniques in which mesh generation is optimized and mesh size is reduced in the regions of flow attachment, detachment, and separation regions of the impeller and cutwater to detect angular mismatches of 0.25 degree or greater.
- 2. Use a number of different convergence criteria to assess whether a solution is converged. These criteria may include the residuals given by the software; global imbalances in momentum, energy, etc.; whether key global quantities have reached an equilibrium value; and whether information from various solution monitoring points have stabilized. Note that these monitoring points should be in areas where the flow could be much weaker, and not where the flow could be converged easily. Use high-convergence criteria, and repeat runs with different monitoring points to ensure proper convergence.
- 3. Provide modeling software that is professionally customized and optimized for the determination of pump fluid dynamics, especially flow attachment, detachment, and separation. Verify the mathematical model and software accuracy by experimental data from test cases including similar dynamics. Ensure that the individual conducting the modeling effort is a CFD specialist

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

with graduate-level education in the subject and relevant experience. Submit the model graphic outputs, signed and notarized by the pump manufacturer's officer in charge of engineering, as a part of the documentation required under paragraph 1.08.

1.08 SUBMITTALS

A. Action Submittals:

- 1. Procedures: Section 01 33 00 SUBMITTAL PROCEDURES.
- 2. In addition to the material listed in the detailed specification, provide the following submittals:
 - a. Documentation of successful pump designs or proposed alternatives as specified under paragraph 1.04B.1 Pump Selection. If included as part of the design, include in the documentation applications where pump cans of a similar size have been provided as part of the design.
 - b. A Certificate of Unit Responsibility attesting that the Contractor has assigned unit responsibility in accordance with the requirements of this section and Section 43 05 11 GENERAL REQUIREMENTS FOR EQUIPMENT. No other submittal material will be reviewed until the certificate has been received and found to be in conformance with these requirements.
 - c. A copy of this specification section and the specification sections listed for submittal in the detailed specification sections. Ensure that the specification copies are complete with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Checkmarks (□) denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated and, therefore, requested by the Contractor, underline each deviation and denote by a number in the margin to the right of the identified paragraph. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Accompany the submittal with a detailed, written justification for each deviation. 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 is sufficient cause for rejection of the entire submittal with no further consideration
 - d. A copy of the contract document control diagrams and process and instrumentation diagrams (P&IDs) 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, mark the drawing or drawings as "no changes required." Failure to include copies of the relevant drawings with the submittal is cause for rejection of the entire submittal with no further review.
 - e. Documentation of certification in accordance with ISO 9001 as specified under paragraph 1.06A.

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

- f. Predicted pump performance curves for each condition point specified showing head, power, efficiency, and NPSH3 on the ordinate plotted against capacity (in million gallons per day [mgd]) on the abscissa, along with the Contractor's warranty to meet the requirements specified in paragraph 1.07 Scope. Provide curves for variable-speed pumps to demonstrate operation at speeds required to achieve the specified reduced-speed operating conditions. Ensure that all curves clearly display the specified operating conditions and conformance with POR and AOR limits in the individual specification sections. Provide variable-speed plots showing specified operating conditions and POR limits. Plot curves at increments of not more than 5 percent speed or 50 rpm increments, whichever is less, from full speed to the lowest speed required to meet specified operating conditions. Ensure that curves for column-type pumps show bowl efficiency and allowances for inlet, column, and discharge head losses separately.
- g. NPSH margin calculations performed for each specified operating condition in accordance with paragraph 1.04 as applicable and including the information required under paragraph 1.04F.
- h. Motor submittal information as specified in Section 43 05 21 COMMON MOTOR REQUIREMENTS FOR EQUIPMENT. In addition, include in this information certified calculations for motor rotor and frame reed frequencies, as specified under paragraph 1.04G.
- i. Complete description and sketch of proposed test setup for factory test if a factory test has been required under the detailed specification section or as required by the provisions of this section. Include in submittal material sample calculations and proposed test log format. If the Contractor proposes a model test for a part or all of the specified performance tests, include in the submittal information the proposed model details and a complete description of the proposed method for comparing the model impeller profiles with the impeller profiles for the prototype pumps.
- j. Drawings showing general dimensions and confirming the size of pumps, motors, drives, and specified appurtenances; piping connections; construction details of equipment (including bearings and bearing isolators); wiring diagrams; and weight of equipment.
- k. Driver unit support calculations and data if the driver is separately supported and if the analysis under the requirements of paragraph 1.05B have been required by the terms of these specifications.
- I. Shaft deflection calculations for volute-type pumps: provide calculations to demonstrate compliance with paragraph 1.04E, per the methodology set forth as required by paragraph 1.05B.
- m. Detail drawings of the pump and driver unit foundation demonstrating conformance to this section and Section 43 05 13 RIGID EQUIPMENT MOUNTS. Include in the submittal drawings depicting type, size, number, projection, and arrangement of anchor bolts; dimensional drawings of the sole and baseplates; and dimensional drawings for the concrete supports for both the pump and motor, if applicable. Ensure that drawings also depict other pertinent information, including location of equipment pads and

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

reinforcement; equipment drains; expansion joint locations; elevation of top of grout and grout thickness; elevation of top of baseplate, soleplate, or mounting block; size and location of electrical conduits; and any other equipment-mounting features embedded in equipment pads.

- n. Limiting nozzle loading criteria, if different from that established by ANSI/HI 9.6.2.
- o. The qualifications of the independent testing laboratory and individual personnel proposed by the Contractor to perform field vibration testing, analysis, and reporting in accordance with the requirements of paragraph 3.06.
- p. The qualifications of the personnel proposed by the Contractor to perform field alignment procedures in accordance with the requirements of paragraph 3.04.
- 3. The following are applicable for pumps specified to meet ANSI/HI 9.6.8 Analysis Level 2 or 3:
 - a. Qualifications of the design professional, and firm name, proposed to perform the mass elastic design analyses specified under paragraph 1.05B if the subject analyses are required by the terms of these specifications.
 - b. Descriptive material outlining the methodology and software to be used in the analyses required under paragraph 1.05B.
 - c. "Executive Summary" report of the mass elastic design analyses for pumps as specified in paragraph 1.05B.
 - d. The proposed instrumentation setup for the in situ torsional vibration test specified under paragraph 1.05B.
 - e. Can design documentation specified under paragraph 1.05C, including bolt patterns for the pump base and soleplate on can.
 - f. "Final Report" of the model study specified under paragraph 1.05C.
 - g. Model graphic outputs specified in paragraph 1.07C.

B. Information Submittals:

- 1. Procedures: Section 01 33 00 SUBMITTAL PROCEDURES:
 - a. Performance guarantee as specified in paragraph 1.06C.
 - b. Equipment anchor calculations specified in paragraph 1.04E.
 - c. O&M information specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA
 - d. Motor product data as specified in Section 43 05 21 COMMON MOTOR REQUIREMENTS FOR EQUIPMENT.
 - e. Bearing L-10 life calculations.
 - f. Critical speed calculations demonstrating compliance with paragraph 1.05B if a lateral rotordynamic analysis is required. Otherwise, provide critical speed calculations demonstrating compliance with paragraph 1.04C.
 - g. Nozzle loading information required under paragraph 3.01.

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

- h. Motor balance logs, certified and notarized as specified in paragraph 1.04G.
- i. Certified balance logs and worksheets, as specified in paragraph 2.05.
- j. Installation certification Section 43 05 11-Form A (see Section 01 99 90 REFERENCE FORMS) as specified in paragraph 3.01.
- k. Training certification Section 43 05 11-Form B (see Section 01 99 90 REFERENCE FORMS) as specified in paragraph 3.08.
- If factory tests are specified in the detail specification section, certification
 of satisfactory testing of each unit as specified. Include in the certified
 material copies of test logs and resulting performance curves.
- m. Documentation of field alignment data in accordance with Section 43 05 14 MACHINE ALIGNMENT.
- n. Field vibration test reports in accordance with paragraph 3.06
- C. The following are applicable for pumps specified to meet ANSI/HI 9.6.8 Analysis Level 2 or 3:
 - 1. Results of model tests for pump cans if model tests are required by the provisions for paragraph 1.05C.
 - 2. "Final Report" of mass elastic systems analyses for pumps as specified in paragraph 1.05B.
 - 3. Results of motor rotor, frame, and assembly bump tests, certified as specified under paragraph 1.04G Electric Motors, along with the design professional's "Supplemental Report" as specified under paragraph 1.05B.
 - 4. Pump can installation acceptance certification, as specified in paragraph 3.03, if applicable.
 - 5. Results of field vibration tests as specified under paragraph 3.06.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Where this section and sections referencing this section are silent with respect to materials of construction on any component, have material selection follow the requirements of Table H.1, ANSI/API 610, Materials Class I-1, with the exception that shafts for vertical column-type pumps be 12 percent chromium stainless steel. 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.

B. Pumps:

- 1. Finish for surfaces in contact with pumped fluid:
 - a. Conform all pump components in contact with the pumped fluid to the following requirements.

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

- b. Indicate surfaces to be machine-finished on the shop drawings by symbols that conform to ASME B46.1, Surface Texture, Surface Roughness, Waviness, and Lay. Ensure that machine surfaces are finished to at least the following tolerances:
- c. Nominal roughness:

Surface	Grade, Ref: ASME B46.1 (SI units microns) (Ra: micro inches)
General machine work	3.2 or better (125 Ra)
Flange faces	3.2 or better (125 Ra)
Journal surfaces at sleeve bearings	0.4 or better (16 Ra)
Hydraulic surfaces	
Impeller	4.5 or better (177 Ra)
Impeller bowl and diffuser	6.3 or better (250 Ra)
All other wetted surfaces	6.3 or better (250 Ra)

d. Flaws such as scratches, ridges, holes, peaks, cracks, or checks that will make the part unsuitable will be cause for rejection. Ensure that machinefinished surfaces are thoroughly cleaned and coated with a protective layer of rust preventive. Oil and wrap small pieces, unassembled pipe, or finished bolts with moisture-resistant paper.

2. Materials:

- a. Unless otherwise specified, ensure that wetted cast-iron parts for pumps for solids-bearing liquid services have 2 to 3 percent nickel added to the cast iron.
- b. Provide stainless-steel impellers for the first stage of custom-engineered pumps and elsewhere when specified. Ensure that stainless-steel impellers are ASTM A743, Grade CA6NM. Where cast-nickel aluminum bronze impellers are specified, ensure that the materials conform to ASTM B148, Alloy C95500.
- c. Ensure that materials for shaft sleeves for packed boxes, fretting seals, and interstage seals conform to ANSI/API 610, Annex H 12 percent chromium-hardened or hard-faced 316 austenitic stainless steel. Ensure that materials for seal glands for packed boxes and shaft sleeves are AISI 316 stainless steel. Ensure that fastener parts of all types in wetted areas conform to ANSI/API 610, Materials Class S-5 requirements. Regardless of the seal construction, adequately size seal chambers to accommodate specified mechanical seals.

2.02 GENERAL QUALITY

- A. Ensure that details of manufacture and assembly of equipment furnished under this section and referencing sections follow the requirements of ANSI/API 610 with respect to the following features (paragraph references, ANSI/API 610):
 - 1. Alignment aids (paragraph 6.1.24)

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

- 2. Removal of rotating element (paragraph 6.1.25)
- 3. Jackscrews for assistance in alignment on baseplates and equipment supports (paragraph 9.3.8.3.2)
- 4. Castings (paragraph 6.12.2)
- B. Provide all components or subassemblies weighing 50 pounds or more with at least one lifting eye or a provision for threading in a lifting eye. Provide components 250 pounds or greater with lifting eyes or provisions for at least two lifting eyes. Provide components 1,000 pounds or greater with at least three lifting eyes or provisions for inserting lifting eyes.

2.03 BASEPLATES AND SOLEPLATES

A. Unless otherwise noted in the detailed specification, have the pump manufacturer furnish pumps with baseplates or soleplates conforming to the requirements of Section 43 05 13 RIGID EQUIPMENT MOUNTS. Design baseplates and soleplates to be installed in the housekeeping curb shown, and ensure that they are machined flat and co-planar to within 0.002 inch per foot in all directions on the face mating with the pump and motor or driver support. Ensure that soleplates have the words "THIS SIDE DOWN" permanently affixed to the underside using a welding rod material or stamped prior to milling. Alternative marking methods, using heavy scribing or machining, are acceptable provided that they may be observed following blasting in preparation for coating.

2.04 WEARING RINGS

A. Where specified, fit pumps with both stationary and rotating wearing rings. Except for the difference in hardness between stationary and rotating rings, ensure that wearing rings are stainless steel and conform to the requirements of ANSI/API 610, paragraph 6.7 and material class S-8 (Table H.1, Annex H). Ensure that maximum wearing ring clearances do not exceed 150 percent of the values stated in Table 6, ANSI/API 610. Ensure that minimum wearing ring hardness on the rotating ring is 350 Brinell Hardness Number (BHN), with the stationary ring not less than 100 hardness points greater.

2.05 BALANCE

- A. Ensure that balancing for pumps with suction nozzle sizes 6 inches in diameter and greater and associated components conform to the requirements set forth in ANSI/API 610, paragraph 6.9.4.1 (equivalent to ISO 1940 or ANSI 2.19 Grade 2.5), unless other portions of this project manual impose more restrictive requirements. It is the intent that the components be balanced as an assembly ("rotor") in accordance with ANSI/API 610 definitions. For extended-shaft pumps, balance impeller(s) and shaft up to the first coupling with the line-shaft.
- B. For separately balanced components, perform a residual unbalance inspection after rotor assembly per ANSI/API 610 requirements, as described in Annex J of that document. Provide copies of worksheets and demonstrate that tolerances are

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

- in compliance (i.e., rotor has passed) in addition to other reporting requirements of this paragraph.
- C. Furnish all balance logs, certified correct and signed by the chief engineer or individual in responsible charge of the manufacturing facility, in accordance with paragraph 1.08.
- 2.06 DRIVE UNIT SUPPORTS FOR SEPARATELY SUPPORTED MACHINES AND INTERMEDIATE SHAFT SUPPORTS (NOT USED)
- 2.07 FLYWHEEL ASSEMBLIES (NOT USED)
- 2.08 CANS FOR COLUMN-TYPE PUMPS (NOT USED)
- 2.09 MACHINING
 - A. Unless otherwise specified, provide machined surfaces with a 125 Ra (micro-inch) finish without any grooves, surface imperfections, or machining marks. Ensure that mating surfaces are coplanar within a maximum of 0.002 inch. Ensure that bearing housings and seals have collinear centerlines within less than 0.001 inch total difference. Provide shafts with a 63 Ra (1.6-micron) finish at fit areas (coupling, sleeves, impeller) and 125 Ra (3.2-micron) finish at the clear spans.

PART 3 EXECUTION

3.01 GENERAL

A. With the exception of submersible pumps and the inlet connection for column-type pumps installed in open forebays or wetwells, connect pump inlet and discharge nozzles to field piping using equipment connection fittings conforming to the requirements of Section 40 05 06.16 PIPING CONNECTIONS. Select restraining rods on equipment connection fittings that is designed specifically to restrain the unbalanced hydraulic thrust developed by the pump when operating at full speed against a closed valve. Torque all restraining rod nuts to ensure that any moment or shear transmitted to the pump nozzles is within the values permitted under ANSI/HI 9.6.2, or that permitted by the equipment manufacturer, whichever is greatest. Where ANSI/HI 9.6.2 is silent with respect to any particular aspect of allowable nozzle loads, have the Contractor follow the written requirements provided by the equipment manufacturer. Install all pumps furnished under specification sections containing the words "custom-engineered" in the title under the presence of a factory-authorized installation specialist or specialists. Ensure that under no circumstances does any installation procedure take place without the installation specialists present. Ensure that equipment installation procedures conform to the requirements of Section 43 05 13 RIGID EQUIPMENT MOUNTS. Upon completion of installation work, have the Contractor submit a complete, properly signed certification Form 43 05 11-A as specified in Section 01 99 90 REFERENCE FORMS.

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

3.02 SOLEPLATES

A. Level soleplates, if provided pursuant to this section or any section referencing this section, or where required by the equipment manufacturer's recommendation, in the presence of a factory-authorized installation specialist to a maximum tolerance of 0.002 inch per foot in all directions. Where the equipment manufacturer requires more stringent tolerances, those tolerances prevail.

3.03 PUMP CANS (NOT USED)

3.04 ALIGNMENT

A. Ensure that journeymen millwrights perform alignment of equipment furnished under this section and any referencing section. Carpenters, laborers, or any other trades are specifically excluded from performing this work. In locations where such trades are not available, have the Contractor retain the services of a firm specializing in this type of work to perform the setting and alignment work. Have the Contractor submit the qualifications of the proposed firm to the Engineer for acceptance prior to performing the work. Ensure that the Engineer personally witnesses final alignment procedures for each item of equipment as a condition precedent to beginning any work required under Section 01 45 33 MANUFACTURERS' FIELD SERVICES. Ensure that alignment techniques conform to the requirements of Section 43 05 14 MACHINE ALIGNMENTS.

3.05 FIELD TESTING

- A. Ensure that field testing conforms to the requirements of Section 01 91 14 TESTING AND STARTUP.
- B. Unless otherwise specified in the detailed specifications, field-test centrifugal pumps for lateral vibration in accordance with paragraph 3.06B. Ensure that "custom-engineered" pumps additionally undergo field torsional vibration testing (paragraph 3.07A).

3.06 FIELD VIBRATION TESTS

A. Qualifications:

1. Ensure that the Contractor retains the services of an independent testing laboratory to conduct the testing work specified under this paragraph. Ensure that the work is directed by a professional mechanical engineer, registered to practice in any one of the 50 states composing the United States. Ensure that the engineer (hereinafter termed "professional vibration analysis specialist") is a graduate of a college holding Accreditation Board for Engineering and Technology Inc. (ABET) accreditation in mechanical engineering and has been engaged in the practice of providing the type of monitoring services required under this paragraph for rotating machinery. Submit the professional vibration analyst's qualifications and references, certified and notarized, for review and acceptance by the Engineer not less than 6 weeks prior to the date scheduled for the field vibration test work specified herein. Ensure that the Engineer

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

- reviews the required documentation and references and indicates acceptance or rejection of the proposed analyst's qualifications within 14 days of submission. If the analyst proposed by the Contractor is rejected, have the Contractor propose an alternative choice with appropriate documentation.
- 2. Ensure that the independent testing laboratory's testing team (comprising the professional vibration analysis specialist and any technicians required to complete the specified tasks) is fully equipped to provide continuous pressure, velocity, and displacement values for rotating equipment installed under the requirements of this section. Ensure that vibration testing equipment includes sufficient calibrated pressure and flow monitoring devices to determine pump operating conditions as well as vibration levels.

B. Vibration Tests:

1. Ensure that the RMS vibration velocity does not exceed the limits established in ISO 10816-3 for electric motors (Table A.1 or A.2, Zone Boundary B/C, with flexible or rigid support determined by paragraph 1.05B.5.a.1)f)(4) Critical Speed Analysis and System Design; Methodology; Lateral rotor and structural dynamic analyses), ISO 10816-6 for reciprocating engine drives (Table A.1, classification number 3, Zone B), ISO 10816-7 Category II for pumps (Table A.1 or A.2, Zone B), and ISO 10816-1 for other rotating components such as support bearings and flywheels (Annex B, Table B.1, Class I, II, or III, Zone B) at any specified continuous-duty operating condition when the pump is operating within the POR. Ensure that measurement locations correspond to guidelines provided in the specific ISO 10816 section for the machine being evaluated (motor, engine, pump, or other component). When operating at any combination of conditions outside the POR for any pump, regardless of type, ensure that limiting values are 30 percent greater than the above limits, as indicated in the following table.

Pumping System Component Vibration Limits

Component	Standard	Applicable range	Notes	Inside POR (in./sec- RMS)	Outside POR (in./sec-RMS)
Motors	ISO 10816-3 Table A.2	15 kilowatts (kW) to 300 kW >300 kW	Rigid base*	0.110 0.177	
Motors	ISO 10816-3 Table A.2	15 kW to 300 kW >300 kW	Flexible base*	0.177 0.280	
Pumps (2 or more vanes)	ISO 10816-7 Table A.1	<pre><268 hp >268 hp</pre>		0.201 0.240	0.261 0.312
Additional for pumps 600 rpm or less	ISO 10816-7 Table A.2	Filtered amplitudes at 1/2X, 1X and 2X	Values are displacement (not velocity)	3.15 mils p-p	3.94 mils p-p
Single vane pumps	ISO 10816-7 Table A.1	<pre><268 hp >268 hp</pre>	Increase 2 or more vane values by 50%	0.302 0.360	0.392 0.468
Support	ISO 10816-1		Class 1: 5 kW	0.071	

APRIL 2022

ATTACHMENT E - TECHNICALS

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

Pumping System Component Vibration Limits

Component	Standard	Applicable range	Notes	Inside POR (in./sec- RMS)	Outside POR (in./sec-RMS)
bearings,			Class II: 75 kW	0.110	
flywheels			Class III: >75kW	0.177	

^{*}Rigid or flexible base determined by analysis using ANSI/HI 9.6.8 methodology.

2. Provide vibration test reports as an information submittal in accordance with paragraph 1.08, and provide the signature of the responsible professional vibration analysis specialist. Ensure that the vibration spectra is of sufficient resolution for legibility of magnitude and frequency data to be properly reviewed by the Engineer. Cascade diagrams are not sufficient for variable-speed drive application unless supported by the required data in a format suitable for more detailed analyses. Provide separate spectra at the maximum and minimum operating speeds and any potential resonant frequencies.

3.07 FIELD TORSIONAL VIBRATION TESTING

A. As required in paragraph 1.05 for custom-engineered pumps, perform field torsional vibration tests under the direct supervision of the design professional responsible for the mass elastic system design on an installed pumping unit selected by the Engineer.

3.08 TRAINING

A. Ensure that training conforms to the requirements of Section 01 78 23 OPERATION AND MAINTENANCE DATA and includes separate training sessions for each operator shift maintained by the City and a separate session for maintenance personnel. Unless otherwise specified in the referencing section, the training requirement is waived for constant-speed pumping equipment with suction nozzle sizes 6 inches in diameter and smaller and for pumps with connected power requirements 10 hp and less. Ensure that the training session for maintenance personnel includes a comprehensive presentation, employing cut-away models or comparable graphics, and documentation on the step-by-step disassembly and subsequent reassembly of a pumping unit. Upon completion of training requirements, ensure that the Contractor submits certified Form 43 05 11-B as specified in Section 01 91 14 TESTING AND STARTUP and Section 01 99 90 REFERENCE FORMS.

END OF SECTION

GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

SECTION 43 23 89.13

HORIZONTAL VARIABLE-SPEED, NON-CLOG CENTRIFUGAL PUMPS

PART 1 GENERAL

1.01 SUMMARY

- A. This section specifies horizontal non-clog, end suction, frame mounted centrifugal pumps for pumping screened wastewater through an oxygenation side stream at variable speed.
 - Equipment furnished under this section shall conform to the requirements of this section and to the requirements in Section 43 23 03 GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS.

B. Equipment List

Item	Equipment Number
Side Stream Pump	PMP-0012-1
Side Stream Pump Motor	M-0012-1
Side Stream Pump VFD	VFD-0012-1

1.02 RELATED SECTIONS

- 1. Section 26 29 23 VARIABLE FREQUENCY MOTOR CONTROLLERS
- 2. Section 43 05 11 GENERAL REQUIREMENTS FOR EQUIPMENT
- Section 43 05 13 RIGID EQUIPMENT MOUNTS
- 4. Section 43 05 14 MACHINE ALIGNMENT
- Section 43 05 21 COMMON MOTOR REQUIREMENTS FOR EQUIPMENT.
- 6. Section 43 23 03 GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS

1.03 REFERENCES

- A. This section contains references to the following documents. These references 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. If requirements of this section conflict with those of the listed documents, requirements of this section prevail.
- B. Unless otherwise specified, reference documents refer to documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if no Bids). If referenced documents have been discontinued by the issuing organization, refer to replacement documents issued or otherwise identified by that organization. If there are no replacement documents, refer to the last version of the document before it was discontinued. Where document dates are given in the following listing, those documents refer to the specific document version associated

HORIZONTAL VARIABLE-SPEED, NON-CLOG CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

with that date, regardless of whether the document has been superseded by a version with a later date, discontinued, or replaced.

Reference	Title
ASTM A48 -REV A	Gray Iron Castings
ASTM A216/A216M	Steel Castings, Carbon, Suitable for Fusion Welding, for High Temperature Service
ASTM A395	Ferrite Ductile Iron Pressure Retaining Castings for Use at Elevated Temperatures
ASTM A536	Ductile Iron Castings
Hydraulic Institute Standards	Standards of the Hydraulic Institute, 14th Edition

1.04 DEFINITIONS

- A. Terminology used in this section conforms to the following definitions:
 - 1. Equipment pad: concrete foundation (block or slab) supporting and elevating equipment mounts above the supporting structural floor slab or local grade.
 - Mounting pads: thickened or raised areas of baseplates and soleplates where the feet or mounting surfaces of mounted equipment and drivers rest on the baseplate or soleplate.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination

- Coordinate pump and motor operational and starting characteristics with adjustable frequency drive settings used for control of this equipment. Include the following:
 - a. Motor minimum operational speed
 - b. Motor maximum operational speed
 - c. Motor ramp-up and ramp-down speed, voltage, and frequency requirements
 - d. Other operating limits imposed by the driven equipment for operation and warranty.

B. Unit Responsibility

- Assign unit responsibility, as specified in Section 43 05 11 GENERAL REQUIREMENTS FOR EQUIPMENT, to the pump manufacturer for the equipment, including seal water unit, specified in this section and the variablefrequency drive controllers specified in Section 26 29 23 VARIABLE FREQUENCY MOTOR CONTROLLERS.
- 2. Provide a completed and signed Unit Responsibility Certification Form (Form 43 05 11-C, Section 01 99 90 REFERENCE FORMS).

HORIZONTAL VARIABLE-SPEED, NON-CLOG CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

1.06 SUBMITTALS

A. Action Submittals

- 1. Comply with procedures described in Section 01 33 00 SUBMITTAL PROCEDURES.
- Comply with requirements of Section 43 23 03 GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS. Sections to be marked-up and submitted in accordance with Section 43 23 03 GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS requirements include:
 - a. This section
 - b. Section 43 05 11 GENERAL REQUIREMENTS FOR EQUIPMENT
 - c. Section 43 05 13 RIGID EQUIPMENT MOUNTS
 - d. Section 43 05 14 MACHINE ALIGNMENT
 - e. Section 43 05 21 COMMON MOTOR REQUIREMENTS FOR EQUIPMENT
 - f. Section 43 23 03 GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS
 - g. Provide coordination items required for proper setup of the seal water unit as specified in paragraph 2.06.

B. Informational Submittals

- 1. Comply with procedures described in Section 01 33 00 SUBMITTAL PROCEDURES.
- 2. Submittals shall conform to the requirements of Section 43 23 03 GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS.
- 3. Provide letter of confirmation of suitability of variable frequency drives being provided by the Contractor in accordance with Section 26 29 23 VARIABLE FREQUENCY MOTOR CONTROLLERS.
- 4. Provide coordination items required for proper setup of the variable frequency drives as specified in paragraph 1.05 Coordination.

C. Closeout Submittals

- Comply with procedures described in Section 01 78 23 OPERATION AND MAINTENANCE DATA.
- 2. Provide operating and maintenance submittals as specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA.
- 3. Submit Installation Certification Form 43 05 11-A as specified in paragraph 3.01.
- 4. Submit Training Certification Form 43 05 11-B as specified in paragraph 3.02.
- 5. Spare Parts
 - a. Comply with procedures described in Section 01 33 00 SUBMITTAL PROCEDURES.

HORIZONTAL VARIABLE-SPEED, NON-CLOG CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

- b. Provide the following spare parts:
 - 1) One complete rotating assembly, including: bearing frame, bearings, shaft, shaft sleeve, mechanical seal, impeller, impeller wear ring, impeller washer, and impeller locking bolt.
 - 2) One spare case wear ring
 - 3) One set of all pump gaskets

1.07 QUALITY ASSURANCE

A. Certifications

- 1. Manufacturers proposing to furnish equipment specified under this section shall hold current certification under ISO 9001-2001.
- 2. Application for certification under ISO 9001 is not an acceptable substitute for current certification. Documentation attesting to current certification shall be signed by an officer of the manufacturer's corporation and notarized.

B. Critical Speeds

1. Critical speeds shall be in accordance with Section 43 23 03 GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS-1.04 except when the title of the detailed section includes "Custom Engineered" in which case Section 43 23 03 GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS -1.05 applies.

C. Vibration Limits

1. Vibration limits shall be in accordance with Section 43 23 03 GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS -3.06 and subject to field testing in accordance with paragraph 3.04.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Comply with procedures described in Section 01 61 00 COMMON PRODUCT REQUIREMENTS.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. The following candidate manufacturers are capable of producing equipment and/or products satisfying the requirements of this section. The manufacturer's standard product may require modification to conform to specified requirements:
 - 1. Flowserve (model: 4MF16B, 6MF16A)
 - 2. Sulzer (model: A33, APP33, APP44)
 - 3. Cornell
 - 4. Peerless
 - 5. Patterson
 - 6. Approved equal

HORIZONTAL VARIABLE-SPEED, NON-CLOG CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

2.02 TYPE

A. ANSI horizontal, end suction, centrifugal pumps capable of variable speed.

2.03 PERFORMANCE/DESIGN CRITERIA

A. General

- 1. The pump shall be designed to pump screened wastewater and operate without clogging or fouling caused by material in the pumped fluid at any operating condition within the range of service specified.
- 2. The pump shall be designed to operate without cavitation and the motor and pump combination shall operate without vibration over the specified range of conditions. The pump head capacity curve shall slope in one continuous curve with no point of reverse slope inflection.
- 3. All components shall be designed to safely withstand forces resulting from flow reversals up to 125 percent of maximum speed within the pump during shutdowns caused by power failure.
- 4. The complete pumping unit shall be designed to operate without overload at any point between shutoff head and Condition B.

B. Service Conditions

Description	Value
Equipment number	PMP-0012-1
Area exposure	Per Section 26 05 00
Fluid type	Unscreened municipal wastewater containing up to 300 mg/L of suspended solids consisting of organic and inorganic materials, rock, grit, petroleum products, and grease
Fluid temperature	40 to 75 degrees F

C. Operating Conditions

Operating Condition	Value
Equipment number	PMP-0012-1
Full Speed Operation, Condition A a, d	
Capacity, gpm	1650
Total head, feet	235
Net positive suction head available (NPSHA), feet	28
Full Speed Operation Condition B b, d	
Capacity, gpm	1800
Total head, feet	216
NPSHA, feet	29

HORIZONTAL VARIABLE-SPEED, NON-CLOG CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

Operating Condition	Value
Equipment number	PMP-0012-1
Reduced Speed, Condition C °	Not Specified
Capacity, gpm	
Total head, feet	
NPSHA, feet	

Notes:

- a. Condition A shall be taken as the rated operating condition. Performance at the rated condition shall be guaranteed in accordance with Section 43 23 03 GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS. Condition A has been selected to obtain the rated pumping capacity for the installation. It is not intended that the pumps be selected for maximum efficiency at Condition A. Pumps furnished under this section shall be selected to achieve Condition A performance, and shall operate continuously without objectionable vibration or cavitation at the head specified under Condition B. Condition A shall be located within the Preferred Operating Region as established by the pump manufacturer in accordance with ANSI/HI 9.6.3 and listed in the manufacturer's published application data.
- b. Condition B head is presented to indicate operating conditions when the pump is operating at maximum speed against minimum anticipated system head, assuming a hypothetical head-capacity curve. Condition B shall be used for pump selection. Condition B shall be located within the Preferred Operating Region as established by the pump manufacturer in accordance with ANSI/HI 9.6.3 and listed in the manufacturer's published application data for the specific model proposed for this application.. Pumps with head-capacity curves steeper than that assumed will produce somewhat less flow at somewhat lower head. The reverse will occur with pumps having a shallower head-capacity curve. Proposed pump selections meeting this discharge head requirement by operating the equipment at less than full speed will be rejected. NPSHA, as listed for Condition B is calculated on a pumped flow of 1800 gpm.
- c. Condition C is the anticipated continuous duty minimum speed condition. Pumps furnished under this specification shall be capable of sustained (24 hours per day) operation at this condition within the requirements set forth in Section 43 23 03 GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS. Condition C shall be located within the Preferred Operating Region as established by the pump manufacturer in accordance with ANSI/HI 9.6.3 and listed in the manufacturer's published application data for the specific model proposed for this application.
- d. Total head in the above tabulation is the algebraic difference between the discharge head and suction head as defined in ANSI/HI 1.1 1.6. NPSHA in the above tabulation refers to the pump inlet piping at centerline elevation as shown and is calculated in accordance with ANSI/HI 1.3 for average barometric pressure and maximum temperature conditions. NPSHA at the pump impeller eye can be determined by adjusting the given value by proposed pump dimensions and the indicated requirements for pump installation details. An allowance of five feet has been included for the presence of volatile constituents in the pumped fluid. Required NPSHA margin shall be as specified in Section 43 23 03 GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS.

D. Design Requirements

Item	Value
Equipment number	PMP-0012-1
Pump	
Rigid sphere, inches diameter (min.), capable of pass through the pump from inlet to discharge	3

APRIL 2022 ATTACHMENT E - TECHNICALS HORIZONTAL VARIABLE-SPEED, NON-CLOG CENTRIFUGAL PUMPS

Item	Value
Equipment number	PMP-0012-1
Minimum efficiency at best efficiency point (BEP) at maximum speed, percent ^a	70
Piping connection size, inches, minimum	
Pump inlet	8
Pump discharge	6
Operating speed, rpm, maximum	1,800
Operating speed, constant or variable	Variable
Approximate pump suction centerline elevation, feet, NAVD 88	70
Motor (See Section 43 05 21)	
Horsepower	150
Type (See Section 43 05 21)	Project defined TEFC – (Corrosion) Severe Duty, Enclosed
Inverter duty	Yes
Space heater	No
Thermal protection	Yes
Temperature sensors	Provide Vibration and
(see Section 40 74 00 for additional specifications and requirements)	Temperature Monitoring.
Ambient duty rating, degree C	+40
Operating speed, rpm, maximum	1,800
Voltage rating	460 volt, 3 Phase
Hazardous rating	None
Reversing motor	No
Multispeed motor	No
Motor starting type	Variable frequency drive, coordinate for proper starting of driven equipment

Note:

E. Vibration and Critical Speeds

1. The pumps shall comply with the requirements of Section 43 23 03 GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS -1.04.

HORIZONTAL VARIABLE-SPEED, NON-CLOG CENTRIFUGAL PUMPS

APRIL 2022 ATTACHMENT E - TECHNICALS

The minimum acceptable efficiency at BEP at the speed required to achieve the performance specified under Condition Points A and B. The minimum acceptable efficiency is not necessarily required to be associated with any operating condition specified in paragraph 2.03.B Operating Conditions.

2.04 SYSTEM OPERATION

- A. The pump will obtain wastewater via a connection to an existing pipeline connected to the wet well. Under normal operating conditions, flooded suction conditions are available. The pump will be located on Level D2 inside a ventilated pump station building. The pump will be controlled by the oxygenation system. Additionally, the pump operation will be interlocked with the station pumps. In auto mode, the side stream pump will not operate if the station pumps are not operating. Pump will discharge to the oxygenation system to be located on Level B1 and then via two connections to an existing force main located on Level D1 of the station building.
- B. The pump motor has been sized to be non-overloading from shutoff head through the specified operating conditions. The pump control strategy should adjust pump speed to prevent the pump from operating at higher flow rates beyond the specified conditions in order to avoid motor overload. Alternatively, speed could be adjusted to prevent overload by monitoring power demand or torque.

2.05 MATERIALS

A. General

 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 to provide greater strength or meet required stress limitations. However, alternative materials must provide at least the same qualities as those specified for the purpose.

B. Pumps

1. Pump materials shall be as follows:

Component	Material
Casing and nozzles	Ductile iron, ASTM A395
Shaft	Steel, AISI 1045, or SAE 4140
Frame	Cast iron, ASTM A48
Impeller	Ductile iron, ASTM A536 or A 395, cast iron, ASTM A48, or cast steel ASTM A216

2.06 COMPONENTS

A. Casing and Backhead

- 1. The casing shall be foot mounted and provided with bosses for suction and discharge gage connections and casing drain.
- 2. The back head shall permit removal of the impeller, shaft, and bearings without disturbing piping connections.
- 3. The back head shall be provided with a "big bore" seal chamber to allow installation and ease of access to larger cartridge seals.

HORIZONTAL VARIABLE-SPEED, NON-CLOG CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

B. Impeller

- 1. The pump impeller shall be open or reverse vane, single-suction type, screwed to the shaft, and sealed with an O ring.
- 2. Pump shall be provided with external adjustment of impeller clearance.
- 3. Provide wearing rings for the impeller and the suction nozzle.

C. Shaft

 The shaft, where inside the stuffing box, ensure that the seal does not require a shaft reduction in size as specified in paragraph 43 05 11 GENERAL REQUIREMENTS FOR EQUIPMENT -2.04 Shaft Packing.

D. Mechanical Seal

- Mechanical seals shall be provided as specified in paragraph 43 05 11 GENERAL REQUIREMENTS FOR EQUIPMENT -2.04 Mechanical Seals, with modification that double seal shall be provided to prevent leakage of the pumped fluid.
- 2. Seal liquid shall be provided by adding an external seal water system.

E. Bearing and Bearing Isolators

 Bearings and bearing isolators shall be provided as specified in paragraphs 43 23 03 GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS -1.04 Bearing Isolators and Pump Shaft Seals.

F. Motors

 Pumps shall be driven by motors conforming to the requirements of paragraph 2.03 Design Requirements, Section 43 23 03 GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS, and Section 43 05 21 COMMON MOTOR REQUIREMENTS FOR EQUIPMENT.

G. Seal Water System

- 1. Pump manufacturer shall have unit responsibility for providing the seal water system. The side stream pump seal water unit shall be installed in parallel to the existing seal water control units for the existing Penasquitos conveyance pumps. The new side stream system shall tap into the existing clean seal water supply and include, at a minimum, the following components:
 - a. manual isolation valve for maintenance
 - b. strainer
 - c. pressure regulator, set as recommended by pump manufacturer
 - d. rotameter
 - e. pressure gauge
 - f. automatic solenoid to be controlled by the oxygenation system
 - g. globe valve for flow rate calibration
 - h. flow switch for seal water confirmation signal to oxygenation system
 - i. flexible hose to mechanical seal

HORIZONTAL VARIABLE-SPEED, NON-CLOG CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

- j. drain hose to floor drain
- k. interconnecting pipe, reducers, bushings, taps, etc. as required

2.07 EQUIPMENT MOUNTS

A. Mounting Plates

- 1. Mounting plates shall be Fabricated Steel Frame per Section 43 05 13 RIGID EQUIPMENT MOUNTS.
- 2. Mounting plate shall be leveled to 0.005 inch/foot or less.
- 3. Pump and motor shall be mounted on a common baseplate.
- 4. Baseplate shall collect, contain, and direct seal water leakage to a single outlet.

B. Grout Type

 Use cementitious non-shrink grout per Section 03 62 13 NON-METALLIC NON-SHRINK GROUT

C. Equipment Anchors

1. Install per Section 43 05 13 RIGID EQUIPMENT MOUNTS

D. Equipment Anchor Sleeves

- 1. Install per Section 43 05 13 RIGID EQUIPMENT MOUNTS.
- 2. Length shall not be less than 15D (D = nominal bolt diameter; bolt diameter determined by mounting plate manufacturer).

E. Equipment Pad

1. Install per Structural typical details drawing.

2.08 FINISHES

- A. Prime coat shall be shop applied epoxy coating with a minimum thickness of 16 mils dry film thickness.
- B. Finish coat shall be field-applied, using coating material and thickness recommended by the manufacturer of the prime coat epoxy.

2.09 SOURCE QUALITY CONTROL

A. Hydrostatic Tests

- 1. Factory test all pressure sustaining parts.
- 2. Conform to the requirements of paragraph 8.3.2 of ANSI/API 610.
- 3. Hold castings at the test pressure for 30 minutes for all pumps with discharge nozzles 14 inches in diameter and less, and 60 minutes for pumps with discharge nozzles 16 inches in diameter and greater.
- 4. Certify correct and notarize by an officer of the pump manufacturer's corporation.

B. Performance Tests

HORIZONTAL VARIABLE-SPEED, NON-CLOG CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

1. Subject each pump to non-witnessed performance testing in accordance with section 43 23 03 GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS to verify full range of operating conditions.

PART 3 EXECUTION

3.01 EQUIPMENT MOUNTING

- A. Comply with procedures described in Section 43 05 13 RIGID EQUIPMENT MOUNTS.
- B. Position equipment pad and equipment anchors for final placement of equipment.
- C. Use a bolting template to position equipment anchors.
- D. Level mounting plates.
- E. Pour grout bed supporting each mounting plate.
- F. Eliminate grout voids below mounting plate.
- G. Tension equipment anchors.
- H. Provide a completed Form 43 05 13-A Section 01 99 90, for each equipment installation.

3.02 ALIGNMENT

A. Comply with procedures described in Section 43 05 14 MACHINE ALIGNMENT.

3.03 FIELD QUALITY CONTROL

- A. Field Testing:
 - 1. Perform lateral vibration testing as specified in Section 43 23 03 GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS.
 - 2. Include in the bid all costs for services of Testing Firms and Design Professionals performing these services.
- B. Manufacturer Services
 - 1. On-Site Inspections and Training
 - a. Provide a factory-trained manufacturer's representative at the Site for the following activities. Specified durations do not include travel time to or from Site.
 - 1) Installation inspections
 - a) Assist, supervise, and inspect the Contractor's activities during installation.
 - b) Provide 4 inspection hours.

HORIZONTAL VARIABLE-SPEED, NON-CLOG CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

- c) Provide a completed Form 43 05 11-A, Section 01 99 90 REFERENCE FORMS.
- 2) Component test phase inspections
 - Assist, supervise, and inspect the Contractor's activities during the system test phase specified in Section 01 91 14 TESTING AND STARTUP and this Section.
 - b) Provide 4 inspection hours.
- 3) System test phase inspections
 - Assist, supervise, and inspect the Contractor's activities during the system test phase specified in Section 01 91 14 TESTING AND STARTUP.
 - b) Provide 4 inspection hours.
- 4) Operational test phase inspections
 - Assist, supervise, and inspect the Contractor's activities during the operational test phase specified in Section 01 91 14 TESTING AND STARTUP.
 - b) Provide 8 inspection hours.
- 5) Training sessions
 - a) Comply with procedures described in Section 01 43 33 MANUFACTURERS' FIELD SERVICE.
 - b) Provide a minimum of four [4] hours classroom training for each training session.
 - c) Conduct two training sessions, one training session per week on two consecutive weeks to accommodate the shift schedules of operation and maintenance staff.
 - d) Certify completion of training on Form 43 05 11-B, Section 01 99 90 REFERENCE FORMS.
- 2. Off-Site Training (Not Used)

3.04 SYSTEMS STARTUP

- A. Comply with procedures described in Section 01 91 14 TESTING AND STARTUP.
- B. Preoperational (factory) testing
 - 1. See paragraphs 1.07 and 2.09
- C. Component testing
 - Complete lateral vibration testing of all pumps in accordance with Section 43 23 03 GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS.
- D. System testing
 - 1. If vibration testing reveals that operation is impaired by poor operation of ancillary equipment (sticking check valves, plugged air/vacuum reliefs, improperly torqued flanges, etc.), repair ancillaries and retest pumps if directed by the Owner.

HORIZONTAL VARIABLE-SPEED, NON-CLOG CENTRIFUGAL PUMPS

APRIL 2022

ATTACHMENT E - TECHNICALS

2. After Owner/Engineer review of the Vibration Design Professional's draft and final reports for lateral and torsional vibration participate with the Owner and Engineer to make required adjustments to the pumping control strategy to avoid damaging vibrations, protect the pumps, and meet performance requirements.

END OF SECTION

HORIZONTAL VARIABLE-SPEED, NON-CLOG **APRIL 2022 CENTRIFUGAL PUMPS** ATTACHMENT E - TECHNICALS

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE LEFT INTENTIONALLY BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS HORIZONTAL VARIABLE-SPEED, NON-CLOG CENTRIFUGAL PUMPS 43 23 89.13 - 14

SECTION 46 31 59 CLEANING REQUIREMENTS FOR OXYGEN SERVICE

PART 1 – GENERAL

1.01 SUMMARY

- A. This Section covers the work required of the Cleaning Subcontractor to provide field cleaning services for all equipment and piping used with gaseous oxygen, and vented gaseous oxygen by the methods outlined in this Section.
- B. This Section also covers the work required of the Oxygenation System as defined in Section 46 51 50, to provide factory cleaning services for all instrumentation, equipment and piping used with gaseous oxygen, and vented gaseous oxygen by the methods outlined in this Section.
- C. Contractor will install the equipment provided by the Oxygen System Supplier, and install the interconnecting piping, valves, and instruments in between the oxygen system components. Contractor is to provide the services of the specialty Cleaning Subcontractor.
- D. This Section specifies cleaning materials, methods, and inspections which shall be used by the Cleaning Subcontractor during field cleaning and by the Supplier of equipment and piping systems (including in-line components and instrumentation) to prepare the oxygen system for safe operation. It also includes the requirements for post-cleaning protection, identification, and other functions related to cleaning.
- E. The Cleaning Subcontractor shall be fully and solely responsible for all damages resulting from inadequate cleaning of equipment and piping for oxygen service and for any hazards which occurs as part of the cleaning process.
- F. The Cleaning Subcontractor shall have sole responsibility to ensure that all equipment, piping, tubing, valves, instrumentation, and vessels which are for use with gaseous oxygen, oxygen off gas, and vented gaseous oxygen, have been cleaned and recleaned if necessary, and comply with this section when placed into service.
 - 1. The Cleaning Subcontractor shall be responsible for protecting existing field devices, valves, instruments, etc. from damage during field cleaning operations.
 - 2. The Contractor shall remove instruments and other devices from existing air piping as directed by the specialty Cleaning Subcontractor, and for providing block-outs and plugs, so that cleaning operations may be conducted.
- G. The Supplier shall have sole responsibility to ensure that all equipment, piping, tubing instrumentation, vessels furnished by the Supplier and combined systems thereof, which are for use with gaseous oxygen, oxygen off gas, and vented gaseous oxygen, have been processed, cleaned and packaged for oxygen service, delivered to the site oxygen cleaned, and recleaned if necessary, and comply with this section when placed into service.

APRIL 2022

CLEANING REQUIREMENTS FOR OXYGEN SERVICE

ATTACHMENT E - TECHNICALS

1.02 RELATED SECTIONS

- A. This section contains specific references to the following related sections. Additional related sections may apply that are not specifically listed below:
 - 1. 46 51 50 Oxygenation System

1.03 REFERENCES

- A. Cleaning shall conform to the latest editions or version in effect at the time of completing the work of the following association, society, or entity named below:
 - 1. Compressed Gas Association (CGA)
 - a. CGA G-4.1 Cleaning Equipment for Oxygen Service
 - 2. ASTM
 - a. G88 Standard Guide for Designing Systems for Oxygen Service
 - b. G93 Standard Practice for Cleaning Methods and Cleanliness Levels for Material and Equipment Used in Oxygen-Enriched Environments
 - 3. Society for Protective Coatings (SSPC)
 - a. SSPC Pictorial Standard CSa2

1.04 SUBMITTALS

A. Action Submittals:

- 1. Procedures: Section 01 33 00.
- A copy of this specification section, and those listed above in Related Sections with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements.
- 3. Check-marks (✓) shall denote full compliance with a paragraph as a whole. Deviations shall be underlined and denoted by a number in the margin to the right of the identified paragraph. The remaining portions of the paragraph not underlined will signify compliance on the part of the Supplier or Cleaning Subcontractor with the specifications. Include a detailed, written justification for each deviation. 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.
- 4. For factory-cleaned equipment, the Supplier shall provide certification of cleaning meeting applicable standards and submit to the Design-Builder a copy of the inspection records for all equipment cleaned for oxygen service. The inspection record for each item shall include the following information:
 - a. A designation of the item covered.
 - b. Serial number.
 - c. Invoice number or other means of identification.
 - d. Cleaning specification and method employed, including the following information:

APRIL 2022

CLEANING REQUIREMENTS FOR OXYGEN SERVICE

ATTACHMENT E - TECHNICALS

- 1) Degree of cleaning in measurable terms.
- 2) Acceptable cleaning procedures.
- 3) Inspection procedures required and method of inspection and testing to ensure the desired level of cleaning.
- 4) Acceptable cleaning materials.
- 5) Acceptable lubricants, sealants, and testing equipment.
- 6) Procedures and requirements to comply with this Section.
- 7) Packaging, protection, and storage of cleaned items.
- e. Qualifications including experience description and references.
- f. Dates of inspection.
- g. Methods of inspection.
- h. Results of inspection.
- i. Inspector's signature and date signed.
- 5. For field-cleaned equipment, the Cleaning Subcontractor shall submit information on the field cleaning plan, which includes the following:
 - a. Degree of cleaning in measurable terms.
 - b. Acceptable cleaning procedures.
 - c. Inspection procedures required and method of inspection and testing to ensure the desired level of cleaning.
 - d. Acceptable cleaning materials.
 - e. Acceptable lubricants, sealants, and testing equipment.
 - f. Packaging, protection, and storage of cleaned items.
 - g. Proposed methodology for completely removing the chemical from the piping and equipment being cleaned, prior to testing and start-up of that equipment.
 - h. Schedule of the Work including durations of required shutdowns.
 - Qualifications including experience description and references.

B. Informational Submittals:

- 1. Procedures: Section 01 33 00
- Certification of satisfactory field cleaning of each unit as specified. The certified
 material shall include product information on all materials used, step-by-step actions,
 and resulting performance.

1.05 QUALITY ASSURANCE

A. Cleaning requirements:

1. All cleaning performed shall be performed in accordance with the requirements of CGA Publication No. G-4.1 in addition to the specific requirements in this Section.

B. Cleaning Subcontractor qualifications:

1. Experience minimum: 5 years in providing field cleaning services for equipment in oxygen service in accordance with CGA Publication No. G-4.1.

APRIL 2022

CLEANING REQUIREMENTS FOR OXYGEN SERVICE

ATTACHMENT E - TECHNICALS

- C. All cleaning and passivation procedures shall be supervised and monitored by a person skilled and experienced in cleaning oxygen equipment cleaning.
 - 1. This person shall be responsible for monitoring the cleaning and for determining whether a component is cleaned properly.
- D. For any components for oxygen service delivered to the jobsite uncleaned, the Design-Builder will either return to the Supplier or require field-cleaning, both at the expense of the Supplier.
- E. Supplier's Cleaning Subcontractor shall inspect any equipment and in-line components cleaned by the Supplier before delivery to the jobsite for adequate cleaning and packaging.
- F. The Contractor will check the pressure of the nitrogen purge on skid-mounted equipment in the field before removing the blind flanges and connections to the piping system.
 - 1. If pressure has been reduced to less than 2 pounds per square inch or to a value unacceptable to the Supplier, the Cleaning Subcontractor will reclean the skid.
- G. The Cleaning Subcontractor shall obtain approval of field cleaning plan before commencing work.

PART 2 - PRODUCTS

2.01 FACTORY-CLEANED EQUIPMENT

- A. The Supplier shall factory clean all equipment before delivery to the site.
- B. After cleaning at the factory, the Supplier shall pressurize with a nitrogen purge to 5 pounds per square inch all equipment that has been factory cleaned, such as oxygen generators, oxygen filters, and pressure reducing stations.
 - 1. Mount a factory pressure gauge at the blind flange of the skid for verification upon arrival at the project site that the nitrogen purge is still present.
- C. The Supplier shall label with "Cleaned for Oxygen Service" and seal each piece of factory cleaned equipment in clear polyethylene protective wrapping to prevent recontamination during shipping, storage, and handling.
- D. The Contractor will bypass all skid mounted equipment until the Cleaning Subcontractor has cleaned all connecting piping as specified in this Section.

2.02 FIELD CLEANING MANUFACTURERS

- A. Field cleaning of equipment and piping systems shall require the services of a specialty Cleaning Subcontractor experienced in performing oxygen cleaning of piping.
- B. The Cleaning Subcontractor shall be the following, or equal:

APRIL 2022

CLEANING REQUIREMENTS FOR OXYGEN SERVICE

ATTACHMENT E - TECHNICALS

- a. Astro Pak Corporation
- b. Cal-Chem Corporation

2.03 MATERIALS

- A. Use the following materials for cleaning, testing, and assembly.
 - 1. Do not use any other materials without the specific written approval of the Design-Builder.
 - 2. The Contractor will be responsible for proper disposal of all solvents, detergents, leak detection solutions, drying agents, and other fluids used in cleaning and testing.
 - Solvents:
 - a. Cleaning solvent usage shall be limited to hand wiping of small components and shall be performed using Isopropyl Alcohol.
 - 4. Sand:
 - a. Sand for cleaning shall be new, clean, dry sand or abrasive grit.
 - 5. Detergents:
 - a. Use any commercial alkaline or neutral water-soluble cleaner, including trisodium phosphate (TSP), provided it is effective and thoroughly flushed from the item after cleaning.
 - b. Follow the detergent manufacturer's direction for use.
 - c. Contain detergent to prevent discharge to the plant drainage systems.
 - 6. Utilities:
 - a. The Cleaning Subcontractor shall provide dry, oil-free, compressed nitrogen gas for purging, drying or testing after final cleaning.
 - b. The nitrogen gas shall be oil-free and dry to at least a minus 30°F or lower dew point.
 - c. The Cleaning Subcontractor shall maintain close inspection and control of the gas filtering equipment.
 - d. Any water used for making up solutions or for flushing, rinsing or testing after final cleaning shall be deionized (DI). DI water is defined for the purposes of this document as water demonstrating a conductivity value of less than 2.0 μS (microSiemens/cm).
 - 7. Tools and Equipment:
 - a. Keep separate all tools and equipment used in connection with Oxygen Cleaning from other tools or thoroughly clean before each such use.
 - b. Wire brushes shall be austenitic stainless steel or bronze to prevent introducing iron particles in the equipment being cleaned. Bristle brushes made with natural bristles are preferred, as some synthetic bristles dissolve in solvents.
 - c. The Cleaning Subcontractor shall provide any tanks, pumps, instruments, shunts across valves or equipment, or temporary pipe supports used during cleaning.
 - 8. Lubricants:

APRIL 2022

CLEANING REQUIREMENTS FOR OXYGEN SERVICE

ATTACHMENT E - TECHNICALS

- a. General lubricants shall be DuPont Krytox, Montedison USA Fomblin, Hooker Fluorolube, Halocarbon or 3M Kel-F Fluorocarbon oils and greases, or Oxweld No. 64 Anti-Friction Compound.
- b. Use Fomblin or Hooker GR-362 grease.
- c. Use lubricants sparingly and only to facilitate assembly or for packing lubrication.
- 9. Leak Detection Solutions:
 - a. Use Glyco Chemicals Sulfate B-1 (4 fl. oz./pint of water), Sherlock, Leak-Tek, Snoop or Ivory soap solution.
 - b. For below freezing applications, Real Cool Snoop or commercial grade ethylene glycol or methyl alcohol may be added.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Site Conditions:
 - 1. Examine the conditions under which the work is to be installed and notify the Design-Builder in writing, of conditions detrimental to the proper and timely completion of the Work.
 - 2. Do not start work until all detrimental conditions are corrected.

3.02 PREPARATION

- A. Equipment and Piping Systems Requiring Field Cleaning
 - 1. The following equipment and piping systems shall require Oxygen Cleaning by the Cleaning Subcontractor in the field:
 - a. All Oxygen piping that is not shipped precleaned and packaged.
 - 2. All equipment or appurtenances, including oxygen generators, valves, filters, instrumentation, orifice plates, and other restrictions must be removed or bypassed from the system prior to cleaning to prevent entrapment of particles.
 - a. Replace all equipment or appurtenances removed for these purposes under clean conditions to prevent contamination of cleaned piping.
 - The Cleaning Subcontractor shall provide temporary labels for each section of piping which is field cleaned for oxygen service but is not immediately connected to mating runs of pipe.
 - a. The labels shall clearly state, "Field Cleaned for Oxygen Service: (Date)" and the section shall be temporarily sealed at exposed ends by the Cleaning Subcontractor until connection to mating piping or appurtenances is performed, or the section is put into service, upon which temporary labels shall be removed.
 - 4. Any equipment, items, and in-line components which were furnished "Cleaned for Oxygen Service" by the Supplier and were later exposed to the environment or somehow contaminated because of action or error by the Contractor, shall be recleaned in the field by the Cleaning Subcontractor, at no added cost to the Design-Builder.

APRIL 2022

CLEANING REQUIREMENTS FOR OXYGEN SERVICE

ATTACHMENT E - TECHNICALS

3.03 FIELD QUALITY CONTROL

- A. Equipment and piping surfaces cleaned per this specification shall be free of contaminants, which can be seen with the naked eye under bright white light or black light, when inspected by methods given herein. The only exceptions shall be stains or lint.
 - 1. To meet this requirement, conventional greases, oils and thread lubricants, shop dirt, water, filings, scale, loose weld spatter, chips, fluxes, paints, varnishes, marking materials, rust (except for light film), excelsior, packing materials, labels and any other foreign materials must be removed. Many of these materials, especially hydrocarbon greases and oils, can react violently in the presence of oxygen, causing fires or explosions, while others can cause dangerous malfunctions of equipment.
 - 2. After an item is cleaned, it must be protected from recontamination until it is used.

B. Inspections and Tests

- 1. The Cleaning Subcontractor shall inspect items cleaned for oxygen service by using black light as described below where possible and whichever other methods specified below as applicable.
 - a. If any of the tests used reveal contaminants, the item must be re-cleaned.
 - b. The Design-Builder shall be notified and present at all inspections and tests.
 - c. Direct Visual Inspection:
 - 1) There shall be no observable residual oil, grease, paint, coating, varnish, or other films; no extensive adherent rust or mill scale, and no loose rust, scale, abrasive, dirt or other particulate matter.
 - 2) Sandblasted surfaces should correspond to SSPC Pictorial Standard CSa2.
 - 3) A light film of rust is acceptable.
 - d. Ultraviolet or "Black Light" Inspection:
 - 1) The surface shall be examined in darkness or subdued light using a 3200-3800 AU wavelength black light.
 - 2) Most common hydrocarbon oils or greases fluoresce, so that they become visible under black light even though they are invisible in normal light. However, not all organic oils fluoresce, so the Cleaning Subcontractor shall back up this inspection by reviewing the manufacturing procedures involved, to make sure that no animal oils such as fish oil rust preventatives, or vegetable oils such as castor oil-based cutting emulsion, were used in its manufacture.
 - 3) If fluorescence shows up as a blotch, smear, smudge, or film, the item shall be recleaned.

e. Wipe Test:

 The item shall be wiped for at least one square foot of its surface with clean white paper or unbleached cloth, which shall be examined under normal and black light.

APRIL 2022

CLEANING REQUIREMENTS FOR OXYGEN SERVICE

ATTACHMENT E - TECHNICALS

2) If excessive discoloration or any fluorescence appears, the surface shall be recleaned.

f. Solvent Color Test:

- 1) This method should be used to check the cleanliness of inaccessible metallic surfaces.
- 2) A pint jar filled with used solvent wash shall be compared with a similar jar filled with new solvent.
- 3) There should be few particles and little, if any, difference in light transmission between the two when they are both held up to the light and viewed simultaneously through the side.
- 2. Finished installations shall be carefully inspected for proper joints and supports, anchoring, interferences, and damage to piping, tubing, and fittings. Defects shall be repaired.

3. Field Testing:

- a. Prior to enclosure or burying, piping and tubing systems shall be pressure tested with nitrogen gas, as required in the Piping Schedule for a period of not less than one hour without exceeding the tolerances listed in the Piping Schedule.
- b. Where no pressures are indicated, the tubes shall be subject to 1-1/2 times the maximum working pressure.
- c. The Cleaning Subcontractor shall furnish test equipment, labor, materials, and devices for this field testing.
- 4. Leakage may be determined by loss of pressure, soap solution, chemical indicator, or other positive and accurate method. Fixtures, devices, or other accessories which are to be connected to the lines and which would be damaged if subjected to the test pressure shall be disconnected and ends of the branch lines be plugged or capped as required during the testing procedures
- 5. Leaks shall be repaired, and the system shall be re-tested until no leaks are found.

C. Safety

- 1. The Cleaning Subcontractor shall ensure that all field-cleaning personnel are thoroughly trained in the proper oxygen cleaning techniques.
 - a. The Cleaning Subcontractor shall require field-cleaning personnel to wear apparel which is free of oil and grease and to work with clean gloves, appropriate eye protection, and appropriate breathing filters/masks and respiratory aid equipment.
- 2. Flammable solvents such as gasoline, kerosene, naphtha, mineral spirits or acetone shall not be used for cleaning purposes.
- 3. Fire extinguisher fluids shall not be used for cleaning purposes.
- 4. The Cleaning Subcontractor shall have full responsibility and liability for ensuring safety with respect to oxygen field cleaning.

APRIL 2022

CLEANING REQUIREMENTS FOR OXYGEN SERVICE

ATTACHMENT E - TECHNICALS

3.04 CLEANING

A. Cleaning Methods

1. The Cleaning Subcontractor shall use the following methods, either singly or in combination, to clean equipment and accessories for oxygen gas service. The actual cleaning method selected will depend on the type and size of the item to be cleaned, the type and extent of contamination, and the facilities available. Cleaning of all stainless-steel pipes, vessels and tanks shall include a passivation process.

a. Mechanical Cleaning:

- 1) This method consists of brushing, sweeping, blowing, scraping, chaining, sandblasting, agitating, swabbing, or otherwise physically removing contaminants from equipment.
- 2) It is generally used as a preliminary cleaning technique or in combination with other methods.
- 3) The exception is sandblasting, which when followed by blowing out, wiping or vacuum cleaning to remove all particles, can be a final cleaning method. The term "sandblasting", as used in this Section, includes shot- and grit blasting.

b. Flushing:

- 1) In this method, the equipment or piping being cleaned is filled with the cleaning detergent and subsequently, thoroughly purged with oil free dry air or dry nitrogen. The process shall be performed as follows:
 - a) An initial rinse with deionized water shall be performed, followed by flushing with detergent solution. The solution must be heated to a temperature ranging from 130F to 180F to be effective.
 - b) The detergent solution will be circulated for a period of 2-4 hours followed by a deionized water rinse.
 - c) Passivation of systems follows for a minimum circulation of 2-4 hours.
 - d) Lastly, the system is purged with dry oil free air or nitrogen for removal of residual liquids until -30F dewpoint is achieved. Polyurethane pigs and certain solvents may be used to aide in water removal."

c. Immersion:

- 1) In this method, the equipment to be cleaned is submersed in solvent (solvents) or detergent solution and, if possible, scrubbed.
- 2) When many parts are to be cleaned, two baths shall be used:
 - a) the first to remove most of the contaminants, and
 - b) the second to remove the remaining contaminants.
- 3) When the first bath becomes dirty, use shall be discontinued; the second bath shall become the first and a new, clean final bath shall be provided.
- 4) Non-metallic parts shall be immersed very briefly or wiped with a cloth as described below to prevent material degradation / deterioration.
- d. Wiping or Mopping:

APRIL 2022

CLEANING REQUIREMENTS FOR OXYGEN SERVICE

ATTACHMENT E - TECHNICALS

- Large parts having readily accessible surfaces may be cleaned by this
 method using solvent or detergent solution. Typical examples would be large
 compressor parts (using solvents) or vessels which can be entered (using
 detergent solutions only).
- 2) Small non-metallic parts which cannot be immersed, because of swelling or deterioration caused by the solvent, shall be cleaned by wiping with a clean cloth moistened with TCE, unless another cleaning method is recommended by the part manufacturer.

B. Cleaning Procedure for Piping Systems

- 1. The general concept of field oxygen cleaning of piping systems is to clean each pipe section, elbow, tee, valve, expansion joint, instrumentation piece or any other in-line component before installation in the piping system, except where these components can be pre-assembled into spools of a size and configuration which will permit sandblasting or solvent cleaning, inspection and handling. The inspection of each item for cleanliness as described herein shall be the final step before installation of the item into its final place.
- 2. Items sent to the field by the Supplier already oxygen pre-cleaned shall also be checked for cleanliness by the Cleaning Subcontractor just prior to installation and recleaned if required.
- 3. "In place cleaning" of a completely preassembled piping or equipment system is not covered by this specification and shall only be performed in accordance with the manufacturer's printed instructions, and only under the direct supervision of a representative of the Supplier.
 - a. Stainless Steel, Brass, Copper, Aluminum and Monel Piping and Tubing:
 - 1) Pipe shall be cut to size and the ends beveled where required for welding.
 - 2) Spools shall be prefabricated, where feasible.
 - 3) Small lines and fittings (3/4-inch diameter and smaller) shall be flushed with solvents. The interior surface of larger lines (1-inch diameter and larger) and fittings shall be swabbed with a rag moistened with solvents.
 - 4) The pipe shall be purged until dry and odor-free with dry nitrogen gas.
 - 5) The pipe shall be inspected as described herein and the ends protected, or it shall be installed within 30 minutes of cleaning.

b. Valves:

- 1) Butterfly and Ball Valves: The Cleaning Subcontractor shall require these valves to be furnished already "Cleaned for Oxygen Service" by the valve manufacturer. However, if the valve requires recleaning in the field, the Cleaning Subcontractor shall proceed as follows, but only under the direct supervision of a representative of the valve manufacturer:
 - a) The valve shall be disassembled and each part cleaned by immersion or by swabbing with solvents (non-metallic parts swabbing only). Parts shall be dried with dry oil-free air or nitrogen.
 - b) Parts shall be inspected per Section 3.5 and the valve reassembled. The valve shall be installed immediately, or it shall be packaged and tagged per Paragraph 3.7 A.4.

APRIL 2022

CLEANING REQUIREMENTS FOR OXYGEN SERVICE

ATTACHMENT E - TECHNICALS

- c) Virgin Teflon packing, Durabla gaskets and approved lubricant per Paragraph 3.1 A.6 shall be used in reassembling valves.
- 2) All Other Valves: The Cleaning Subcontractor shall require these valves to be furnished already "Cleaned for Oxygen Service" by the valve manufacturer. If for any reason recleaning in the field is required, it shall be performed in accordance with the valve manufacturer's printed instructions, and only under the direct supervision of a representative of the valve manufacturer. If any valve recalibration is required, the Subcontractor shall require that it be performed by the valve manufacturer's representative. After cleaning, the valve shall be inspected as specified herein and shall be installed immediately or it shall be packaged and tagged as specified herein.
- c. Miscellaneous "In-Line Components":
 - In-line components such as strainers, orifice plates, etc., should be cleaned by swabbing with solvents. In the case of expansion joints, cleaning by scrubbing and flushing with solvents is required to get into all cavities. The items shall be inspected before installation.
- d. Instrumentation Tubing:
 - 1) Stainless steel tubing shall be flushed with solvents and blown dry with clean nitrogen gas. Ends of tubing shall be capped until used. Tubing shall be tested for cleanliness.
- C. Cleaning Procedures for Equipment
 - 1. All equipment requiring oxygen cleaning shall be furnished already "Cleaned for Oxygen Service" by the Supplier.
 - 2. The Supplier shall perform any equipment recalibration, if required.
 - 3. After cleaning, the equipment shall be inspected and installed immediately or packaged and tagged as specified herein.

3.05 PROTECTION

- A. Protect factory or field cleaned piping, vessels, and equipment until placed in service using the methods described below.
 - a. Short-term protection for periods up to 1 week:
 - Cover pipe ends and other openings with metal or plastic caps or plugs, or a double layer of 6-mil polyethylene film, sealed to the pipe or nozzle with waterproof tape.
 - b. Medium-term protection for periods between 1 week and 1 month:
 - 1) Welding Ends: Close with clean Wedge Projects, or equivalent, galvanized steel caps sealed with two turns of Tuck No. 90, or equivalent, two-inch waterproof tape.
 - 2) Flanged Ends: Close with 10-gage, or heavier, oxygen cleaned steel flange covers over solid Neoprene or Durabla gaskets, held in place with at least four hex-head bolts.
 - c. Long-term protection for 1 month and longer:

APRIL 2022

CLEANING REQUIREMENTS FOR OXYGEN SERVICE

ATTACHMENT E - TECHNICALS

- 1) Fill cleaned piping system or equipment with dry nitrogen, pressurize to 2 psig, and maintain positive pressure.
- 2) Identify pressurized lines at all significant flanges and valves.
- d. Protection of small parts:
 - Keep small parts such as valves, expansion joints, pressure gages, etc., in heavy gage polyethylene bags or wrap and seal in polyethylene sheeting until installation.
- e. Equipment protection:
 - 1) Cover manholes, inspection ports, nozzles and other openings after cleaning by using blind flanges, plastic protectors, hardboard covers, or polyethylene sheets securely taped in place.
 - 2) Completely cover larger pieces of equipment after cleaning or re-cleaning with polyethylene sheeting.
- f. Identification:
 - 1) Any piping, equipment, or vessels cleaned in the field per this Section shall be identified "CLEANED FOR OXYGEN SERVICE."

END OF SECTION

APRIL 2022

CLEANING REQUIREMENTS FOR OXYGEN SERVICE

ATTACHMENT E - TECHNICALS

SECTION 46 51 50 OXYGENATION SYSTEM

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope:

1. This section specifies requirements for the air compressor system, compressed air storage tank, pressure swing adsorption units, oxygen storage tank, oxygen pressure booster, oxygen buffer tank, oxygen pressure vessel, side stream pump, interconnecting piping, and all associated appurtenances, together termed as the oxygenation system. More restrictive requirements supersede this specification, where listed in individual equipment specifications, including but not limited to the side stream pump, control panels and enclosures, and electric motors.

B. Definitions:

- 1. The following definitions apply to equipment specified in this and referencing sections:
 - a. Side Stream Pump: Centrifugal pump for dedicated side stream wastewater pumping service to provide liquid to the oxygenation pressure vessel.
 - b. Oxygenation Pressure Vessel: Dedicated pressure tank for dissolution of oxygen into a wastewater stream for the purpose of increasing the dissolved oxygen content of the wastewater stream.
 - c. Oxygen Pressure Booster: Dedicated compressor for boosting oxygen pressure prior to delivery to the oxygen buffer tank and subsequently the oxygenation pressure vessel.
 - d. Swing Adsorption Unit: Equipment that accepts compressed air and produces oxygen-rich gas (referred to as oxygen) to be temporarily stored in the oxygen storage tank
 - e. Air Compressor System: A self-contained unit that draws ambient air and produces compressed air.

1.02 QUALITY ASSURANCE

A. Arrangement: The arrangement of equipment shown on the drawings is based upon information available to the Engineer 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 his bid proposal. Structural supports, foundations, connected piping, valves, and electrical conduit specified may have to be altered to

APRIL 2022

OXYGENATION SYSTEM

ATTACHMENT E - TECHNICALS

accommodate the equipment actually provided. No additional payment shall be made for such revisions and alterations.

- B. Unit Responsibility: 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 his responsibility to the Owner for performance of all systems as provided in the General Conditions of the Contract Documents.
- C. 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 43 05 11-C specified in Section 01 99 90 REFERENCE FORMS, 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.

1.03 REFERENCES

- A. This section contains references to the documents in the table below. 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. The following order of precedence prevails in the event of conflict between the requirements of this section or any referencing section and those of the listed documents (in the order of primacy):
 - 1. The referencing section
 - 2. This section

APRIL 2022

OXYGENATION SYSTEM

ATTACHMENT E - TECHNICALS

3. The referenced document

B. Unless otherwise specified, references to documents mean the documents in effect at the time of advertisement for bids or invitation to bid (or on the effective date of the agreement if there were no bids). References to documents mean the replacement documents issued or otherwise identified by the organization if referenced documents have been discontinued, 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 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
ASME Code	ASME Boiler and Pressure Vessel Code Section VIII, Div. 1
ASME B16.1/B16.5	Pipe Flanges and Flanged Fittings
CGA G-4.1	Cleaning Equipment For Oxygen Service
NFPA 53	Recommended Practice on Materials, Equipment, and Systems Used in Oxygen-Enriched Atmospheres
NFPA 55	Compressed Gases and Cryogenic Fluids
NFPA 820	Standard for Fire Protection in Wastewater Treatment and Collection Facilities

1.04 DESIGN REQUIREMENTS

A. General:

- 1. Wastewater Quality as measured in calendar year 2022
 - a. BOD 270 mg/L average, range 109 421 mg/L
 - b. pH 7.6 average, range 5.8 8.0
- 2. The oxygenation system shall be designed to deliver a quantity of oxygen so as to achieve the following:
 - a. H₂S gas phase concentration of 5 parts per million by volume (ppmv) or less at the FM terminus/junction structure
 - b. Dissolved sulfide concentration of 0.1 milligrams per liter (mg/L) or less at the FM terminus/junction structure
 - c. Dissolved oxygen concentration of 2.0 mg/L or greater at the FM terminus/junction structure
 - d. A control system that assures O_2 gas concentration of <22.5 % by volume is always maintained at the off gas expelled from the force main high points and at the gas phase in the force main terminus/junction structure

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: See Section 01 11 00 SUMMARY OF WORK.

APRIL 2022 ATTACHMENT E - TECHNICALS **OXYGENATION SYSTEM**

1.06 SUBMITTALS

A. Action Submittals:

- 1. Comply with procedures as described in Section 01 33 00 SUBMITTAL PROCEDURES.
- 2. Provide submittals that conform to the requirements of this Section. Sections to be marked up and submitted include:
 - a. This section
 - b. Section 43 05 11 GENERAL REQUIREMENTS FOR EQUIPMENT
 - c. Section 43 05 13 RIGID EQUIPMENT MOUNTS
 - d. Section 43 05 21 COMMON MOTOR REQUIREMENTS FOR EQUIPMENT
- Provide shop drawings which at a minimum include detailed mechanical drawings, arrangements, weights, locations and layout, power and control wiring diagrams, utility requirements, make and model information on pumps and motors, performance data on pumping equipment and installation manuals.

B. Informational Submittals:

- 1. Comply with procedures as described in Section 01 33 00 SUBMITTAL PROCEDURES.
- 2. Provide required certificates of compliance, certificates of warranty, and user manuals.

C. Closeout Submittals:

- Comply with procedures as described in Section 01 78 23 OPERATION AND MAINTENANCE DATA.
- 2. Provide manufacturer's certification of installation, test reports and service records for maintenance performed during installation.

1.07 WARRANTY

- A. The manufacturer shall guarantee that the Oxygenation system will perform in accordance with the specifications when operated within the specified design conditions.
- B. The manufacturer shall guarantee all materials and equipment to be free from all defects due to faulty materials or workmanship for a period of twelve months from the date of startup and shall be limited to the repair or replacement of the Oxygenation system.

1.08 PERFORMANCE GUARANTEE

- A. Oxygenation System Supplier shall guarantee that the System shall provide a minimum oxygen transfer efficiency of 90% or greater.
- B. Performance testing as described in the 01 91 14 TESTING AND STARTUP shall be means of proving performance criteria is met.

APRIL 2022

OXYGENATION SYSTEM

ATTACHMENT E - TECHNICALS

PART 2 PRODUCTS

2.01 OXYGENATION PRESSURE VESSEL (TNK-0011-1)

- A. The Oxygenation pressure vessel shall be constructed of Type 304L stainless steel and fabricated to ASME standards with ASME stamp for 150 psig pressure rated vessels.
- B. The Oxygenation pressure vessel shall include the following features:
 - 1. Self-cleaning bottom discharge design.
 - 2. Sight glasses (if required by manufacturer).
 - 3. Manway.
 - 4. 8-inch ANSI 150 pound flanged inlet and discharge ports.
 - 5. 1-inch female NPT threaded oxygen port.
 - 6. System discharge instrumentation ports.
 - 7. Bead blast finish.
 - 8. Free standing vessel with lower mounting flange/feet for anchoring.
 - 9. Pressure relief valves as needed.
- C. Oxygenation pressure vessel Dimensions and Parameters:
 - 1. Nominal Diameter: Not to exceed 6 feet.
 - 2. Nominal Height: Not to exceed 14 feet.
 - 3. Nominal Headloss: Not to exceed 15 feet of water column at design conditions.
- D. Supplier and Model:
 - 1. ECO Oxygen Technologies, model ECO2-5-8-PC
 - 2. BlueInGreen, LLC, model SDOX-C5
- 2.02 SIDE STREAM PUMP (PMP-0012-1)
 - A. The side stream pump shall be as specified in Section 43 23 89.13 HORIZONTAL VARIABLE SPEED NON-CLOG CENTRIFUGAL PUMPS, together with any other applicable sections referenced therein.

2.03 OXYGEN GENERATION SYSTEM

- A. General:
 - 1. The Oxygen Generator System shall include but not be limited to:
 - a. One (1) air compressor/dryer system; (CMPR-0032-1)
 - b. One (1) feed compressed air storage tank (air receiver); (TNK-0034-1)
 - c. One (1) pressure swing adsorption unit (oxygen generator); (O2G-0022-1)
 - d. One (1) oxygen storage tank (receiver), oxygen pressure booster and oxygen buffer tank (receiver) control panel with interconnecting conduit and wire; interconnecting piping and valves.

APRIL 2022

OXYGENATION SYSTEM

ATTACHMENT E - TECHNICALS

2. Oxygen tanks supplied shall be painted green to indicate oxygen contained within and air tanks painted grey. Each storage tank shall be clearly labeled air or oxygen.

B. Oxygen Generator:

- 1. The Oxygen Generator (swing adsorption unit) shall have a capacity of 2,500 standard cubic feet per hour (SCFH) of oxygen gas from a source of clean, dry, compressed air at 45 psig.
- 2. Specification shall adhere to the ASME Code.
- 3. Feed air volume shall be an average of 475 standard cubic feet per minute (SCFM), at a minimum of 90 psig incoming pressure.
- 4. The oxygen gas produced by the Oxygen Generator shall have a concentration of 93.0% +/- 3.0%.
- 5. The oxygen gas produced by the Oxygen Generator shall be available from an oxygen storage tank with a storage capacity of at least 1,060 gallons at a minimum pressure of 45 psig (3 Bar) and typically be in the range of 50 psig to 60 psig (3.4 Bar to 4.0 Bar).
- 6. The oxygen gas produced by the Oxygen Generator shall have a maximum dewpoint of -76°F (-60°C).
- 7. The oxygen generator sieve beds shall be painted green, which normally identifies equipment or transmission lines and hoses as containing oxygen.
- 8. Maximum dimensions of the system shall be: $87 \frac{1}{2}$ " wide x 66" (92" with doors open) deep x 151" high.
- 9. Sound levels shall not exceed 76 dBA at 1 meter.
- 10. Weight shall be approximately 10,000 lbs.
- 11. Power shall be supplied at 120 VAC 60 Hz, 50 Watts (nominal).
- 12. Air inlet shall be 3" JIC bulkhead.
- 13. Oxygen outlet shall be 1.5" bulkhead.
- 14. Manufacturer: Oxygen System International (OGSI), model OG-2500, or equal.

C. Air Compressor/Dryer System:

- 1. The compressor/dryer shall be an oil-injected rotary screw compressor with built-in air dryer, control panel and variable frequency drive.
- 2. Unit Design Requirements:
 - a. Unit shall be rated for 60 Hz, 480 volts.
 - b. Installed main motor power shall be 90 kW (125 hp) nominal.
 - c. Maximum operating pressure shall be 102 psig.
 - d. Capacity of Free Air Delivery shall be 103-648 cfm.
 - e. Mean noise level shall be a maximum of 74 dBA at 1 meter.
 - f. Unit shall contain a built-in control display on the side of the unit.
 - g. Unit shall contain a high efficiency oil filter capable of removing 300% smaller particles than conventional oil filters.
 - h. Unit shall contain an aftercooler with an integrated water separator.

APRIL 2022

OXYGENATION SYSTEM

ATTACHMENT E - TECHNICALS

- Unit shall contain electronic water drains to ensure constant removal of condensate.
- j. Unit shall contain a main cooling fan that shall maintain operating temperatures. Historical ambient temperature range is 35 90 degrees Fahrenheit.
- k. Unit shall contain an oil separator that will remove oil particles from the compressed air while minimizing pressure drop.
- I. Unit shall contain an inlet valve operated through vacuum and air pressure that is sized for maximum flow to eliminate inefficient pressure drops.
- m. Unit shall contain a heavy-duty air intake filter to protect the compressor components and reduce ambient noise.
- n. Unit shall contain a variable frequency drive that automatically adjusts motor speed depending on demand.
- o. Unit shall contain an Integrated Refrigerant-Type Air Dryer with the following specifications:
 - 1) Shall be rated for 60 Hz.
 - 2) Pressure dew point full feature at an ambient temperature of 20°C and a relative humidity of 100% shall be 3°C.
 - 3) Pressure drop over dryer shall be 0.20 bar (3psi).
 - 4) Total power consumption at an ambient temperature of 20°C and a relative humidity of 100% (including fan) shall be 2.6 kW.
 - 5) Compressed air outlet temperature shall be 30°C.
 - 6) Cooling air flow shall be 975 cfm.
 - 7) Heat dissipated by cooling air at an ambient temperature of 20°C and a relative humidity of 100% shall be 28,354 BTU/hr.
- p. Unit shall be designed, manufactured, and tested in accordance with ISO 9001, ISO 14001 and ISO 1217, Ed. 3, Annex C.
- q. Maximum weight shall be about 3,300 lbs.
- r. Dimensions shall be 86 inches wide x 50 inches deep x 77 inches high.
- 3. Manufacturer: Atlas Copco Model GA90 VSD+ FF or equal.
- D. Compressed Air and Oxygen Storage Tank: (TNK-0034-1, TNK-0023-1)
 - 1. Requirements:
 - a. Oxygen storage tank shall be 1,060 gallons.
 - b. Maximum weight shall be about 2,200 lbs.
 - c. Diameter: 48 inches.
 - d. Height (without base): 144 inches.
 - e. Pressure Rating: 200 psi. Built in accordance with Section VIII Division 1 ASME code.
 - 2. Manufacturer: Oxygen Generating Systems International (OGSI) model OST-1060 or equal.
- E. Oxygen Buffer Tanks: (TNK-0025-1)
 - 1. Design Requirements:

APRIL 2022

OXYGENATION SYSTEM

ATTACHMENT E - TECHNICALS

- a. Tank shall be 400 gallons.
- b. Approximate maximum weight shall be 935 lbs.
- c. Diameter: 36 inches.
- d. Height (without base): 93 inches.
- e. Pressure Rating: 200 psi. Built in accordance with Section VIII Division 1 ASME code.
- 2. Manufacturer: Oxygen Generating Systems International (OGSI) model OST-400 or equal.
- F. Oxygen Pressure Booster (PMP-0024-1)
 - 1. The oxygen pressure booster shall be upstream of the SS buffer tank.
 - 2. Design Requirements:
 - a. Size: 28" L x 25" W x 30"H (approx.) to fit in designated area
 - b. Weight: 400 lbs (approx.)
 - c. Inlet pressure: 3-50 psi
 - d. Discharge pressure: 150 psi
 - e. Cooling: Air
 - f. Motor: 5 hp maximum (as specified by Oxygen Pressure Vessel manufacturer)
 - g. Drive: Direct Drive
 - h. Controls: High Pressure Safety Shut Down
 - i. Filtration: Y Strainer, 100 Mesh
 - 3. Manufacturer: RIX Industries model 2TX1B or equal.

2.04 PIPING

A. Oxygen gas piping shall be per 40 05 02.11 OXYGEN GAS. Compressed air piping shall be per 40 05 02.05 COMPRESSED AIR AND VENT. Bonding jumpers shall be per 40 05 01 PIPING SYSTEMS.

2.05 INSTRUMENTATION AND CONTROL AND POWER

- A. General: Oxygenation System shall include but is not limited to below and as shown on Contract Drawings. Refer to the Instrument Index (40 06 70 Attachment A) for tag numbers.
 - 1. One (1) Gas Supply Regulator (as required by manufacturer)
 - 2. Pressure Transmitters & Gauges
 - 3. Two (2) Tank Level Pressure Transmitters for Differential
 - 4. One (1) Thermal dispersion flowmeter
 - 5. One (1) RTD
 - 6. Provide power and control panels, electrical components and wiring for a complete, functional system.
 - 7. Provide all items not specifically specified which are required to implement the specified functions and the functions required for proper system operation.

APRIL 2022

OXYGENATION SYSTEM

ATTACHMENT E - TECHNICALS

- 8. Coordinate controls with existing DCS system.
- 9. Provide manufactures recommended spare parts.
- B. Oxygen Generator with PLC Control Panel:
 - 1. Each Oxygenation System, including all pumps, gauges, and meters, shall be operated from (1) single control panel.
 - 2. The control panel shall be rated for use on a 120-volt power supply and shall be housed in a NEMA Type 4X 304 stainless steel enclosure
 - 3. At a minimum, the control panel shall include: HMI, Lockable Power Disconnect, Emergency Stop Button, and Emergency Stop Reset Button.
 - 4. The control panel shall provide both manual and automatic control and include one set of dry contacts for oxygen generation unit safety interlocks.
 - 5. Interposing I/O relays as necessary.
 - 6. Disconnects and fusing for AC power distribution.
 - 7. DC power supply and fusing for DC power distribution.
 - 8. The Oxygen Generator shall have a non-resettable digital elapsed time meter that records running hours.
 - 9. The Oxygen Generator shall have an internal pressure switch which will turn the generator on and off based on the oxygen storage tank pressure. This switch shall only be effective while the 'Automatic' mode of operation is selected on the control switch. The pressure switch set points shall be factory set but be adjustable for modification.
 - 10. The Oxygen Generator shall have a dial gauge to indicate the regulated feed air pressure as feed air enters the Oxygen Generator.
 - 11. The Oxygen Generator shall have a dial gauge to indicate the oxygen discharge pressure as it departs the Oxygen Generator.
 - 12. The Oxygen Generator shall have a manual pushbutton drain to vent accumulated condensate in the filter bowl housings.
 - 13. The Oxygen Generator control panel shall have indicating lights which indicate the point in the separation process the Oxygen Generator is at while it cycles-
 - 14. Remote Access: Ethernet CAT6. Ethernet Switch provided. Protocol converter as required to integrate into existing plant DCS.
 - 15. Provide Programmable Logic Controllers:
 - a. Allen Bradley CompactLogix
 - 1) Processor: 1769-L33ER, or approved equal.
 - 2) Discrete Input Modules: 1769-IA16, or approved equal.
 - 3) Discrete Output Modules: 1769-OA8, or approved equal.
 - 4) Analog Input Modules: 1769-IF4I, or approved equal.
 - 5) Analog Output Modules: 1769-OF4CI, or approved equal.
 - 16. User Interface (HMI):
 - a. Operating Control Mode selection shall be available to the Operator from the HMI.
 - b. Provide the capability to monitor system parameters for alarm indication and data logging and trending.

APRIL 2022

OXYGENATION SYSTEM

ATTACHMENT E - TECHNICALS

- c. Allen Bradley PanelView Plus 6, or equal
- 17. Provide all necessary wireways, wiring, labels, and miscellaneous hardware for a complete control panel.
- 18. Provide spare parts:
 - a. 1 I/O module of each type used
 - b. 1 dc power supply of each type used
 - c. 25% or 5 (whichever is greater) fuses of each size used

C. Remote Terminal Units (RTU)

- 1. Provide Cellular Remote I/O connection to Kika Court.
- 2. Cellular connection shall be secured by a direct Virtual Parallel Tunnel (VPN) between the PQPS and the Kika Court site.
- 3. Remote I/O connection shall use Ethernet/IP for communications with the PLC.
- 4. Provide enclosure for both RTU's
 - a. PQPS 20" x 16" x 8" NEMA 4X, 316SS, Hoffman A20H1608SS6LP or approved equal
 - b. Kika Court 20" x 16" x 8" NEMA 4X, 316SS, Hoffman A20H1608SS6LP or approved equal with station mount and sun shield.

5. RTU Components

- a. Power Supply 24VDC, Phoenix Contact UNO-PS/1AC/24DC/90W/C2LPS or approved equal.
- b. UPS Phoenix Contact UNO-UPS/24DC/24DC/60W or approved equal
- c. Cellular Router Open VPN support, 2x SMA-F antenna sockets, 1 Ethernet connection, Verizon Network (4G), Phoenix Contact TC Router 3002T-4G VZW or approved equal
- d. Antenna Multiband 4G cellular antenna with mounting bracket for outdoor installation with 10-meter cable. Phoenix Contact TC ANT Mobile Wall 10M.
- e. Bus Coupler Axioline F bus coupler Ethernet/IP, Phoenix Contact AXL F BK EIP EF or approved equal
- f. Back Plane Axioline F backplane, 4 slots, 100 Mbps transmission speed, Phoenix Contact AXL F BP SE4 or approved equal
- g. Discrete Input Module 16 Digital inputs 24Vdc, Phoenix Contact AXL SE DI16/1 or approved equal
- h. Discrete Output Module 16 Digital Outputs 24 Vdc, Phoenix Contact AXL SE DO16/1 or approved equal
- i. Analog Input Module 4 channel 4-20mA, Phoenix Contact AXL SE Al4 I 4-20 or approved equal
- j. Analog Output Module 4 channel 4-20mA, Phoenix Contact AXL AO4 I 4-20 or approved equal

D. Sidestream Pump Starter Panel:

1. Local Starter panel shall include all breakers, disconnect switch, circuit breaker, control transformer and fuses, relays and pilot devices as required to control the specified side stream pump.

APRIL 2022

OXYGENATION SYSTEM

ATTACHMENT E - TECHNICALS

- 2. The panel enclosure shall be Type 4X 304 stainless steel and be constructed following the UL standards.
- 3. At a minimum, the control panel shall include: Hand/Off/Auto Selector switch, Emergency Stop and Reset Button. Pilot lights for Running, Stopped, Fail and High Temperature status and alarms.
- 4. The starter panel shall provide local manual control and include all breakers, fuses, terminal blocks and dry contacts required.

E. Oxygen Pressure Booster Starter Panel:

- 1. Local Starter panel shall include all breakers, disconnect switch, circuit breaker, control transformer and fuses, relays and pilot devices as required to control the specified Oxygen Pressure Booster compressor.
- 2. The panel enclosure shall be Type 4X 304 stainless steel and be constructed following the UL standards.
- 3. At a minimum, the control panel shall include: Hand/Off/Auto Selector switch, Emergency Stop and Reset Button. Pilot lights for Running, Stopped, Fail status and alarms.
- 4. The starter panel shall provide local manual control and include all breakers, fuses, terminal blocks and dry contacts required.

F. Oil Injected Rotary Screw Air Compressor:

- 1. Local panel shall include all breakers, disconnect switch, circuit breaker, control transformer and fuses, relays and pilot devices as required to control the specified Oil Injected Rotary Screw Air Compressor
- 2. The panel enclosure shall be Type 4X 304 stainless steel and be constructed following the UL standards.
- At a minimum, the control panel shall include: Hand/Off/Auto Selector switch, Emergency Stop and Reset Button. Pilot lights for Running, Stopped, Fail status and alarms.
- 4. Local panel shall provide local manual and automatic control via full color touch display and controller:
- 5. Local control via start/stop buttons
- 6. Remote control via digital input(s)
- 7. Remote control via Ethernet network connection.
- 8. Remote LAN control via DCS network.
- 9. When in Remote or LAN control, the start/stop buttons on the controller will not work.
- 10. Panel shall include all breakers, fuses, terminal blocks and dry contacts required.
- G. Control Valves: Electrically operated, valves shall be provided for the control valves shown on the contract drawings and whatever other valves are needed for system operation by the system supplier. Valve operators shall be powered from the 120V power panel shown in the drawings. Operation of the valves shall be controlled by the Oxygenation PLC Panel. Valves and operators shall be of the type shown on the drawings. Actuator enclosures shall meet the classification of

APRIL 2022

OXYGENATION SYSTEM

ATTACHMENT E - TECHNICALS

the area they are located per the classifications and enclosure requirements identified

2.06 DCS COMMUNICATION

- A. General: The Oxygen Dissolution System shall be provided with sufficient instrumentation and controls such that all system parameters shown below may be monitored and controlled locally by the operator or remotely via the Owner's DCS Systems.
- B. The DCS programming and configuration shall be performed by Emerson.
- C. A new Emerson Ethernet Link Controller (ELC) module (Emod 5X00419G01 and Pmod 1X00569H01) with appropriate Ethernet/IP licensing (CPSABEIP) shall be provided licensed to the Owner by Emerson.
- D. Emerson shall supply a new Field LAN Router (ISR4321-KP Router) to the Owner.
- E. Emerson shall install the ELC, and the Field LAN Router.
- F. The PLC programmer shall meet with Emerson to develop the strategy for exchanging data between the PLC and DCS.
 - 1. Read only data
 - 2. Read/Write data
- G. The signals shown on the drawings a listed here, shall be exchanged, via the CAT-6 link between the Oxygenation PLC and DCS using the Ethernet/IP protocol.
 - 1. Signals from the Oxygen Dissolution Systems to DCS:
 - a. Status (Running, Stopped, Shutdown)
 - b. Active Control Mode (DO Feedback, Oxygen Delivery)
 - c. Remote / Local mode
 - d. Oxygen Delivery, mg/L
 - e. Carrier Water Flow Rate, gpm
 - f. Valve statuses
 - 2. Signals from DCS to the Oxygen Dissolution System:
 - a. Run / Stop Command
 - b. Control Mode Selection (DO Feedback, Oxygen Delivery)
 - c. Plant Production Flow Rate, MGD
 - d. Process oxygen Signal
 - e. Oxygen Setpoint
 - f. Oxygen Delivery Rate Setpoint, lb/hr
 - 3. Additional signals required for the DCS to provide the same functionality as the Oxygenation System HMI.

APRIL 2022

OXYGENATION SYSTEM

2.07 DESCRIPTION OF OPERATION

- A. The Oxygenation System shall operate by redirecting a side stream of raw, unscreened wastewater from the force main and pumping it through the Oxygenation Vessel. Gaseous oxygen is fed into the Oxygenation Vessel by the Oxygen Control Panel as controlled by the Process Control Panel. The vessel shall provide a large oxygen/water interface to achieve rapid oxygen dissolution such that the gaseous oxygen is completely dissolved before being blended back into the force main. The Oxygenation System shall not have a pure oxygen headspace inside of the vessel.
- B. The Process Control Panel PLC shall monitor the force main flow rate, side stream water flow rate, and water temperature and system pressure. Based on this data, the PLC shall calculate the amount of oxygen required to meet the oxygen demand of the wastewater. The PLC shall be capable of adjusting the oxygen feed rate into the Oxygenation Vessel by means of the mass flow controller to match the calculated oxygen demand.
- C. The Oxygenation System shall be capable of automatically adding variable amounts of oxygen as required by varying force main flow rates.
- D. The PLC shall also monitor the side stream pump operation, side stream water flow rate, oxygen flow rate, and water temperature and system pressure. These parameters shall be checked against design inputs to ensure optimal system performance and provide for system shutdown and/or alarm notification if the operation is out of tolerance.
- E. Alarms shall be capable of being transmitted to the owner in accordance with their requirements, specified in this section under sub-section 2.06.

PART 3 EXECUTION

3.01 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.

3.02 EQUIPMENT MOUNTING

A. Comply with procedures described in Section 43 05 13 RIGID EQUIPMENT MOUNTS.

3.03 FIELD QUALITY CONTROL

A. Field Testing:

 Conduct operational testing to confirm proper operation of the oxygenation system and verify that all components of the system are operating as intended by the design requirements. Operational testing shall have a duration of no less than 8-hours. Any alterations or modifications required to achieve proper

APRIL 2022

OXYGENATION SYSTEM

ATTACHMENT E - TECHNICALS

operation shall be at no additional cost to the Owner. All testing equipment, including but not limited to, laboratory equipment, field instruments, temporary utilities if required, bypass piping and valving shall be included in the base bid and at no additional cost to the Owner.

- 2. Provide a summary test report as described in Section 01 78 23 OPERATION AND MAINTENANCE DATA.
- 3. Include in bid all costs for services of testing firms and design professionals as may be required for performing these services.

B. Manufacturer Services:

- 1. Onsite Inspections and Training: Provide a factory-trained manufacturer's representative at the site for the following activities. Specified durations do not include travel time to or from the site.
 - a. Installation inspections:
 - 1) Assist, supervise, and inspect the Contractor's activities during installation.
 - 2) Provide 16 hours.
 - 3) Provide a completed Manufacturer's Certificate of Proper Installation per Section 01 43 33.
 - b. Component test phase inspections:
 - Assist, supervise, and inspect the Contractor's activities during the system test phase specified in Section 01 43 33 MANUFACTURERS' FIELD SERVICES – 3.01.F and this section.
 - 2) Provide 8 hours.
 - c. System test phase inspections:
 - Assist, supervise, and inspect the Contractor's activities during the system test phase specified in Section 01 91 14 TESTING AND STARTUP.
 - 2) Provide 8 hours.
 - d. Operational test phase inspections:
 - Assist, supervise, and inspect the Contractor's activities during the operational test phase specified in Section 01 43 33 MANUFACTURERS' FIELD SERVICES and 01 91 14 TESTING AND STARTUP.
 - 2) Provide 16 hours.
 - e. Training sessions:
 - 1) Comply with procedures described in Section 01 43 33 MANUFACTURERS' FIELD SERVICES.
 - 2) Provide a minimum of 6 hours classroom training for each training session.
 - 3) Conduct two training sessions, one training session per week on 2 consecutive weeks to accommodate the shift schedules of operation and maintenance staff.
 - 4) Certify completion of training per Section 01 43 33 MANUFACTURERS' FIELD SERVICES.

APRIL 2022 OXYGENATION SYSTEM

ATTACHMENT E - TECHNICALS

2. Offsite Training (Not Used)

3.04 SYSTEMS STARTUP

A. Comply with procedures described in Section 01 91 14 TESTING AND STARTUP.

END OF SECTION

APRIL 2022 ATTACHMENT E - TECHNICALS OXYGENATION SYSTEM 46 51 50 - 15

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

THIS PAGE INTENTIONALLY LEFT BLANK

APRIL 2022 ATTACHMENT E - TECHNICALS OXYGENATION SYSTEM 46 51 50 - 16

SUPPLEMENTARY SPECIAL PROVISIONS APPENDICES

APPENDIX A

NOTICE OF EXEMPTION

NOTICE OF EXEMPTION

(Check one or To: X	both) _RECORDER/COUNTY CLERK P.O.BOX 1750, MS A-33 1600 PACIFIC HWY, ROOM 260 SAN DIEGO, CA 92101-2422	FROM:	CITY OF SAN DIEGO PUBLIC UTILITIES DEPARTMENT 9192 TOPAZ WAY SAN QIEGO, CA 92123
<u>X</u>	OFFICE OF PLANNING AND RESEARCH 1400 TENTH STREET, ROOM 121 SACRAMENTO, CA 95814		

PROJECT NO.: N/A PROJECT TITLE: PENASQUITOS PUMP STATION OXYGEN ADDITION SYSTEM

PROJECT LOCATION-SPECIFIC: Penasquitos Pump Station located at 10150 Cara Way, San Diego, CA 92129; Miramar Ranch North Community Planning Area, Council District 5.

PROJECT LOCATION-CITY/COUNTY: City of San Diego/San Diego County

DESCRIPTION OF NATURE AND PURPOSE OF THE PROJECT: The purpose of this project is to install a High Purity Oxygen (HPO) system to improve the treatment performance and reliability of the North City Water Reclamation Plant (NCWRP). This project will confirm the theoretical effectiveness of HPO in reducing septicity of the wastewater conveyed to the NCWRP. The project will include the installation and testing of new above ground equipment including a pump pedestal, pump and motor, oxygenation pressure vessel, oxygen generation system, booster, oxygen tank, air compressor, compressed air piping, electrical breakers, and associated appurtenances. The work does not include any ground disturbing activities or physical modification to the environment. This project is located within the developed pump station and no impacts to sensitive biological resources or archeological resources will result from this work.

NAME OF PUBLIC AGENCY APPROVING PROJECT: City of San Diego

NAME OF PERSON OR AGENCY CARRYING OUT PROJECT: City of San Diego - Public Utilities Department Engineering and Program Management; 9192 Topaz Way, San Diego, CA 92123; Project Manager: Tiffany Lavan (858) 614-5714

EXEMPT	STATUS: (CHECK ONE)	(a e 1 1 1
()	MINISTERIAL (SEC. 21080(b)(1); 15268);	Ernest J Dronenburg, Jr. Recorder County Clerk
()	DECLARED EMERGENCY (SEC. 21080(b)(3); 15269(a); EMERGENCY PROJECT (SEC. 21080(b)(4)	NOV 0 8 2018
(X)	CATEGORICAL EXEMPTION: 15303 NEW CONSTRUCTION	
()	STATUTORY EXEMPTIONS:	BY

REASONS WHY PROJECT IS EXEMPT: This project includes the installation of new above-ground equipment at an existing City facility. Work will not include any ground disturbing activities and would not result in an impact or modification to the environment. This project meets the criteria for a Categorical Exemption pursuant to State CEQA Guidelines Section 15303 — New Construction or Conversion of Small Structures which allows for installation of small new equipment and facilities in small structures, specifically water mains, sewage and other utility extensions to serve such construction. The project does not trigger any of the exceptions to the exemptions listed in the CEQA Guidelines § 15300.2 in that no cumulative impacts were identified: no significant effects on the environment were identified; the project is not adjacent to a scenic highway: no significant effects to historical resources would be affected by the action: and the project was not identified on a list of hazardous wastes sites pursuant to Section 65962.5 of the Government Code.

LEAD AGENCY CONTACT PERSON:

Keli Balo, Project Officer II, Public Utilities Department, Telephone: (858) 292-6423

 ATTACH CERTIFIED DOCUMENT OF EXEMPTION F HAS A NOTICE OF EXEMPTION BEEN FILED BY TH YES () NO 	
IT IS HEREBY CERTIFIED THAT THE CITY OF SAN DIEGO HA	S DETERMINED THE ABOVE ACTIVITY TO BE EXEMPT FROM CEQA
	,
My MM, Preject Office	11-5-2018
SIGNATURE	DATE
CHECK ONE: (X) SIGNED BY LEAD AGENCY () SIGNED BY APPLICANT	DATE RECEIVED FOR FILING WITH COUNTY CLERK OR OPR:

FILED II	N THE OFFICE	OF THE CO	YTNUC	CLERK
San Dieg	o County on	NOV 0 8	2018	Market and the second second
Posted_	NOV 0 8 2018	_Removed	B. Cillector registrativismi of all the selectors of a	
Returned	to agency on	ing galandere som kommen som en s	a normálním mánických miestecký sprogramovn	****************
Deputy_	NBA	HIRAMI		

IF FILED BY APPLICANT:

APPENDIX B

FIRE HYDRANT METER PROGRAM

CITY OF SAN DIEGO CALIFORNIA	NUMBER	DEPARTMENT
DEPARTMENT INSTRUCTIONS	DI 55.27	Water Department
SUBJECT		EFFECTIVE DATE
	PAGE 10F 10	
FIRE HYDRANT METER PROGRAM		October 15, 2002
(FORMERLY: CONSTRUCTION METER		
PROGRAM)		
	SUPERSEDES	DATED
	DI 55.27	April 21, 2000

1. **PURPOSE**

1.1 To establish a Departmental policy and procedure for issuance, proper usage and charges for fire hydrant meters.

2. <u>AUTHORITY</u>

- 2.1 All authorities and references shall be current versions and revisions.
- 2.2 San Diego Municipal Code (NC) Chapter VI, Article 7, Sections 67.14 and 67.15
- 2.3 Code of Federal Regulations, Safe Drinking Water Act of 1986
- 2.4 California Code of Regulations, Titles 17 and 22
- 2.5 California State Penal Code, Section 498B.0
- 2.6 State of California Water Code, Section 110, 500-6, and 520-23
- 2.7 Water Department Director

Reference

- 2.8 State of California Guidance Manual for Cross Connection Programs
- 2.9 American Water Works Association Manual M-14, Recommended Practice for Backflow Prevention
- 2.10 American Water Works Association Standards for Water Meters
- 2.11 U.S.C. Foundation for Cross Connection Control and Hydraulic Research Manual

3. **DEFINITIONS**

3.1 **Fire Hydrant Meter:** A portable water meter which is connected to a fire hydrant for the purpose of temporary use. (These meters are sometimes referred to as Construction Meters.)

CITY OF SAN DIEGO CALIFORNIA	NUMBER	DEPARTMENT
DEPARTMENT INSTRUCTIONS	DI 55.27	Water Department
SUBJECT		EFFECTIVE DATE
	PAGE 2OF 10	
FIRE HYDRANT METER PROGRAM		October 15, 2002
(FORMERLY: CONSTRUCTION METER		
PROGRAM)		
	SUPERSEDES	DATED
	DI 55.27	April 21, 2000

- 3.2 **Temporary Water Use:** Water provided to the customer for no longer than twelve (12) months.
- 3.3 **Backflow Preventor:** A Reduced Pressure Principal Assembly connected to the outlet side of a Fire Hydrant Meter.

4. **POLICY**

- 4.1 The Water Department shall collect a deposit from every customer requiring a fire hydrant meter and appurtenances prior to providing the meter and appurtenances (see Section 7.1 regarding the Fees and Deposit Schedule). The deposit is refundable upon the termination of use and return of equipment and appurtenances in good working condition.
- 4.2 Fire hydrant meters will have a 2 ½" swivel connection between the meter and fire hydrant. The meter shall not be connected to the 4" port on the hydrant. All Fire Hydrant Meters issued shall have a Reduced Pressure Principle Assembly (RP) as part of the installation. Spanner wrenches are the only tool allowed to turn on water at the fire hydrant.
- 4.3 The use of private hydrant meters on City hydrants is prohibited, with exceptions as noted below. All private fire hydrant meters are to be phased out of the City of San Diego. All customers who wish to continue to use their own fire hydrant meters must adhere to the following conditions:
 - a. Meters shall meet all City specifications and American Water Works Association (AWWA) standards.
 - b. Customers currently using private fire hydrant meters in the City of San Diego water system will be allowed to continue using the meter under the following conditions:
 - 1. The customer must submit a current certificate of accuracy and calibration results for private meters and private backflows annually to the City of San Diego, Water Department, Meter Shop.

CITY OF SAN DIEGO CALIFORNIA	NUMBER	DEPARTMENT
DEPARTMENT INSTRUCTIONS	DI 55.27	Water Department
SUBJECT FIRE HYDRANT METER PROGRAM (FORMERLY: CONSTRUCTION METER PROGRAM)	PAGE 3OF 10	October 15, 2002
,	SUPERSEDES	DATED
	DI 55.27	April 21, 2000

- 2. The meter must be properly identifiable with a clearly labeled serial number on the body of the fire hydrant meter. The serial number shall be plainly stamped on the register lid and the main casing. Serial numbers shall be visible from the top of the meter casing and the numbers shall be stamped on the top of the inlet casing flange.
- 3. All meters shall be locked to the fire hydrant by the Water Department, Meter Section (see Section 4.7).
- 4. All meters shall be read by the Water Department, Meter Section (see Section 4.7).
- 5. All meters shall be relocated by the Water Department, Meter Section (see Section 4.7).
- 6. These meters shall be tested on the anniversary of the original test date and proof of testing will be submitted to the Water Department, Meter Shop, on a yearly basis. If not tested, the meter will not be allowed for use in the City of San Diego.
- 7. All private fire hydrant meters shall have backflow devices attached when installed.
- 8. The customer must maintain and repair their own private meters and private backflows.
- 9. The customer must provide current test and calibration results to the Water Department, Meter Shop after any repairs.
- 10. When private meters are damaged beyond repair, these private meters will be replaced by City owned fire hydrant meters.

CITY OF SAN DIEGO CALIFORNIA	NUMBER	DEPARTMENT
DEPARTMENT INSTRUCTIONS	DI 55.27	Water Department
SUBJECT		EFFECTIVE DATE
	PAGE 4OF 10	
FIRE HYDRANT METER PROGRAM		October 15, 2002
(FORMERLY: CONSTRUCTION METER		
PROGRAM)		
	SUPERSEDES	DATED
	DI 55.27	April 21, 2000

- 11. When a private meter malfunctions, the customer will be notified and the meter will be removed by the City and returned to the customer for repairs. Testing and calibration results shall be given to the City prior to any reinstallation.
- 12. The register shall be hermetically sealed straight reading and shall be readable from the inlet side. Registration shall be in hundred cubic feet.
- 13. The outlet shall have a 2 ½ "National Standards Tested (NST) fire hydrant male coupling.
- 14. Private fire hydrant meters shall not be transferable from one contracting company to another (i.e. if a company goes out of business or is bought out by another company).
- 4.4 All fire hydrant meters and appurtenances shall be installed, relocated and removed by the City of San Diego, Water Department. All City owned fire hydrant meters and appurtenances shall be maintained by the City of San Diego, Water Department, Meter Services.
- 4.5 If any fire hydrant meter is used in violation of this Department Instruction, the violation will be reported to the Code Compliance Section for investigation and appropriate action. Any customer using a fire hydrant meter in violation of the requirements set forth above is subject to fines or penalties pursuant to the Municipal Code, Section 67.15 and Section 67.37.

4.6 Conditions and Processes for Issuance of a Fire Hydrant Meter

Process for Issuance

- a. Fire hydrant meters shall only be used for the following purposes:
 - 1. Temporary irrigation purposes not to exceed one year.

CITY OF SAN DIEGO CALIFORNIA	NUMBER	DEPARTMENT
DEPARTMENT INSTRUCTIONS	DI 55.27	Water Department
SUBJECT		EFFECTIVE DATE
	PAGE 5OF 10	
FIRE HYDRANT METER PROGRAM		October 15, 2002
(FORMERLY: CONSTRUCTION METER		
PROGRAM)		
	SUPERSEDES	DATED
	DI 55.27	April 21, 2000

- 2. Construction and maintenance related activities (see Tab 2).
- b. No customer inside or outside the boundaries of the City of San Diego Water Department shall resell any portion of the water delivered through a fire hydrant by the City of San Diego Water Department.
- c. The City of San Diego allows for the issuance of a temporary fire hydrant meter for a period not to exceed 12 months (365 days). An extension can only be granted in writing from the Water Department Director for up to 90 additional days. A written request for an extension by the consumer must be submitted at least 30 days prior to the 12 month period ending. No extension shall be granted to any customer with a delinquent account with the Water Department. No further extensions shall be granted.
- d. Any customer requesting the issuance of a fire hydrant meter shall file an application with the Meter Section. The customer must complete a "Fire Hydrant Meter Application" (Tab 1) which includes the name of the company, the party responsible for payment, Social Security number and/or California ID, requested location of the meter (a detailed map signifying an exact location), local contact person, local phone number, a contractor's license (or a business license), description of specific water use, duration of use at the site and full name and address of the person responsible for payment.
- e. At the time of the application the customer will pay their fees according to the schedule set forth in the Rate Book of Fees and Charges, located in the City Clerk's Office. All fees must be paid by check, money order or cashiers check, made payable to the City Treasurer. Cash will not be accepted.
- f. No fire hydrant meters shall be furnished or relocated for any customer with a delinquent account with the Water Department.
- g. After the fees have been paid and an account has been created, the

CITY OF SAN DIEGO CALIFORNIA	NUMBER	DEPARTMENT
DEPARTMENT INSTRUCTIONS	DI 55.27	Water Department
SUBJECT		EFFECTIVE DATE
	PAGE 6 OF 10	
FIRE HYDRANT METER PROGRAM		October 15, 2002
(FORMERLY: CONSTRUCTION METER		
PROGRAM)		
	SUPERSEDES	DATED
	DI 55.27	April 21, 2000

meter shall be installed within 48 hours (by the second business day). For an additional fee, at overtime rates, meters can be installed within 24 hours (within one business day).

4.7 Relocation of Existing Fire Hydrant Meters

- a. The customer shall call the Fire Hydrant Meter Hotline (herein referred to as "Hotline"), a minimum of 24 hours in advance, to request the relocation of a meter. A fee will be charged to the existing account, which must be current before a work order is generated for the meter's relocation.
- b. The customer will supply in writing the address where the meter is to be relocated (map page, cross street, etc). The customer must update the original Fire Hydrant Meter Application with any changes as it applies to the new location.
- c. Fire hydrant meters shall be read on a monthly basis. While fire hydrant meters and backflow devices are in service, commodity, base fee and damage charges, if applicable, will be billed to the customer on a monthly basis. If the account becomes delinquent, the meter will be removed.

4.8 **Disconnection of Fire Hydrant Meter**

- a. After ten (10) months a "Notice of Discontinuation of Service" (Tab 3) will be issued to the site and the address of record to notify the customer of the date of discontinuance of service. An extension can only be granted in writing from the Water Department Director for up to 90 additional days (as stated in Section 4.6C) and a copy of the extension shall be forwarded to the Meter Shop Supervisor. If an extension has not been approved, the meter will be removed after twelve (12) months of use.
- b. Upon completion of the project the customer will notify the Meter Services office via the Hotline to request the removal of the fire hydrant meter and appurtenances. A work order will be generated

CITY OF SAN DIEGO CALIFORNIA	NUMBER	DEPARTMENT
DEPARTMENT INSTRUCTIONS	DI 55.27	Water Department
SUBJECT		EFFECTIVE DATE
	PAGE 7OF 10	
FIRE HYDRANT METER PROGRAM		October 15, 2002
(FORMERLY: CONSTRUCTION METER		
PROGRAM)		
	SUPERSEDES	DATED
	DI 55.27	April 21, 2000

for removal of the meter.

- c. Meter Section staff will remove the meter and backflow prevention assembly and return it to the Meter Shop. Once returned to the Meter Shop the meter and backflow will be tested for accuracy and functionality.
- d. Meter Section Staff will contact and notify Customer Services of the final read and any charges resulting from damages to the meter and backflow or its appurtenance. These charges will be added on the customer's final bill and will be sent to the address of record. Any customer who has an outstanding balance will not receive additional meters.
- e. Outstanding balances due may be deducted from deposits and any balances refunded to the customer. Any outstanding balances will be turned over to the City Treasurer for collection. Outstanding balances may also be transferred to any other existing accounts.

5. **EXCEPTIONS**

Any request for exceptions to this policy shall be presented, in writing, to the Customer Support Deputy Director, or his/her designee for consideration.

6. **MOBILE METER**

- 6.1 Mobile meters will be allowed on a case by case basis. All mobile meters will be protected by an approved backflow assembly and the minimum requirement will be a Reduced Pressure Principal Assembly. The two types of Mobile Meters are vehicle mounted and floating meters. Each style of meters has separate guidelines that shall be followed for the customer to retain service and are described below:
 - a) **Vehicle Mounted Meters**: Customer applies for and receives a City owned Fire Hydrant Meter from the Meter Shop. The customer mounts the meter on the vehicle and brings it to the Meter Shop for

CITY OF SAN DIEGO CALIFORNIA	NUMBER	DEPARTMENT
DEPARTMENT INSTRUCTIONS	DI 55.27	Water Department
SUBJECT		EFFECTIVE DATE
	PAGE 8OF 10	
FIRE HYDRANT METER PROGRAM		October 15, 2002
(FORMERLY: CONSTRUCTION METER		
PROGRAM)		
	SUPERSEDES	DATED
	DI 55.27	April 21, 2000

inspection. After installation is approved by the Meter Shop the vehicle and meter shall be brought to the Meter Shop on a monthly basis for meter reading and on a quarterly basis for testing of the backflow assembly. Meters mounted at the owner's expense shall have the one year contract expiration waived and shall have meter or backflow changed if either fails.

- b) Floating Meters: Floating Meters are meters that are not mounted to a vehicle. (Note: All floating meters shall have an approved backflow assembly attached.) The customer shall submit an application and a letter explaining the need for a floating meter to the Meter Shop. The Fire Hydrant Meter Administrator, after a thorough review of the needs of the customer, (i.e. number of jobsites per day, City contract work, lack of mounting area on work vehicle, etc.), may issue a floating meter. At the time of issue, it will be necessary for the customer to complete and sign the "Floating Fire Hydrant Meter Agreement" which states the following:
 - 1) The meter will be brought to the Meter Shop at 2797 Caminito Chollas, San Diego on the third week of each month for the monthly read by Meter Shop personnel.
 - 2) Every other month the meter will be read and the backflow will be tested. This date will be determined by the start date of the agreement.

If any of the conditions stated above are not met the Meter Shop has the right to cancel the contract for floating meter use and close the account associated with the meter. The Meter Shop will also exercise the right to refuse the issuance of another floating meter to the company in question.

Any Fire Hydrant Meter using reclaimed water shall not be allowed use again with any potable water supply. The customer shall incur the cost of replacing the meter and backflow device in this instance.

CITY OF SAN DIEGO CALIFORNIA	NUMBER	DEPARTMENT
DEPARTMENT INSTRUCTIONS	DI 55.27	Water Department
SUBJECT		EFFECTIVE DATE
	PAGE 9 OF 10	
FIRE HYDRANT METER PROGRAM		October 15, 2002
(FORMERLY: CONSTRUCTION METER		
PROGRAM)		
	SUPERSEDES	DATED
	DI 55.27	April 21, 2000

7. FEE AND DEPOSIT SCHEDULES

7.1 **Fees and Deposit Schedules:** The fees and deposits, as listed in the Rate Book of Fees and Charges, on file with the Office of the City Clerk, are based on actual reimbursement of costs of services performed, equipment and materials. Theses deposits and fees will be amended, as needed, based on actual costs. Deposits, will be refunded at the end of the use of the fire hydrant meter, upon return of equipment in good working condition and all outstanding balances on account are paid. Deposits can also be used to cover outstanding balances.

All fees for equipment, installation, testing, relocation and other costs related to this program are subject to change without prior notification. The Mayor and Council will be notified of any future changes.

8. <u>UNAUTHORIZED USE OF WATER FROM A HYDRANT</u>

- 8.1 Use of water from any fire hydrant without a properly issued and installed fire hydrant meter is theft of City property. Customers who use water for unauthorized purposes or without a City of San Diego issued meter will be prosecuted.
- 8.2 If any unauthorized connection, disconnection or relocation of a fire hydrant meter, or other connection device is made by anyone other than authorized Water Department personnel, the person making the connection will be prosecuted for a violation of San Diego Municipal Code, Section 67.15. In the case of a second offense, the customer's fire hydrant meter shall be confiscated and/or the deposit will be forfeited.
- 8.3 Unauthorized water use shall be billed to the responsible party. Water use charges shall be based on meter readings, or estimates when meter readings are not available.
- 8.4 In case of unauthorized water use, the customer shall be billed for all applicable charges as if proper authorization for the water use had been obtained, including but not limited to bi-monthly service charges, installation charges and removal charges.

CITY OF SAN DIEGO CALIFORNIA DEPARTMENT INSTRUCTIONS	NUMBER DI 55.27	DEPARTMENT Water Department
SUBJECT		EFFECTIVE DATE
FIRE HYDRANT METER PROGRAM (FORMERLY: CONSTRUCTION METER PROGRAM)	PAGE 10OF 10	October 15, 2002
,	SUPERSEDES	DATED
	DI 55.27	April 21, 2000

8.5 If damage occurs to Water Department property (i.e. fire hydrant meter, backflow, various appurtenances), the cost of repairs or replacements will be charged to the customer of record (applicant).

Water Department Director

Tabs: 1. Fire Hydrant Meter Application

2. Construction & Maintenance Related Activities With No Return

To Sewer

3. Notice of Discontinuation of Service

APPENDIX

Administering Division: Customer Support Division

Subject Index: Construction Meters

Fire Hydrant

Fire Hydrant Meter Program

Meters, Floating or Vehicle Mounted

Mobile Meter

Program, Fire Hydrant Meter

Distribution: DI Manual Holders



Application for Fire (EXHIBIT A) **Hydrant Meter**

(For Office Use Only)

NS REQ	FAC#	
DATE	ВҮ	

METER SHOP (619) 527-7449 Application Date

Meter I	nfor	mation
INICICI	11101	mation

Meter Information	4	Application Date	Re	equested Instal	l Date:	
Fire Hydrant Location: (Attach Detailed Map//Thomas Bros	tion drawing.) <u>Zip:</u>	Ī	.B.	G.B. (CITY USE)		
Specific Use of Water:						
Any Return to Sewer or Storm Drain, If so, explain:			***	-		
Estimated Duration of Meter Use:				Ch	neck Box if Recl	aimed Water
Company Information						
Company Name:						
Mailing Address:						
City: Sta	te:	Zip:		Phone:	()	
*Business license#	*	Contra	ctor license#			
A Copy of the Contractor's license OR Busine	ss License is r	equired	at the time o	of meter is	suance.	· · · · · · · · · · · · · · · · · · ·
Name and Title of Billing Agent: (PERSON IN ACCOUNTS PAYABLE)				Phone:	()	150 A
Site Contact Name and Title:				Phone:	()	
Responsible Party Name:				Title:		
Cal ID# Phone: ()						
Signature: Date:						
Guarantees Payment of all Charges Resulting from the use of this N	Meter. <u>Insures that e</u>	mployees	of this Organization	understand the	proper use of Fi	re Hydrant Meter
*	5	43.				
Fire Hydrant Meter Removal Req	uest		Requested Re	emoval Date	e:	
Provide Current Meter Location if Different from Above:						
Signature:		Tit	le:		Date:	j.
Phone: ()	Pa	ger: ()			# AT 8
City Meter Private Meter						
Contract Acct #:	Deposit Am	ount:	936.00	Fees Amou	nt: \$ 62.0	00
Meter Serial #	Meter Size:	05	Meter Make and Style: 6-7			6-7
Backflow #	Backflow Size	a:		Backflow Make and S	Style	*.
Name:		.riune und e	Date:			

Date:

WATER USES WITHOUT ANTICIPATED CHARGES FOR RETURN TO SEWER

Auto Detailing

Backfilling

Combination Cleaners (Vactors)

Compaction

Concrete Cutters

Construction Trailers

Cross Connection Testing

Dust Control

Flushing Water Mains

Hydro Blasting

Hydro Seeing

Irrigation (for establishing irrigation only; not continuing irrigation)

Mixing Concrete

Mobile Car Washing

Special Events

Street Sweeping

Water Tanks

Water Trucks

Window Washing

Note:

1. If there is any return to sewer or storm drain, then sewer and/or storm drain fees will be charges.

Date		
Name of Responsible Party Company Name and Address Account Number:		
Subject: Discontinuation of Fire	Hydrant Meter Service	
Dear Water Department Customer:		
The authorization for use of Fire Hydrar ends in 60 days and will be removed on additional 90 days must be submitted in date. If you require an extension, please extension to:	or after (Date Authorization writing for consideration 3	on Expires). Extension requests for an 30 days prior to the discontinuation
	City of San Diego Water Department Attention: Meter Service 2797 Caminito Chollas San Diego, CA 92105-50	
Should you have any questions regardin	g this matter, please call th	ne Fire Hydrant Hotline at (619)
Sincerely,		
Water Department		

APPENDIX C

MATERIALS TYPICALLY ACCEPTED BY CERTIFICATE OF COMPLIANCE

MATERIALS TYPICALLY ACCEPTED BY CERTIFICATE OF COMPLIANCE

- 1. Soil amendment
- 2. Fiber mulch
- 3. PVC or PE pipe up to 16 inch diameter
- 4. Stabilizing emulsion
- 5. Lime
- 6. Preformed elastomeric joint seal
- 7. Plain and fabric reinforced elastomeric bearing pads
- 8. Steel reinforced elastomeric bearing pads
- 9. Waterstops (Special Condition)
- 10. Epoxy coated bar reinforcement
- 11. Plain and reinforcing steel
- 12. Structural steel
- 13. Structural timber and lumber
- 14. Treated timber and lumber
- 15. Lumber and timber
- 16. Aluminum pipe and aluminum pipe arch
- 17. Corrugated steel pipe and corrugated steel pipe arch
- 18. Structural metal plate pipe arches and pipe arches
- 19. Perforated steel pipe
- 20. Aluminum underdrain pipe
- 21. Aluminum or steel entrance tapers, pipe downdrains, reducers, coupling bands and slip joints
- 22. Metal target plates
- 23. Paint (traffic striping)
- 24. Conductors
- 25. Painting of electrical equipment
- 26. Electrical components
- 27. Engineering fabric
- 28. Portland Cement
- 29. PCC admixtures
- 30. Minor concrete, asphalt
- 31. Asphalt (oil)
- 32. Liquid asphalt emulsion
- 33. Ероху

APPENDIX D

SAMPLE CITY INVOICE WITH CASH FLOW FORECAST

City of San Diego, CM&FS Div., 9753 Chesapeake 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:**

Contact Name:

This Estimate Previous Totals To Date Totals to Date Item Description Contract Authorization Item # % / QTY Unit Price Qty Extension Amount % / QTV Amount Amount 0.00 \$ 1 \$ 2 \$ \$ 0.00% \$ \$ 0.00% 3 _ \$ \$ 0.00% 4 \$ 0.00% 5 0.00% 6 \$ \$ 0.00% 8 \$ \$ \$ 0.00% \$ 0.00% 5 0.00% 6 \$ \$ \$ \$ \$ 0.00% \$ 8 \$ \$ 0.00% 9 \$ \$ 0.00% \$ \$ 0.00% 10 \$ 11 \$ \$ 0.00% \$ \$ 0.00% 12 \$ 13 \$ \$ 0.00% 14 \$ \$ 0.00% --0.00% 15 \$ \$ \$ 0.00% 16 \$ \$ _ _ **Field Orders** \$ \$ 0.00% -\$ \$ 0.00% -**CHANGE ORDER No.** \$ \$ 0.00% \$ 0.00% \$ Total Authorized Amount (including approved Change Order) \$ Total Billed

SUMMARY A. Original Contract Amount I certify that the materials Retention and/or Escrow Payment Schedule \$ have been received by me in \$0.00 B. Approved Change Order #00 Thru #00 Total Retention Required as of this billing (Item E) Total Authorized Amount (A+B) the quality and quantity specified Previous Retention Withheld in PO or in Escrow \$0.00 D. Total Billed to Date \$0.00 Add'l Amt to Withhold in PO/Transfer in Escrow: **Resident Engineer** Less Total Retention (5% of D) Amt to Release to Contractor from PO/Escrow: Less Total Previous Payments **Construction Engineer** G. Payment Due Less Retention \$0.00 Contractor Signature and Date:

NOTE: CONTRACTOR TO CALCULATE TO THE 2ND DECIMAL PLACE.

\$0.00

H. Remaining Authorized Amount

RE Phone#:

Fax#:

Billing Period: (To)

WBS #:	B18108
Date Submitted:	10/10/2018
NTP Date:	3/23/2018
Final Statement of WD Date:	5/23/2020
Contract #:	K-XX-XXXX-XXX-X
Contract Amount:	\$5,617,000

Construction Cash Flow Forecast "Sewer and Water Group Job 965 (W)"

Year	January	February	March	April	May	June	July	August	September	October	November	December
2018	, ,	,		15,000	25,000	52,000	52,000	100,000	10,000	100,000	100,000	100,000
2019	10,000	10,000	85,000	58,000	100,000	100,000	100,000	100,000	100,000	100,000	1,000,000	1,000,000
2020	100,000	100,000	100,000	1,000,000	1,000,000							
2021												
2022												
2023												
2024												
2025												

APPENDIX E

LOCATION MAP





PENASQUITOS PUMP STATION OXYGENATION SYSTEM

SENIOR ENGINEER REYHANEH MARTIN 858-243-5036

PROJECT MANAGER PROJECT ENGINEER ANTHONY VAN 858-292-6492

NOVENCIDO REYNALDO 858-292-6416

FOR QUESTIONS ABOUT THIS PROJECT

Call: (619) 533-4207

Email: engineering@sandiego.gov WTERSTATE 15 SB ON 1-15 WIESSATE SAMB HOV INTERSTATE 15 NB OFF POWAY POWAY CARA WERSTAF 16 SB MIESSAIE 588 HOV. MYERSTATE 15 NB UNNAMED PRIVATE Legend **CIP Project Location**

COMMUNITY NAME: MIRAMAR RANCH

COUNCIL DISTRICT: 5

APPENDIX F

HAZARDOUS WASTE LABEL/FORMS

STATE AND FEDERAL LAW PROHIBITS IMPROPER DISPOSAL IF FOUND, CONTACT THE NEAREST POLICE, OR PUBLIC SAFETY AUTHORITY, OR THE U.S. ENVIRONMENTAL PROTECTION AGENCY OR THE CALIFORNIA DEPARTMENT OF HEALTH SERVICES GENERATOR NAME __ ADDRESS ____ STATE MANIFEST DOCUMENT NO. ACCUMULATION START DATE WASTE NO. .. CA WASTE NO. CONTENTS, COMPOSITION _ PROPER DOT SHIPPING NAME TECHNICAL NAME (S) UNINA NO. WITH PREFIX __ PHYSICAL STATE | HAZARDOUS PROPERTIES O SOLID O LIQUID | O CORROSIVE O S O FLAMMABLE ☐ TOXIC O REACTIVE O OTHER . CONTAINS HAZARDOUS OR TOXIC WASTES

INCIDENT/RELEASE ASSESSMENT FORM 1

If you have an emergency, Call 911

Handlers of hazardous materials are required to report releases. The following is a tool to be used for assessing if a release is reportable. Additionally, a non-reportable release incident form is provided to document why a release is not reported (see back).

Que	estions for Incident Assessment:	YES	NO
1.	Was anyone killed or injured, or did they require medical care or admitted to a hospital for observation?		
2.	Did anyone, other than employees in the immediate area of the release, evacuate?		
3.	Did the release cause off-site damage to public or private property?		
4.	Is the release greater than or equal to a reportable quantity (RQ)?		
5.	Was there an uncontrolled or unpermitted release to the air?		
6.	Did an uncontrolled or unpermitted release escape secondary containment, or extend into any sewers, storm water conveyance systems, utility vaults and conduits, wetlands, waterways, public roads, or off site?		
7.	Will control, containment, decontamination, and/or clean up require the assistance of federal, state, county, or municipal response elements?		
8.	Was the release or threatened release involving an unknown material or contains an unknown hazardous constituent?		
9.	Is the incident a threatened release (a condition creating a substantial probability of harm that requires immediate action to prevent, reduce, or mitigate damages to persons, property, or the environment)?		
10.	Is there an increased potential for secondary effects including fire, explosion, line rupture, equipment failure, or other outcomes that may endanger or cause exposure to employees, the general public, or the environment?		

If the answer is YES to any of the above questions – report the release to the California Office of Emergency Services at 800-852-7550 and the local CUPA daytime: (619) 338-2284, after hours: (858) 565-5255. Note: other state and federal agencies may require notification depending on the circumstances.

Call 911 in an emergency

If all answers are NO, complete a Non Reportable Release Incident Form (page 2 of 2) and keep readily available. Documenting why a "no" response was made to each question will serve useful in the event questions are asked in the future, and to justify not reporting to an outside regulatory agency.

If in doubt, report the release.

5-02-08 Page 1 of 2

¹ This document is a guide for accessing when hazardous materials release reporting is required by Chapter 6.95 of the California Health and Safety Code. It does not replace good judgment, Chapter 6.95, or other state or federal release reporting requirements.

NON REPORTABLE RELEASE INCIDENT FORM

1. RELEASE AND RESPONSE DES	CRIPTION	Incident #	
Date/Time Discovered	Date/Time Discharge	Discharge Stopped ☐ Yes ☐ I	No
Incident Date / Time:			
Incident Business / Site Name:			
Incident Address:			
Other Locators (Bldg, Room, Oil Field, I	Lease, Well #, GIS)		
Please describe the incident and indicate	specific causes and area affected.	Photos Attached?:	No
Indicate actions to be taken to prevent sin	nilar releases from occurring in the	tuture.	
2. ADMINISTRATIVE INFORMAT	TION		
Supervisor in charge at time of incident:	1011	Phone:	
Contact Person:		Phone:	
		12.0000	
3. CHEMICAL INFORMATION			
Chemical	Quantity	\square GAL \square LBS \square	FT³
Chemical	Quantity		
	Quantity	GAL LBS L	FT ³
Chemical	Quantity	\square GAL \square LBS \square	FT³
Clean-Up Procedures & Timeline:	Quantity	GIL EDS	
Completed By:	Phone:		
Print Name:	Title:		_

EMERGENCY RELEASE FOLLOW - UP NOTICE REPORTING FORM

A	BUSINESS NAME FACILITY EMERGENCY CONTACT & PHONE NUMBER () -
E	INCIDENT MO DAY YR OES OES NOTIFIED (use 24 hr time) CONTROL NO.
(INCIDENT ADDRESS LOCATION CITY/COMMUNITY COUNTY ZIP
	CHEMICAL OR TRADE NAME (print or type) CAS Number
	CHECK IF CHEMICAL IS LISTED IN 40 CFR 355, APPENDIX A CHECK IF RELEASE REQUIRES NOTIFI - CATION UNDER 42 U.S.C. Section 9603 (a)
	PHYSICAL STATE CONTAINED PHYSICAL STATE RELEASED QUANTITY RELEASED SOLID LIQUID GAS
	ENVIRONMENTAL CONTAMINATION AIR WATER GROUND OTHER TIME OF RELEASE DURATION OF RELEASE —DAYS —HOURS—MINUTES
	ACTIONS TAKEN
E	
	KNOWN OR ANTICIPATED HEALTH EFFECTS (Use the comments section for addition information) ACUTE OR IMMEDIATE (explain)
F	CHRONIC OR DELAYED (explain) NOTKNOWN (explain)
	ADVICE REGARDING MEDICAL ATTENTION NECESSARY FOR EXPOSED INDIVIDUALS
	COMMENTS (INDICATE SECTION (A - G) AND ITEM WITH COMMENTS OR ADDITIONAL INFORMATION)
	CERTIFICATION: I certify under penalty of law that I have personally examined and I am familiar with the information submitted and believe the submitted information is true, accurate, and complete.
	REPORTING FACILITY REPRESENTATIVE (print or type) DATE: DATE:

EMERGENCY RELEASE FOLLOW-UP NOTICE REPORTING FORM INSTRUCTIONS

GENERAL INFORMATION:

Chapter 6.95 of Division 20 of the California Health and Safety Code requires that written emergency release follow-up notices prepared pursuant to 42 U.S.C. § 11004, be submitted using this reporting form. Non-permitted releases of reportable quantities of Extremely Hazardous Substances (listed in 40 CFR 355, appendix A) or of chemicals that require release reporting under section 103(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 [42 U.S.C. § 9603(a)] must be reported on the form, as soon as practicable, but no later than 30 days, following a release. The written follow-up report is required in addition to the verbal notification.

BASIC INSTRUCTIONS:

- The form, when filled out, reports follow-up information required by 42 U.S.C § 11004. Ensure that all information requested by the form is provided as completely as possible.
- If the incident involves reportable releases of more than one chemical, prepare one report form for each chemical released.
- If the incident involves a series of separate releases of chemical(s) at different times, the releases should be reported on separate reporting forms.

SPECIFIC INSTRUCTIONS:

Block A: Enter the name of the business and the name and phone number of a contact person who can provide detailed facility information concerning the release.

Block B: Enter the date of the incident and the time that verbal notification was made to OES. The OES control number is provided to the caller by OES at the time verbal notification is made. Enter this control number in the space provided.

Block C: Provide information pertaining to the location where the release occurred. Include the street address, the city or community, the county and the zip code.

Block D: Provide information concerning the specific chemical that was released. Include the chemical or trade name and the Chemical Abstract Service (CAS) number. Check all categories that apply. Provide best available information on quantity, time and duration of the release.

Block E: Indicate all actions taken to respond to and contain the release as specified in 42 U.S.C. § 11004(c).

Block F: Check the categories that apply to the health effects that occurred or could result from the release. Provide an explanation or description of the effects in the space provided. Use Block H for additional comments/information if necessary to meet requirements specified in 42 U.S.C. § 11004(c).

Block G: Include information on the type of medical attention required for exposure to the chemical released. Indicate when and how this information was made available to individuals exposed and to medical personnel, if appropriate for the incident, as specified in 42 U.S.C. § 11004(c).

Block H: List any additional pertinent information.

Block I: Print or type the name of the facility representative submitting the report. Include the official signature and the date that the form was prepared.

MAIL THE COMPLETED REPORT TO:

State Emergency Response Commission (SERC) Attn: Section 304 Reports Hazardous Materials Unit 3650 Schriever Avenue Mather, CA 95655

NOTE: Authority cited: Sections 25503, 25503.1 and 25507.1, Health and Safety Code. Reference: Sections 25503(b)(4), 25503.1, 25507.1, 25518 and 25520, Health and Safety Code.

APPENDIX G

SAMPLE OF PUBLIC NOTICE

FOR SAMPLE REFERENCE ONLY





CONSTRUCTION NOTICE

PROJECT TITLE

Work on your street will begin within one week to replace the existing water mains servicing your community.

The work will consist of:

- Saw-cutting and trench work on Ingulf Street from Morena Boulevard to Galveston Street to install new water mains, water laterals and fire hydrants.
- Streets where trenching takes place will be resurfaced and curb ramps will be upgraded to facilitate access for persons with disabilities where required.
- This work is anticipated to be complete in your community by December 2016.

How your neighborhood may be impacted:

- Water service to some properties during construction will be provided by a two-inch highline pipe that will run along the curb. To report a highline leak call 619-515-3525.
- Temporary water service disruptions are planned. If planned disruptions impact your property, you will receive advance notice.
- Parking restrictions will exist because of the presence of construction equipment and materials.
- "No Parking" signs will be displayed 72 hours in advance of the work.
- Cars parked in violation of signs will be TOWED.

Hours and Days of Operation:

Monday through Friday X:XX AM to X:XX PM.

City of San Diego Contractor:

Company Name, XXX-XXX-XXXX





CONSTRUCTION NOTICE

PROJECT TITLE

Work on your street will begin within one week to replace the existing water mains servicing your community.

The work will consist of:

- Saw-cutting and trench work on Ingulf Street from Morena Boulevard to Galveston Street to install new water mains, water laterals and fire hydrants.
- Streets where trenching takes place will be resurfaced and curb ramps will be upgraded to facilitate access for persons with disabilities where required.
- This work is anticipated to be complete in your community by December 2016.

How your neighborhood may be impacted:

- Water service to some properties during construction will be provided by a two-inch highline pipe that will run along the curb. To report a highline leak call 619-515-3525.
- Temporary water service disruptions are planned. If planned disruptions impact your property, you will receive advance notice.
- Parking restrictions will exist because of the presence of construction equipment and materials.
- "No Parking" signs will be displayed 72 hours in advance of the work.
- Cars parked in violation of signs will be TOWED.

Hours and Days of Operation:

Monday through Friday X:XX AM to X:XX PM.

City of San Diego Contractor:

Company Name, XXX-XXX-XXXX



To contact the City of San Diego: SD Public Works
619-533-4207 | engineering@sandiego.gov | sandiego.gov/CIP

APPENDIX H

ADVANCED METERING INFRASTRUCTURE (AMI) DEVICE PROTECTION

Protecting AMI Devices in Meter Boxes and on Street Lights

The Public Utilities Department (PUD) has begun the installation of the Advanced Metering Infrastructure (AMI) technology as a new tool to enhance water meter reading accuracy and efficiency, customer service and billing, and to be used by individual accounts to better manage the efficient use of water. All AMI devices shall be protected per Section 402-2, "Protection", of the 2021 Whitebook.

AMI technology allows water meters to be read electronically rather than through direct visual inspection by PUD field staff. This will assist PUD staff and customers in managing unusual consumption patterns which could indicate leaks or meter tampering on a customer's property.

Three of the main components of an AMI system are the:

A. Endpoints, see Photo 1:

Photo 1



B. AMI Antenna attached to Endpoint (antenna not always required), see Photo 2:



Network Devices, see Photo 3:

Photo 3



AMI endpoints transmit meter information to the AMI system and will soon be on the vast majority of meters in San Diego. These AMI devices provide interval consumption data to the PUD's Customer Support Division. If these devices are damaged or communication is interrupted, this Division will be alerted of the situation. The endpoints are installed in water meter boxes, coffins, and vaults adjacent to the meter. A separate flat round antenna may also be installed through the meter box lid. This antenna is connected to the endpoint via cable. The following proper installation shall be implemented when removing the lid to avoid damaging the antenna, cable, and/or endpoint. Photo 4 below demonstrates a diagram of the connection:

Photo 4



The AMI device ERT/Endpoint/Transmitter shall be positioned and installed as discussed in this Appendix. If the ERT/Endpoint/Transmitter is disturbed, it shall be re-installed and returned to its original installation with the end points pointed upwards as shown below in Photo 5.

The PUD's code compliance staff will issue citations and invoices to you for any damaged AMI devices that are not re-installed as discussed in the Contract Document Photo 5 below shows a typical installation of an AMI endpoint on a water meter.

Photo 5



Photo 6 below is an example of disturbance that shall be avoided:

Photo 6



You are responsible when working in and around meter boxes. If you encounter these endpoints, use proper care and do not disconnect them from the registers on top of the water meter. If the lid has an antenna drilled through, do not change or tamper with the lid and inform the Resident Engineer immediately about the location of that lid. Refer to Photo 7 below:

Photo 7



Another component of the AMI system are the Network Devices. The Network Devices are strategically placed units (mainly on street light poles) that collect interval meter reading data from multiple meters for transmission to the Department Control Computer. If you come across any of these devices on street lights that will be removed or replaced (refer to Photos 8 and 9 below), notify AMI Project Manager Arwa Sayed at (619) 362-0121 immediately.

Photo 8 shows an installed network device on a street light. On the back of each Network Device is a sticker with contact information. See Photo 9. **Call PUD Water Emergency Repairs at 619-515-3525 if your work will impact these street lights.** These are assets that belong to the City of San Diego and you shall be responsible for any costs of disruption of this network.

Photo 8



Network Device

Photo 9



If you encounter any bad installations, disconnected/broken/buried endpoints, or inadvertently damage any AMI devices or cables, notify the Resident Engineer immediately. The Resident Engineer will then immediately contact the AMI Project Manager, Arwa Sayed, at (619) 362-0121.

APPENDIX I

LCP TRACKER THIRD PARTY USER AGREEMENT AND FORMS



Third Party User Agreement

LCPtracker, Inc., a California corporation with a place of b	ousiness located at 117 East Chapman,
Orange, California 92866 ("LCPtracker"), and Parsons-Bla	ack & Veatch Joint Venture, a joint
venture governed by the laws of the state of California ("	Parsons B&V JV") are willing to provide
you, [NAME OF CONTRACTOR/CONSULTANT]	with a place of
business located at [ADDRESS OF CONTRACTOR/CONSULT	<u>TANT]</u>
("Third Party User") with a limited license (subject to the	terms of this Agreement) to the Licensed
Software Services (as defined below), pursuant to the Ma	aster Subscription Software as a Service
License Agreement between Parsons B&V JV and LCPtrac	ker dated March 5, 2021 (the " Master
Agreement"), but only on the condition that Third Party	User accepts and complies with all the
terms in this Third Party User Agreement (this "Agreeme	nt") which is entered into as of [insert
date of signature by Contractor/Consultant	, 2021 (the "Effective Date") and
governs the license and use of Licensed Software Service	s (defined below). LCPtracker and Third
Party User therefore agree as follows:	

1. DEFINITIONS.

"Affiliate" means any entity which directly or indirectly controls, is controlled by, or is under common control with the subject entity. "Control," for purposes of this definition, means direct or indirect ownership or control of more than fifty percent (50%) of the voting interests of the subject entity.

"Applicable Law" means all federal, state, local and other laws, rules and regulations, ordinances, interpretive letters and other official releases of or by any governmental authority, decrees, orders and codes as the same are promulgated, supplemented and or amended from time to time and as are, or may be, applicable to a Party's performance of its obligations under the Agreement, including any applicable law relating to the privacy or processing, protection, collection, use, disclosure or distributions of personally identifiable information or personally identifiable healthcare information about an individual as more particularly described in any such applicable law. "Applicable Law" includes, without limitation, the California Privacy Rights Act.

"Third Party Data" means all Third Party User's or its Users' electronic data or information entered into any Licensed Software Services.

"**Documentation**" means the online user guides, training material and other documentation for the applicable Licensed Software Services, accessible via login and updated from time to time.

"Licensed Software Services" means any LCPtracker software as a service products and related services that are provided to Third Party User (and listed at Exhibit 1) by LCPtracker or Parsons B&V JV online, including associated offline components, as described in the Documentation. "Licensed Software Services" excludes non-LCPtracker applications and Licensed Software Services are only to be used for the certain Pure Water Program projects detailed in Exhibit 1 (the "Pure Water Projects").

"Malicious Code" means viruses, worms, time bombs, Trojan horses and other harmful or malicious code, files, scripts, agents or programs.

"Subscription Term" means the applicable license term detailed at Exhibit 1.

"Users" means persons or entities who are authorized by Third Party User to use the Licensed Software Services for the Pure Water Projects pursuant to a Licensed Software Schedule, and who have been entered as a user in the Licensed Software Services by Third Party User, Parsons B&V JV, or LCPtracker, and is listed as a subcontractor to Third Party User in the Licensed Software Services. Users include Third Party User (or User) employees, consultants, contractors and agents. Use of the Licensed Software Services is solely for the benefit of Third Party User and its Users for the Pure Water Projects, and Third Party User remains liable for any breach by itself or any of its Users of the terms of this Agreement (which Users are governed in their use of the Licensed Software Services in the same way as Third Party is governed hereunder). For the avoidance of doubt, any persons or entities who are authorized by Third Party User to use the Licensed Software Services are Users. Third Party User must ensure that Users not share their user identification or passwords.

2. SUBSCRIPTION LICENSED SOFTWARE SERVICES

- **2.1. Provisions of Licensed Software Services.** LCPtracker shall make the Licensed Software Services available to Third Party User pursuant to this Agreement during the Subscription Term specified in Exhibit 1.
- **2.2. Limitations.** Licensed Software Services are licensed and not purchased. All rights not expressly granted herein are reserved by LCPtracker and/or its licensors and/or suppliers. Without limiting the generality of the preceding sentence, Third Party User receives no rights and will not: (i) modify, port, translate, localize or create derivative works based on the Licensed Software Services, (ii) use, copy, rent, lease, market, distribute or sublicense the Licensed Software Services except as otherwise permitted hereunder; (iii) reverse engineer, decompile, or disassemble the Licensed Software Services; (iv) disclose the results of benchmark or other performance test run on the Licensed Software Services to any third party without LCPtracker's prior written consent (which results are LCPtracker Confidential Information). This Agreement grants no additional express or implied license, right or interest in any copyright, patent, trade secret, trademark, invention or other intellectual property right of LCPtracker. Third Party User will not remove, or allow to be removed, any LCPtracker copyright, trade secret or other proprietary rights notice from any LCPtracker product.

3. USE OF THE SERVICES

3.1. Third Party User Responsibilities. Third Party User may permit any number of Users (unless otherwise set forth in Exhibit 1) to use the Licensed Software Services for the purposes of uploading the appropriate data for Third Party User's use for the specified Pure Water Projects in accordance with Exhibit 1. Each User shall access and use the Licensed Software Services (i) in accordance with the terms of this Agreement, Exhibit 1 and the Documentation, and (ii) through a unique and reasonably secure username and password. If a two-factor authentication login system is provided, it is required to be used. Third Party User shall (i) be responsible for the administration of user identifications and passwords and it's Users' compliance with this Agreement and shall require Users to acknowledge their understanding of and compliance with the restrictions and responsibilities related to the use of the Licensed Software Services, including, without limitation, protecting their user identification and passwords; (ii) use commercially reasonable efforts to prevent unauthorized access to or use of the Licensed Software Services, and notify LCPtracker promptly of any such unauthorized access or use, and (iii) use the Licensed Software Services only in accordance with the Documentation, Applicable Laws. Third Party User shall not (a) make the Licensed Software Services available to anyone other than Users, (b) sell,

resell, rent or lease the Licensed Software Services, (c) use the Licensed Software Services to store or transmit infringing, libelous, or otherwise unlawful or tortious material, or to store or transmit material in violation of third-party privacy rights, (d) use the Licensed Software Services to store or transmit Malicious Code, (e) interfere with or disrupt the integrity or performance of the Licensed Software Services or third-party data contained therein, or (f) attempt to gain unauthorized access to the Licensed Software Services or their related systems or networks. Third Party User is solely responsible for its and its Users' legal compliance in its use of the Licensed Software Services and LCPtracker shall have no liability for Third Party Users, or the Users' input or implementation of the Licensed Software Services.

4. [INTENTIONALLY OMITTED]

5. PROPRIETARY RIGHTS

- **5.1.** Reservation of Rights in Licensed Software Services. Subject to the limited rights expressly granted hereunder, LCPtracker reserves all rights, title and interest in and to Licensed Software Services and its underlying software covered by this Agreement, including but not limited to all related intellectual property rights. No rights are granted to Third Party User hereunder other than as expressly set forth herein. The Licensed Software Services are licensed and not sold to Third Party User. Third Party User is granted a limited, revocable, non-transferable (except in accordance with this Agreement) and non-exclusive right to access and use the specified Licensed Software Services solely for the Third Party User's internal business purposes, subject to the terms and conditions of this Agreement, the LCPtracker documentation and Exhibit 1 for the applicable Subscription Term(s).
- **5.2. Restrictions.** In addition to the restrictions set forth in Section 3 above, Third Party User shall not (i) permit any third party to access the Licensed Software Services except as permitted herein, (ii) create derivate works based on the Licensed Software Services, (iii) copy, frame or mirror any part or content of the Licensed Software Services, (iv) reverse engineer the Licensed Software Services, or (v) access the Licensed Software Services in order to (a) build a competitive product or service, or (b) copy any features, functions or graphics of the Licensed Software Services.
- **5.3. Suggestions.** Any suggestions, enhancement requests, recommendations or other feedback relating to the operation of the Licensed Software Services provided by Third Party User or its Users ("**Feedback**"), during and after the Subscription Term is and remains the intellectual property of LCPtracker and LCPtracker has all rights therein to exploit and commercialize any Feedback as LCPtracker chooses without compensation or other consideration to Third Party User or its Users.
- **5.4. Federal Government End Use Provisions.** LCPtracker provides the Licensed Software Services, including related software and technology, for ultimate federal government end use solely in accordance with the following: Government technical data and software rights related to the Licensed Software Services include only those rights customarily provided to the public as defined in this Agreement. This customary commercial license is provided in accordance with FAR 12.211 (Technical Data) and FAR 12.212 (Software) and, for Department of Defense transactions, DFAR 252.227-7015 (Technical Data Commercial Items) and DFAR 227.7202-3 (Rights in Commercial Computer Software or Computer Software Documentation). If a government agency has a need for rights not conveyed under these terms, it must negotiate with LCPtracker to determine if there are acceptable terms for transferring such rights, and a mutually acceptable

written addendum specifically conveying such rights must be included in any applicable contract or agreement.

5.5. Service Provider. Use of Third Party Data. LCPtracker, as a service provider on behalf of Third Party User, shall not access, use, process or retain Third Party Data except as necessary to perform its obligations under this Agreement and Exhibit 1 or as otherwise in strict accordance with the written instructions of Third Party User except and only to the extent that such Third Party Data is deidentified or in the aggregate and such is prevented from being re-identified and accessed or acquired by unauthorized parties. Upon termination of Licensed Software Services, LCPtracker shall comply with Third Party User's direction as set forth in Section 11.1. "Termination." All Licensed Software Services that are provided depend on the accuracy of information submitted by Third Party User or its Users. LCPtracker is not responsible for any errors due to inaccurate information.

6. CONFIDENTIALITY

- **6.1. Definition of Confidential Information.** As used herein, "Confidential Information" means all information disclosed by a party ("Disclosing Party") to the other party ("Receiving Party"), whether orally or in writing, that is designated as confidential or that reasonably should be understood to be confidential given the nature of the information and the circumstances of disclosure. Third Party User Confidential Information shall include Third Party Data; LCPtracker Confidential Information shall include all Licensed Software Services; and Confidential Information of each party shall include the terms and conditions of this Agreements, as well as business and marketing plans, technology and technical information, product plans, pricing and designs, and business processes disclosed by such party. However, Confidential Information (other than Third Party Data) shall not include any information that (i) is or becomes generally known to the public without breach of any obligation owed to the Disclosing Party, (ii) was known to the Receiving Party prior to its disclosure by the Disclosing Party without breach of any obligation owed to the Disclosing Party, (iii) is received from a third party without breach of any obligation owed to the Disclosing Party, or (iv) was independently developed by the Receiving Party without access or reference to the Disclosing Party's Confidential Information.
- **6.2. Protection of Confidential Information.** The Receiving Party shall (i) use the same degree of care that it uses to protect the confidentiality of its own confidential information of like kind (but in no event less than reasonable care), (ii) not use any Confidential Information of the Disclosing Party for any purpose outside the scope of this Agreement, and (iii) except as otherwise authorized by the Disclosing Party in writing, limit access to Confidential Information of the Disclosing Party to those of its and its Affiliates' employees, contractors and agents who need such access for purposes consistent with this Agreement and who have signed confidentiality agreements with the Receiving Party containing protections no less stringent than those contained herein. Neither party shall disclose the terms of this Agreement to any third party other than its Affiliates that have a need to know and their legal counsel and accountants without the other party's prior written consent.
- **6.3. Compelled Disclosure.** The Receiving Party may disclose Confidential Information of the Disclosing Party if it is compelled by law to do so, provided the Receiving Party gives the Disclosing Party prior notice of such compelled disclosure (to the extent legally permitted) and reasonable assistance, at the Disclosing Party's cost, if the Disclosing Party wishes to contest the disclosure. If the Receiving Party is compelled by law to disclose the Disclosing Party's Confidential Information

as part of a civil proceeding to which the Disclosing Party is a party, and the Disclosing Party is not contesting the disclosure, the Disclosing Party will reimburse the Receiving Party for its reasonable cost of compiling and providing secure access to such Confidential Information.

7. WARRANTIES AND DISCLAIMERS

- **7.1.** Warranties. LCPtracker warrants that (i) LCPtracker has validly entered into this Agreement and has the legal power to do so, (ii) the Licensed Software Services shall perform materially in accordance with the Documentation, (iii) LCPtracker will not transmit Malicious Code to Third Party User, provided it is not a breach of this subpart (iii) if Third Party User or a User uploads a file containing Malicious Code into the Licensed Software Services and later downloads that file containing Malicious Code. For any breach of a warranty above, Third Party User exclusive remedy shall be as provided in Section 11.1 (Termination for Cause).
- 7.2. Third Party User Warranties. Third Party User represents and warrants that Third Party User has all rights and necessary authority to enter into this Agreement and the person signing this Agreement on behalf of Third Party User has the necessary authority to do so. Third Party User acknowledges that Third Party User is solely responsible for the content uploaded into the Licensed Software Services included in Third Party Data or by any User authorized by Third Party User and warrants that Third Party User shall comply with all Applicable Law with regard to its use of the Licensed Software Services and content and shall require all Users to acknowledge and agree to the use obligations and restrictions under this Agreement. The parties acknowledge and agree that during the term of this Agreement, Third Party User or other third parties on its behalf may disclose certain Third Party Data, including personally identifiable data regarding employees or other individuals, to LCPtracker for the benefit of Third Party User and Parsons B&V JV. Third Party User represents and warrants to LCPtracker that: (i) each of Third Party User and such other third parties are authorized to collect, use and disclose the Third Party Data to LCPtracker for use and storage pursuant to this Agreement; (ii) such disclosure, use or storage does not and shall not violate Applicable Law (including for the avoidance of doubt all privacy rules including the CCPA and CPRA), the rights of any third party or, if applicable, such Third Party User's agreements with or privacy notices to individuals with respect to whom the Third Party Data relates; and (iii) Third Party User shall not request LCPtracker to use, store, disclose or otherwise process Third Party Data in any manner that would not be permissible under Applicable Law or, if applicable, Third Party User's agreements with or privacy notices to individuals with respect to whom the Third Party Data relates, if done by Third Party User.
- **7.4. Third Party User Obligations.** Third Party User shall: (i) safeguard the usernames, passwords and other security data, methods and devices furnished by Parsons B&V JV or LCPtracker to Third Party User in connection with the Service and prevent unauthorized access to or use of the Service and promptly notify LCPtracker or Parsons B&V JV if it becomes aware of any such unauthorized access or that the security of its usernames or passwords has been compromised; (ii) be responsible for Third Party User networks, equipment and system security required or appropriate in connection with the Service; and (iii) have sole responsibility for the accuracy, quality, integrity, legality, reliability and appropriateness of all Third Party Data.
- **7.3. Disclaimer.** EXCEPT AS EXPRESSLY PROVIDED HEREIN, LCPTRACKER MAKES NO OTHER WARRANTIES OF ANY KIND, WHETHER EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, AND SPECIFICALLY DISCLAIMS ALL IMPLIED WARRANTIES, INCLUDING ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, TO THE MAXIMUM EXTENT

8. MUTUAL INDEMNIFICATION

- **8.1. Indemnification by LCPtracker.** LCPtracker shall defend Third Party User against any claim, demand, suit, or proceeding made or brought against Third Party User by a third party alleging that the use of the Licensed Software Services as permitted hereunder infringes or misappropriates the intellectual property rights of a third party (a "Claim Against Third Party User"), and shall indemnify Third Party User for any damages, reasonable attorney fees and costs finally awarded against Third Party User as a result of, and for amounts paid by Third Party User under a courtapproved settlement of a Claim Against Third Party User; provided that Third Party User (a) promptly provides LCPtracker written notice of the Claim Against Third Party User; (b) allows LCPtracker sole control of the defense and settlement of the Claim Against Third Party User (provided that LCPtracker may not settle any Claim Against Third Party User unless the settlement unconditionally releases Third Party User of all liability); and (c) provides to LCPtracker all reasonable assistance, at LCPtracker's expense. In the event of a Claim Against Third Party User, or if LCPtracker reasonably believe the Licensed Software Services may infringe or misappropriate a third party's intellectual property rights, LCPtracker may, in LCPtracker's sole discretion and at no cost to Third Party User, (i) modify the Licensed Software Services so that they are no longer infringing, without breaching LCPtracker warranties under "LCPtracker Warranties" above, (ii) obtain a license for Third Party User's continued use of the Licensed Software Services in accordance with this Agreement, or (iii) if neither of the foregoing is commercially practicable despite LCPtracker using all reasonable efforts and if Third Party User is not permitted to continue using the Licensed Software Services, then this Agreement will terminate with respect to such infringing Licensed Software Services.
- **8.2.** Indemnification by Third Party User. Third Party User shall defend LCPtracker against any claim, demand, suit or proceeding made or brought against LCPtracker by a third party alleging that Third Party Data, or Third Party User's or its Users' use of the Licensed Software Services in a manner not permitted hereunder (i) infringes or misappropriates the intellectual property rights of a third party or (ii) violates Applicable Law (a "Claim Against LCPtracker"), and shall indemnify LCPtracker for any damages, attorney fees and costs finally awarded against LCPtracker as a result of, or for any amounts paid by LCPtracker under a court-approved settlement of, a Claim Against LCPtracker; provided that LCPtracker (a) promptly give Third Party User written notice of the Claim Against LCPtracker; (b) give Third Party User sole control of the defense and settlement of the Claim Against LCPtracker (provided that Third Party User may not settle any Claim Against LCPtracker unless the settlement unconditionally releases LCPtracker of all liability); and (c) provide to Third Party User all reasonable assistance, at Third Party User expense.
- **8.3. Exclusive Remedy.** THIS SECTION 8 STATES THE INDEMNIFYING PARTY'S SOLE LIABILITY TO, AND THE INDEMNIFIED PARTY'S EXCLUSIVE REMEDY AGAINST, THE OTHER PARTY FOR ANY TYPE OF CLAIM DESCRIBED IN THIS SECTION.

9. LIMITATION OF LIABILITY

- 9.1. Limitation of Liability. LCPTRACKER'S LIABILITY ARISING OUT OF OR RELATED TO THIS AGREEMENT OR ANY SCHEDULE HEREUNDER (WHETHER IN CONTRACT OR TORT OR UNDER ANY OTHER THEORY OF LIABILITY) SHALL NOT EXCEED \$25,000.
- 9.2. Exclusion of Consequential and Related Damages. EXCEPT FOR (i) A BREACH OF THE LICENSE GRANT HEREUNDER BY THIRD PARTY USER, (ii) A BREACH OF THE CONFIDENTIALITY

OBLIGATIONS BY EITHER PARTY, (iii) DEATH, PERSONAL INJURY OR TANGIBLE PROPERTY DAMAGE CAUSED BY A PARTY, (iv) VIOLATION OF LAW OR (v) A PARTY'S INDEMNIFICATION OBLIGATIONS (COLLECTIVELY, THE "EXCLUSIONS"), IN NO OTHER EVENT SHALL EITHER PARTY HAVE ANY LIABILITY TO THE OTHER PARTY FOR ANY INDIRECT, SPECIAL, INCIDENTAL OR, CONSEQUENTIAL DAMAGES HOWEVER CAUSED, WHETHER IN CONTRACT, TORT OR UNDER ANY OTHER THEORY OF LIABILITY, AND WHETHER OR NOT THE PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. NOTWITHSTANDING THE FOREGOING, IN NO EVENT, INCLUDING WITH REGARD TO THE EXCLUSIONS, SHALL EITHER PARTY BE LIABLE TO THE OTHER FOR ANY LOST PROFITS OR REVENUES OR, COVER OR PUNITIVE DAMAGES HOWEVER CAUSED, WHETHER IN CONTRACT, TORT OR UNDER ANY OTHER THEORY OF LIABILITY, AND WHETHER OR NOT THE PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. THE FOREGOING DISCLAIMERS SHALL NOT APPLY TO THE EXTENT PROHIBITED BY APPLICABLE LAW.

10. TERM

10.1. Term of Agreement. This Agreement commences on the date of this Agreement and continues until termination as provided below, or upon termination of the Master Agreement, whichever occurs first.

11. TERMINATION

- **11.1. Termination for Cause.** LCPtracker may terminate this Agreement (i) effective immediately upon written notice to Third Party User if Parsons B&V JV directs LCPtracker to cease providing Third Party User access to the Service, and (ii) effective immediately upon written notice to Third Party User if Third Party User or one of its Users materially breaches this Agreement and such breach is incapable of cure, or with respect to a material breach capable of cure, Third Party User does not cure such breach within 30 days after receipt of written notice of such breach.
- **11.2.** Automatic Termination and Actions Following. In addition, this Agreement shall terminate immediately and automatically upon (i) any termination or expiration of the Master Agreement or (ii) the termination or expiration of a License Product Schedule under which the license for the Licensed Software Services in Exhibit 1 is granted. Upon any termination or expiration of this Agreement, Third Party User and its Users shall no longer be permitted to use the Licensed Software Services and Third Party User shall destroy or return (as directed by LCPtracker) all Confidential Information of LCPtracker (including Documentation) related to such Exhibit 1 and an officer of Third Party User shall certify the same in writing within thirty (30) days of such termination.
- **11.2. Surviving Provisions.** All Sections intended by their nature to survive termination, including, without limitation, Section 6 "Confidentiality", shall survive any termination or expiration of this Agreement.

12. GOVERNING LAW AND JURISDICTION

12.1. General. Each party agrees that this Agreement shall be governed by and construed under the laws of the State of California without regard to the conflicts of law provisions thereof, or any other provisions which would result in the application of a different body of law and to the exclusive jurisdiction of the applicable courts for San Diego County, California. The parties agree that the United Nations Convention on Contracts for the International Sales of Goods is expressly excluded from this Agreement.

13. GENERAL PROVISIONS

- **13.1. Notices.** Any notice required or permitted to be delivered pursuant to this Agreement, and any permission and approval required hereunder shall be in writing and shall be deemed to have been given: (i) upon delivery, if delivered in person, (ii) upon electronic confirmation of delivery if sent by electronic mail, or (iii) three (3) business day after deposit in the United States mail, registered or certified mail, return receipt requested, postage prepaid, in each case addressed to the addressee set out in the first paragraph of this Agreement or to such other address as may be specified by either Party hereto upon notice given to the other Party in accordance with this Section.
- **13.2. Severability.** If a provision of the Agreement or portion thereof is found to be invalid or unenforceable under Applicable Law, it shall be, to the extent practicable, conformed to meet the original intention of the parties, and shall not invalidate the remainder of such provision or the remaining provisions of the Agreement.
- **13.3. Export Compliance.** The Licensed Software Services and other technology the LCPtracker makes available, and derivatives thereof may be subject to export laws and regulations of the United States and other jurisdictions. Third Party User shall not, and further shall not permit Users to, access or use Services in a U.S.- embargoed country or in violation of any U.S. export law or regulation.
- **13.4. Anti-Corruption.** Third Party User acknowledges that it has not received or been offered any illegal or improper bribe, kickback, payment, gift, or thing of value from any LCPtracker employees or agents in connection with this Agreement. Reasonable gifts and entertainment provided in the ordinary course of business do not violate the above restriction. If Third Party User learns of any violation of the above restriction, Third Party User will use reasonable efforts to promptly notify LCPtracker in writing.
- **13.5.** Relationship of the Parties. The parties are independent contractors. This Agreement does not create a partnership, franchise, joint venture, agency, fiduciary or employment relationship between the parties.
- 13.6. No Third-Party Beneficiaries. There are no third-party beneficiaries to this Agreement.
- **13.7. Waiver.** No failure or delay by either party in exercising any right under this Agreement shall constitute a waiver of that right.
- **13.8. Attorney Fees.** The prevailing party shall be entitled to all expenses, including attorneys' fees and costs, incurred in connection with any dispute hereunder including mediation, arbitration, lawsuit, appeal, bankruptcy proceedings or other actions.
- **13.9. Assignment.** Neither party may assign any of its rights or obligations hereunder, whether by operation of law or otherwise, without the prior written consent of the other party (not to be unreasonably withheld). Notwithstanding the foregoing, either party may assign this Agreement in its entirety, without consent of the other party, to its Affiliate or in connection with a merger, acquisition, corporate reorganization, or sale of all or substantially all of its assets not involving a direct competitor of the other party, provided that the assignee agrees in writing to be bound by the terms of this Agreement. A party's sole remedy for any purported assignment by the other party in breach of this paragraph shall be, at the non-assigning party's election, termination of this Agreement upon written notice to the assigning party.

13.10. Entire Agreement. This Agreement, including all exhibits and addenda hereto, constitutes the entire agreement between the parties and supersedes all prior and contemporaneous agreements, proposals or representations, written or oral, concerning its subject matter. No modification, amendment, or waiver of any provision of this Agreement shall be effective unless in writing and either signed or accepted electronically by the party against whom the modification, amendment or waiver is to be asserted. However, to the extent of any conflict or inconsistency between the provisions in the body of this Agreement and any exhibit or addendum hereto, the terms of such exhibitor addendum. Notwithstanding any language to the contrary therein, no terms or conditions stated in a Third Party User purchase order or other order documentation shall be incorporated into or form any part of this Agreement, and all such terms or conditions shall be null and void.

13.11. Counterparts; Electronically transmitted Documents and Signatures. This Agreement may be executed in one or more counterparts; each of which shall be deemed an original and all of which together shall constitute one and the same instrument, it being understood that the Parties need not sign the same counterpart. An electronic signature or a manual signature on this Agreement which image, in either case is transmitted electronically, shall constitute an original signature for all purposes. The delivery of this Agreement, including signature pages may be transmitted or exchanged by the Parties by way of exchanging (a) signed originals, (b) facsimile transmission, (c) by any other electronic means intended to preserve the original graphic and pictorial appearance of a document, including sending in portable document format (pdf) via email, or (d) any combination of any such means, and the Parties hereby adopt as original any such documents received. Delivery of such documents by facsimile or by any other electronic means shall have the same effect as physical delivery of the paper bearing the original signature.

[SIGNATURES BEGIN ON THE FOLLOWING PAGE]

IN WITNESS WHEREOF, authorized representatives of the parties have executed this Agreement effective as of the Effective Date defined above.

LCPtracker, Inc.	THIRD PARTY USER: [Name of 3 rd Party User]
Ву:	Ву:
Name:	Name:
Title:	Title:
Date:	Date:

EXHIBIT 1

Limited use license in accordance with the Agreement for the following construction projects: [Insert name(s) of Pure-Water Project construction projects that are applicable to this 3rd Party User Morena Pump Station] (the "Pure Water Projects")

Name of Software	License Duration
LCPtracker Pro	From activation in the Licensed Software Services until termination by Parsons B&V JV or LCPtracker with 30 days notice to Third Party User, or the date of termination of the Master Agreement, whichever occurs first.

For the avoidance of doubt, the only Users that are permitted to use the Licensed Software Services are those working on the Pure Water Projects.



AUTHORIZED SIGNATORY

	uthorized Signatory	Title of Authorized Signatory
Signature o		
	of Authorized Signatory	Signature of Authorized Signatory
	of Authorized Signatory Owner/Officer	Print Name of Approved Authorized Signatory
penalty of perjury of the original and and days worked, whatever form or works contract. To person identified	to so affirm, that the record d depict truly, fully and corr and the amounts by catego manner to each person by jo affirm signatory authoriza	rson(s) identified below have the authority underly are originals or are full, true, and correct copies rectly, the craft or type of work performed, hours bry listed, disbursed by way of cash, check, or in ob classification and/or skill pursuant to a publication, or to delegate signatory authorization, the officers of the company. If delegating signatory remain current.
Date:		
Address: City, State, Zip:		
Company:		
Bid Number:		
Did Massalass		

16 771 l Page



List of Trades/Crafts Instructions

All contractors working on projects subject to prevailing wage requirements should submit to the City's Prevailing Wage Unit:

1) List of crafts and/or trades for work to be performed by your firm and each subcontractor.

Example:

ACCEPTABLE

TRADE/CRAFT	CLASSIFICATION	DETERMINATION NUMBER
LABORER	Laborer: Engineering Construction Group 1	SD-23-102-3-2014-2
OPERATING ENGINEER	OPERATING ENGINEER Group 12	SD-23-63-3-2016-1
CARPENTER	Carpenter (Heavy and Highway Work)	SD-23-31-4-2015-2
LABORER	Laborer (Engineer Construction) Period 4	2016-2

NOT ACCEPTABLE

TRADE/CRAFT	CLASSIFICATION	DETERMINATION NUMBER
LABORER	Laborer Engineering	2014-2
CARPENTER	Carpenter	SD-23-31-4-2015-2
	Apprentice	2016-2
	Plastering	

2) The name, contact person, business address, telephone (including area code) and e-mail address for the prime contractor and each subcontractor along with the specific dollar amount of each subcontract. If different from the specified business address, provide address and telephone number of the facility where payroll records are located and maintained. Also, please provide the anticipated start and end dates for each contractor.

NOTE: You must list all subcontractors, vendors, and suppliers, regardless of dollar amount and tier level.



List of Trades/Crafts

Rid Number:		
Sul	ime Contractor bcontractor er Subcontractor If tier sub, indicate prime	
Email:	Phone:	
Anticipated Start Date Anticipated End Date:	<u> </u>	
TRADE/CRAFT	CLASSIFICATION	DETERMINATION NUMBER



LABOR COMPLIANCE CHECKLIST

California Code of Regulations Title 8, Section 16421

MUST BE FILLED OUT BY ALL CONTRACTORS OF ALL TIERS

The federal and state labor law requirements applicable to the contract are composed of but not limited to the following items:

Payment of Prevailing Wages:

The contractor to whom the contract is awarded, and its subcontractors hired for the public works project are required to pay not less than the specified general prevailing wage rates to all workers employed in the execution of the contract. (Labor Code Section 177 et seq.)

The contractor is responsible for ascertaining and complying will all current general prevailing wage rates for crafts and any rate changes that occur during the life of the contract. Information on all prevailing wage rates are to be posted at the jobsite for all workers to view. Current wage rate information can be found at the DLSR website.

Apprentices:

It is the duty of the contractor and subcontractors to employ registered apprentices on the public works project and to comply with all aspects of Labor Code Section 1777.5, relating to Apprentice on Public Works. (1) Notify approved apprenticeship programs of contract award; (2) employ apprentices; (3) pay training fund contributions.

Penalties:

There are penalties required for contractor/subcontractor's failure to pay prevailing wages and for failure to employ apprentices, including forfeitures and debarment under Labor Code Sections 1775; 1776; 1777.7; 1777.7 and 1813.

Certified Payroll Reports:

Under Labor Code Section 1776, contractors and subcontractors are required to keep accurate payroll records showing the name, address, social security number and work classification of each employee and owner performing work; also, the straight time and overtime hours worked each day for each week, the fringe benefits, and, the actual per diem wage paid to each owner, journey person, apprentice worker or other employee hired in connection with the public works project.

The certified payroll records shall contain the same data fields listed on the Public Works Payroll Reporting Form (A-1-131) and contain or is accompanied by a declaration made under penalty of perjury. (California Code of Regulations, Section 16401).

Prime Contractors are responsible for submittal of their payrolls and those of their respective subcontractors as one package. Any payroll not submitted in the proper form will be rejected. In the event that there has been no work performed during a given week, the Certified Payroll Report shall be annotated: "No work" for that week or a Non-Performance Statement must be submitted.

Contractors are required to submit Certified Payroll Reports to the Department of Industrial Relations via its online eCPR system. Additionally, in accordance with California Labor Code Section 1776(b)(2), a copy of the contractor's CPRs shall be furnished upon request to a representative of the body awarding the contract and the DLSE, DIR. Under Labor Code Section 1776(g) there are penalties required for contractor's/subcontractor's failure to maintain and submit copies of certified payroll records on request.

Nondiscrimination in Employment:

There exist prohibitions against employment discrimination under Labor Code Sections 1735 and 1777.6, the Government Code, the Public Contracts Code, and Title VII of the Civil Rights Act of 1964.

Kickbacks Prohibited:

Contractors and subcontractors are prohibited from recapturing wages illegally by accepting or extracting "kickbacks" from employee wages under Labor Code Section 1778.

Acceptance of Fees Prohibited:

There exists a prohibition against contractor/subcontractor acceptance of fees for registering any person for public work under Labor Code Section 1779; or for filling work orders on public works contracts pursuant to Labor Code Section 1780.

1|Page



Listing of Subcontractors:

All prime contractors are required to list properly all subcontractors, of all tiers, hired to perform work on the public works projects covering more than one-half of one percent, pursuant to Government Code Section 4104.

Proper Licensing:

Contractors are required to be licensed properly and to require that all its subcontractors be properly licensed. Penalties are required for employing workers while unlicensed under Labor Code Section 1021 and under the California Contractor License Law found at Business and Professions Code Section 7000 et seq.

Unfair Competition Prohibited:

Contractors and subcontractors are prohibited from engaging in unfair competition as specified under Business and Professions Code Sections 17200 to 17208.

Workers Compensation Insurance:

Labor Code Section 1861 requires that contractors and subcontractors be properly insured for Workers Compensation.

OSHA:

Contractors and subcontracts are required to abide by the Occupational, Safety and Health laws and regulations that apply to the particular construction project.

Proof of Eligibility/Citizenship:

The federal prohibition against hiring undocumented workers and the requirement to secure proof of eligibility/citizenship from all workers, is required.

Itemized Wage Statement:

Labor Code Section 226 requires that employees be provided with itemized wage statements

Contractor Registration:

As of April 1, 2015, Labor Code Section 1725.5 requires that all contractors and subcontractors performing work on a public works project must be registered with the State of California, Department of Industrial Relations. Registration occurs annually.

CERTIFICATION:

I acknowledge that I have been informed and am aware of the foregoing requirements and that I am authorized to make this certification.

Name:	
Title:	
Email:	
Phone:	
Company Name:	
Signature:	

Fringe Benefit Statement

Contract/Proposal No:		Project Name:		Date:	
		used for checking payrolls or ap benefits, subsistence and/or tra the various classes of work are	plied to Force Account work whic vel allowance payment (as require tabulated below. THIS DOCUMEI	fied payroll. In order that the property may be done on the above conted by collective bargaining agreem NT CONTAINS PERSONAL INFO	ract the hourly rates for fringe nents) made for employees on RMATION AND, PURSUANT
Classification:		•	Effective Date:	Subsistence or Travel Pay:	
		Trust Fund Paid to:(Name)			
	Health and Welfare \$	Address:			
		Trust Fund Paid To:(Name)			
	Pension \$	Address:			
		Trust Fund Paid to:(Name)			
	Vacation/Holiday \$	Address:			
		Trust Fund Paid To:(Name)			
	Training and/or Other \$	Address:			
Classification:			Effective Date:	Subsistence or Travel Pay:	
		Trust Fund Paid to:(Name)			
	Health and Welfare \$	Address:			
		Trust Fund Paid To:(Name)			
	Pension \$	Address:			
	Venetion/Helidou	Trust Fund Paid to:(Name)			
	Vacation/Holiday \$	Address:			
	Training and/or Other C	Trust Fund Paid To:(Name)			
	Training and/or Other \$	Address:			
Cla	ssification:		Effective Date:	Subsistence or Travel Pay:	
	Health and Welfare \$	Trust Fund Paid to:(Name)			
	Health and Wellare \$	Address:			
	Pension \$	Trust Fund Paid To:(Name)			
	Perision \$	Address:			
	Vacation/Holiday \$	Trust Fund Paid to:(Name)			
	Vacation/Holiday \$	Address:			
	Training and/or Other \$	Trust Fund Paid To:(Name)			
	Training and/or Other \$	Address:			
Supp	lemental statement must be	submitted during the progr	ress of work should a cha	nge in rate of any of the cl	lassifications be made.

I CERTIFY THAT THE FRINGE BENEFIT PAYMENTS ARE MADE TO THE APPROVED PLANS, FUND OR PROGRAMS LISTED ABOVE.

Submitted (Contractor/Subcontractor)	By (Name and Title)	Signature

PUBLIC WORKS CONTRACT AWARD INFORMATION

Contract award information must be sent to your Apprenticeship Committee if you are approved to train. If you are not approved to train, you must send the information (which may be this form) to ALL applicable Apprenticeship Committees in your craft or trade in the area of the site of the public work. Go to: http://www.dir.ca.gov/databases/das/pwaddrstart.asp for information about programs in your area and trade. You may also consult your local Division of Apprenticeship Standards (DAS) office whose telephone number may be found in your local directory under California, State of, Industrial Relations, Division of Apprenticeship Standards.

Do not send this form to the Divisi	on of Apprenticeship Standards.		
NAME OF YOUR COMPANY	CONTRACTOR'S STATE LICENSE NO		
MAILING ADDRESS- NUMBER & STREET, CITY, ZIP CODE	AREA CODE & TELEPHONE NO.		
NAME & ADDRESS OF PUBLIC WORKS PROJECT	DATE YOUR CONTRACT EXECUTED		
	DATE OF EXPECTED OR ACTUAL START OF PROJECT		
NAME & ADDRESS OF PUBLIC AGENCY AWARDING CONTRACT	ESTIMATED NUMBER OF JOURNEYMEN HOURS		
	OCCUPATION OF APPRENTICE		
THIS FORM IS BEING SENT TO: (NAME & ADDRESS OF APPRENTICESHIP PROGRAM(S))	ESTIMATED NUMBER OF APPRENTICE HOURS		
	APPROXIMATE DATES TO BE EMPLOYED		
This is not a request for of Contractors must make a separate request for actual dispatch, in a	· · · · · · · · · · · · · · · · · · ·		
Check One Of Th	e Boxes Below		
We are already approved to train apprentices by the Appropriate Committee We will ampley and train	under their Standards Enter name of the Committee		
Apprenticeship Committee. We will employ and train	under their Standards.		
2. We will comply with the standards of Apprenticeship Committee for the duration of this job	only. Enter name of the Committee		
including § 230.1 (c) which requires that apprentices perform work of the craft or trade to which the apprer	We will employ and train apprentices in accordance with the California Apprenticeship Council regulations, including § 230.1 (c) which requires that apprentices employed on public projects can only be assigned to perform work of the craft or trade to which the apprentice is registered and that the apprentices must at all times work with or under the direct supervision of journeyman/men.		
Signature	Date		
Typed Name			
Title			

State of California - Department of Industrial Relations DIVISION OF APPRENTICESHIP STANDARDS

DAS 140 (REV. 1/04)

Explanation to box 1 - 3 on form DAS 140

- Box 1 is for contractors who are already approved to train by an apprenticeship program (signatory/member).
- Box 2 indicates that a contractor is willing to comply with a program's Standards for the current project only. This generally means that the fringe benefits and the training funds will be paid to that Committee's Trust Fund. It also allows a contractor to take advantage of a more generous maximum ratio than the CAC Standards, but does not affect the minimum ratio of 1 apprentice hour for every 5 journeyman hours.
- Box 3 means that a contractor will be governed by the regulations of the California Apprenticeship Council. Generally this means that the minimum and maximum ratio for apprentices is the same 1 apprentice hour for every 5 journeyman hours per each craft, totaled at the end of the project. It also means the Training Fund Contribution is usually paid to the California Apprenticeship Council.

ATTACHMENT F

PROJECT LABOR AGREEMENT (PLA)

CITY OF SAN DIEGO

PROJECT LABOR AGREEMENT

FOR CONSTRUCTION OF PURE WATER PROGRAM PHASE I PROJECTS

Effective Date: June 16, 2020

ARTICLE 1	RECITALS	1 -
ARTICLE 2	DEFINITIONS	3 -
ARTICLE 3	SCOPE OF THE AGREEMENT	5 -
ARTICLE 4	UNION RECOGNITION AND EMPLOYMENT	9 -
ARTICLE 5	UNION ACCESS AND STEWARDS	15 -
ARTICLE 6	WAGES AND BENEFITS	16 -
ARTICLE 7	WORK STOPPAGES AND LOCKOUTS	19 -
ARTICLE 8	WORK ASSIGNMENTS AND JURISDICTIONAL DISPUTES	23 -
ARTICLE 9	MANAGEMENT RIGHTS	24 -
ARTICLE 10	SETTLEMENT OF GRIEVANCES AND DISPUTES	26 -
ARTICLE 11	COMPLIANCE	29 -
ARTICLE 12	SAFETY AND PROTECTION OF PERSON AND PROPERTY	30 -
ARTICLE 13	TRAVEL AND SUBSISTENCE	30 -
ARTICLE 14	APPRENTICES	31 -
ARTICLE 15	LEGAL ACTION	32 -
ARTICLE 16	PRE-JOB CONFERENCE	32 -
ARTICLE 17	LABOR/MANAGEMENT AND COOPERATION	33 -
ARTICLE 18	SAVINGS AND SEPARABILITY	34 -
ARTICLE 19	WAIVER	35 -

ARTICLE 20 AMENDMENTS	35 -
ARTICLE 21 DURATION OF THE PLA	35 -
ARTICLE 22 WORK AND ECONOMIC OPPORTUNITY	37 -
ARTICLE 23 HELMETS TO HARDHATS	39 -
ATTACHMENT A – LETTER OF ASSENT	42 -
ATTACHMENT B-1 – WORKFORCE DISPATCH REQUEST FORM	43 -
ATTACHMENT B-2 – CONTRACTOR CORE WORKFORCE FORM	44 -
ATTACHMENT C – DRUG AND ALCOHOL TESTING POLICY	45 -
APPENDIX A – SAN DIEGO PURE WATER PROGRAM PHASE I COVERED PROJECTS	51 -
APPENDIX B MEMORANDUM OF UNDERSTANDING #1 PROJECT LABOR AGREEMENT SECTION 3.1	59 -
APPENDIX B MEMORANDUM OF UNDERSTANDING #2 NO DISCRIMINATION AND HARASSMENT	60 -

CITY OF SAN DIEGO

PROJECT LABOR AGREEMENT

FOR CONSTRUCTION OF PURE WATER PROGRAM

PHASE I COVERED PROJECTS

This Project Labor Agreement (hereinafter, "PLA" or "Agreement") is entered into this 16th day of June, 2020 by and between the San Diego Building and Construction Trades Council (hereinafter "Council"), and the signatory Craft Unions (hereinafter, together with the Council, collectively, the "Union" or "Unions"), and the Contractors performing work on Covered Projects that are subject to this Agreement. The City of San Diego is not a signatory Party to this Agreement, but shall be considered a "negotiating party" and will be responsible for implementing and administering the Agreement as described herein together with the Council, Unions and Contractors.

ARTICLE 1

RECITALS

WHEREAS, the City desires the completion of the Pure Water Program Phase I Projects in a professional, safe, efficient, and economical manner, without undue delay or work stoppage; and

WHEREAS, the successful completion of the City's Pure Water Program Phase I Projects are of the utmost importance to the rate payers and the City; and

WHEREAS, the Parties have pledged their full commitment to work towards a mutually satisfactory completion of the Pure Water Program Phase I Projects; and

WHEREAS, large numbers of workers of various skills will be required in the performance of the construction work on the Pure Water Program Phase I Projects, including workers affiliated with and/or represented by the Unions; and

WHEREAS, it is recognized that on construction projects with multiple contractors and bargaining units on the job site at the same time over an extended period of time, the potential for work disruption is substantial without an overriding commitment to maintain continuity of work; and

WHEREAS, the Parties agree that by establishing and stabilizing wages, hours, and working conditions for the workers employed on the Pure Water Program Phase I Projects, a

satisfactory, continuous, and harmonious relationship will exist among labor and management that will lead to the efficient and economical completion of Covered Projects; and

WHEREAS, in recognition of the special needs of the Project Work and to maintain a spirit of harmony, labor-management relations, peace, and stability during the term of this PLA, the Parties agree to establish effective and binding methods for the settlement of all misunderstandings, disputes and grievances without any strikes, slowdowns, work interruptions, or disruption of Project Work, and the Contractors agree not to engage in any lockout.

WHEREAS, the City places high priority upon the development of comprehensive programs for the recruitment, training, and employment of City Residents and Targeted Workers, and also recognizes the ability of local Apprenticeship Programs to provide meaningful and sustainable careers in the building and construction industry. The Parties will encourage City Residents and Targeted Workers to participate in Project Work through programs and procedures jointly developed to prepare and encourage such individuals for entrance into Apprenticeship Programs and formal employment on the Project Work through the referral programs sponsored and/or supported by the Parties to this PLA.; and

WHEREAS, the Project Work will provide opportunities for Disadvantaged Business Enterprises to participate as Contractors, subcontractors, or suppliers, and the Parties therefore agree that they will cooperate with all efforts of the City, the Project Labor Coordinator, and other organizations retained by the City for this purpose, to encourage and assist the participation of Disadvantaged Business Enterprises in the Project Work. Specifically, all Parties understand that the City has established and quantified goals which place a strong emphasis on the utilization of Disadvantaged Business Enterprises on the Project. Each Party agrees that it shall participate in outreach programs and provide education, and assistance to businesses not familiar with working on projects of this scope. Further, the Parties shall ensure that the provisions of this PLA do not inadvertently establish impediments to participation of such Disadvantaged Business Enterprises, City Residents and Targeted Workers.

WHEREAS, it is further understood that the City is a real party in interest to this Agreement and shall actively administer and enforce the obligations of this PLA to ensure that the benefits of this Agreement flow to all signatory Parties, craft persons working under it, and the rate payers and residents of the City. The City will send a letter to the Council to signify that the City will be performing its obligation under this Agreement and will designate a "Project Labor Coordinator," either from its own staff and/or an independent contractor acting on behalf of the City, to monitor and enforce compliance with this PLA. In addition, this letter will state that the City will include and incorporate this Agreement into each Covered Project's construction documents. The Project Labor Coordinator, as the authorized representative of the City, will assist with the development and implementation of the programs referenced in this PLA, all of which are critical to fulfilling the intent and purposes of the Parties and this PLA.

NOW, THEREFORE, IT IS AGREED BETWEEN AND AMONG THE PARTIES AS FOLLOWS:

ARTICLE 2

DEFINITIONS

Capitalized terms utilized in this PLA which are not otherwise defined herein shall have the meanings ascribed to said terms below.

"Agreement" means this Project Labor Agreement (PLA).

"Applicable Prevailing Determination" means the prevailing wage determinations applicable to Project Work pursuant to the State of California Labor Code.

"Apprentice" means an apprentice properly registered in an Apprenticeship Program for the entire time they are employed on a Covered Project.

"Apprenticeship Program" as used in this PLA shall be defined as an apprenticeship program certified by the State of California.

"City" means the City of San Diego and its departments delivering the Covered Projects.

"City Resident" means a City of San Diego permanent resident at the time of initial employment on a Covered Project or a Veteran residing anywhere.

"Contractor" means any contractor to whom the City awards a Construction Contract for Project Work and all subcontractors utilized by such Contractors for Project Work. The term "Contractor" includes any individual, firm, partnership, corporation, owner operator, or combination thereof, including joint ventures, that has entered into a contract with the City for Project Work, or any subcontractor who has signed a contract with a Contractor or another subcontractor for Project Work.

"Core Employees" are defined in Article 4, Section 4.6 (e).

"Council" means the San Diego County Building & Construction Trades Council.

"Covered Contract" means a contract awarded to a Contractor by the City for a Pure Water Program Phase I Project identified in Appendix A.

"Covered Project" or "Project Work" means a Pure Water Program Phase I Project that is identified in Appendix A and is limited to the construction site of work.

"Disadvantaged Business Enterprise" means a firm that has been certified via the Department of Transportation, but also includes: Minority Business Enterprises or Woman Business Enterprises certified by the Department of Transportation or the California Public Utilities Commission; and Small Local Business Enterprises or Emerging Local Business Enterprises certified by the City.

"Prime Contractor" means the prime Contractor awarded a Covered Contract in privity directly with the City.

"Project Labor Coordinator" means the designee of the City, either from its own staff and/or an independent entity acting on behalf of the City, to monitor compliance with this Agreement and assist with developing, implementing and administering the requirements, policies and programs referenced herein.

"Schedule A's" means the local master labor agreements of the Unions.

"Targeted Worker" means any individual qualifying for one (1) or more of the following Targeted Worker categories:

- (a) Is a Veteran, or is the eligible spouse of a "Veteran of the United States armed forces, under Section 2(a) of the Jobs for Veterans Act (38 United States Code [U.S.C.] 4215[a]);
- (b) At initial time of employment on a Covered Project, is an Apprentice with less than ten (10) percent of the work hours required for graduation to become a Journeyperson;
- (c) Has no high school diploma or general education diploma (GED);
- (d) Is homeless or has been homeless within the last year;
- (e) Is a former foster youth;
- (f) Is a custodial single parent;
- (g) Is experiencing protracted unemployment (receiving unemployment benefits for at least three [3] months);
- (h) Is a current recipient of government cash or food assistance benefits;
- (i) Has a documented income at or below 100 percent of the Federal Poverty Level;

(j) Is formerly incarcerated with a history of involvement with the criminal justice system.

"Union" or "Unions" means any labor organization signatory to this Agreement acting in their own behalf and on behalf of their respective affiliates and member organizations whose names are subscribed hereto and who have, through their officers, executed this Agreement.

"Veteran" means a veteran or the eligible spouse of a veteran of the United States armed forces, under Section 2(a) of the Jobs for Veterans Act (38 U.S.C. 4215[a]);

ARTICLE 3

SCOPE OF THE AGREEMENT

- **Section 3.1** This PLA is limited to covering all onsite construction work within the scope of each Covered Contract.
- <u>Section 3.2</u> <u>Exclusions.</u> Items specifically excluded from the scope of this PLA include the following:
 - (a) Work of non-manual employees including but not limited to, superintendents, supervisors, staff engineers, quality control and quality assurance personnel, timekeepers, mail carriers, clerks, office workers, messengers, guards, safety personnel, emergency medical and first aid technicians, and other professional, engineering, administrative, supervisory, and management employees; and
 - (b) All offsite manufacturing, fabrication, deliveries, maintenance, and handling of materials, equipment, or machinery, and the offsite hauling of materials of any kind to or from the Covered Project site. However, any lay down or storage areas for equipment or material and manufacturing (i.e. prefabrication) sites dedicated solely for the project, and the movement of materials or goods between locations on a Covered Project site are within the scope of the PLA. Onsite fabrication work includes work done for the Project in temporary yards or areas near the Project. On-site construction shall also include the site of any batch plant constructed solely to supply materials to the Project; and
 - (c) All employees of the City, Project Labor Coordinator, design teams (including, but not limited to, architects, engineers, and master planners), or any other consultants for the City (including, but not limited to, project managers and

construction managers and their employees where not engaged in Project Work) and their subconsultants, and other employees of professional service organizations, not performing manual labor within the scope of this PLA. Notwithstanding the foregoing, however, this exclusion shall not apply to the classifications for Surveyors and/or Building/Construction Inspectors and/or Field Soils and Material Testers (Inspectors) unless they are City employees. This inclusion applies to the scope of work defined in the State of California Wage Determination for Surveyors and/or Building/Construction Inspectors and/or Field Soils and Material Testers (Inspectors). This shall also specifically include such work where it is referred to by utilization of such terms as "quality control" or "quality assurance." Every Inspector performing under these classifications on Covered Projects pursuant to a professional services agreement, a contract entered into directly with the City, or a contract with a Contractor shall be bound to all applicable requirements of this Agreement; and

- (d) Any work performed on or near or leading to or into a site of work covered by this PLA and undertaken by state, county, city, or other governmental bodies, or their contractors (other than work within the scope of this PLA undertaken by contractors to the City); or by private utilities, or their contractors; and
- (e) Work performed by employees of a manufacturer or vendor on the manufacturer's or vendor's equipment, if required by the warranty agreement in order to maintain the warranty or guarantee, and provided that the warranty agreement is the manufacturer's or vendor's usual and customary warranty agreement for such equipment and is consistent with industry practice; and
- (f) Specialized or technical work requiring specialized training, unique skills, or a level of specific technical experience which employees represented by the Union do not possess. At least ten (10) working days notice shall be given to the Council before any work is performed pursuant to this exemption.; and
- (g) Laboratory work for testing; and
- (h) Non-construction support services contracted by the City, Project Labor Coordinator, or Contractor in connection with this Project.

Section 3.3 Awarding of Contracts.

(a) The City has the absolute right to bid or award Covered Contracts regardless of delivery method to any Contractor notwithstanding the existence or non-existence of any agreements between such Contractor and any Union Parties,

provided only that such Contractor is willing, ready, and able to execute and comply with this PLA should such Contractor be awarded work covered by this PLA.

- (b) It is agreed that all Contractors who have been awarded a contract for Project Work shall be required to accept and be bound by the terms and conditions of this PLA. Contractors shall evidence their acceptance of this Agreement by executing a Letter of Assent as set forth in Attachment A hereto. The Prime Contractor must sign and submit the Letter of Assent as a condition of award prior to the execution of a Covered Contract. No Contractor shall commence Project Work without first providing a copy of the signed Letter of Assent to the Project Labor Coordinator.
- (c) The City and Prime Contractors agree that to the extent permitted by law and consistent with the economy and efficiency of construction and operation, it will use its best efforts to purchase materials, equipment, and supplies that will not create labor strife. Under all circumstances, however, the City and Prime Contractors shall retain the absolute right to select the lowest responsive and responsible bidder for the award of contracts on all Covered Projects.

<u>Section 3.4</u> <u>Coverage Exception</u>. The Parties agree and understand that this PLA shall not apply to any work that would otherwise be covered Project Work if a governmental agency or granting authority partially or fully funding such work determines that it will not fund the Project Work if it is covered by this PLA. The City agrees that it will make every effort to establish the inclusion of this PLA with any governmental agency or granting authority funding a Covered Project.

Section 3.5 Schedule A's.

(a) The provisions of this PLA, including the Schedule A's (which are the local Master Labor Agreements of the signatory Unions having jurisdiction over the work on the Project, as such may be changed from time to time consistent with Section 21.3, and which are incorporated herein by reference), shall apply to the work covered by this PLA, notwithstanding the provisions of any other local, area and/or national agreement that may conflict with or differ from the terms of this PLA. Where a subject covered by the provisions of this PLA is also covered by a Schedule A, the provisions of this PLA shall prevail. Where a subject is covered by a provision of a Schedule A and not covered by this PLA, the provisions of the Schedule A shall prevail. Any dispute as to the applicable source between this PLA and any Schedule A shall be resolved under the procedures established in Article 10.

- (b) It is understood that this PLA, together with the referenced Schedule A's, constitutes a self-contained, stand-alone agreement and, by virtue of having become bound to this PLA, the Contractor will not be obligated to sign any other local, area, or national collective bargaining agreement as a condition of performing work within the scope of this PLA (provided, however, that the Contractor may be required to sign a uniformly applied non-discriminatory Participation or Subscription Agreement at the request of the trustees or administrator of a trust fund established pursuant to Section 302 of the Labor Management Relations Act, and to which such Contractor may be bound to make contributions under this PLA, provided that such Participation or Subscription Agreement does not purport to bind the Contractor beyond the terms and conditions of this PLA and/or expand its obligation to make contributions pursuant thereto). It shall be the responsibility of the Prime Contractor to have each of its Contractors of any tier sign the documents with the appropriate Union prior to the Contractor beginning Project Work.
- Section 3.6 The Parties agree that this PLA will be made available to, and will fully apply to, any successful bidder for Project Work, without regard to whether that successful bidder performs work at other sites on either a Union or non-Union basis. This PLA shall not apply to any work of any Contractor other than that on Project Work specifically covered by this PLA.
- <u>Section 3.7</u> <u>Binding Signatories Only</u>. This PLA and Letter of Assent shall only be binding on the signatory Parties hereto, and shall not apply to the parents, affiliates, subsidiaries, or other ventures of any such Party.
- <u>Section 3.8</u> Other City Work. Nothing contained herein shall be interpreted to prohibit, restrict, or interfere with the performance of any other operation, work, or function not covered by this PLA, which may be performed by City employees or contracted for by the City for its own account, on its property, or in and around a project site.
- Section 3.9 Separate Liability. It is understood that the liability of the Contractor(s) and the liability of the separate Unions under this PLA shall be several and not joint. The Unions agree that this PLA does not have the effect of creating any joint employment status between or among the City or Project Labor Coordinator and/or any Contractor.
- Section 3.10 Completed Project Work. As areas of Project Work are accepted by the City, this PLA shall have no further force or effect on such items or areas except where the Contractor is directed by the City or its representatives to engage in repairs, modification and/or check-out functions required by its contract(s) with the City.

Section 3.11 Except for all work performed under the NTL Articles of Agreement, the National Stack/Chimney Agreement, and the National Cooling Tower Agreement, all instrument calibrations work and loop checking shall be performed under the terms of the UA/IBEW Joint National Agreement for Instrument and Control Systems Technicians, and the National Agreement of the International Union of Elevator Constructors, with the exception of Article 7 (Work Stoppages and Lockouts), Article 8 (Work Assignments and Jurisdictional Disputes) and Article 10 (Settlement of Grievances and Disputes) of this PLA, which shall apply to such work.

ARTICLE 4

UNION RECOGNITION AND EMPLOYMENT

- <u>Section 4.1</u> <u>Recognition</u>. The Contractor recognizes the Unions as the exclusive bargaining representative for the employees engaged in Project Work. Such recognition does not extend beyond the period when the employee is engaged in Project Work.
- Section 4.2 Contractor Selection of Employees. The Contractor shall have the right to determine the competency of all employees, the number of employees required, the duties of such employees within their craft jurisdiction, and shall have the sole responsibility for selecting employees to be laid off, consistent with this Article. The Contractor shall also have the right to reject any applicant referred by a Union for any reason, subject to any reporting time requirements of the applicable Schedule A; provided, however, that such right is exercised in good faith and not for the purpose of avoiding the Contractor's commitment to employ qualified workers through the procedures endorsed in this PLA.

Section 4.3 Referral Procedures.

(a) For signatory Unions to this Agreement having a job referral system contained in a Schedule A, the Contractor agrees to comply with such system and it shall be used exclusively by such Contractor, except as modified by this PLA. Such job referral system will be operated in a nondiscriminatory manner and in full compliance with federal, state, and local laws and regulations that require equal employment opportunities and non-discrimination. All of the foregoing hiring procedures, including related practices affecting apprenticeship, shall be operated so as to consider the goals of the City to encourage employment of City Residents, Targeted Workers, and utilization of Disadvantaged Business Enterprises on the Project Work, and to facilitate the ability of all Contractors to meet their employment needs.

- (b) The local Unions will exert their best efforts to recruit and refer sufficient numbers of skilled craft workers to fulfill the labor requirements of the Contractor, including specific employment obligations to which the Contractor may be legally and/or contractually obligated; and to refer Apprentices as requested to develop a larger, skilled workforce. The Unions will work with the Project Labor Coordinator and others designated by the City, to identify and refer competent craft persons as needed for Project Work, and to identify individuals, particularly City Residents and Targeted Workers, for entrance into Apprenticeship Programs, or participation in other identified programs and procedures to assist individuals in qualifying and becoming eligible for such Apprenticeship Programs, all maintained to increase the available supply of skilled craft personnel for Project Work and future construction work to be undertaken by the City.
- (c) The Union shall not knowingly refer an employee currently employed by a Contractor on Project Work to any other Contractor.

Section 4.4

Non-Discrimination in Referral, Employment, and Contracting. The Unions and Contractors agree that they will not discriminate against any employee or applicant for employment on the basis of race, color, religion, gender, national origin, age, Union status, sex, sexual orientation, marital status, political affiliation, or disability. Further, it is recognized that the City has certain policies, programs, and goals for the utilization of Disadvantaged Business Enterprises. The Parties shall jointly endeavor to assure that these commitments are fully met, and that any provisions of this PLA that may appear to interfere with Disadvantaged Business Enterprises successfully bidding for work on Covered Projects shall be carefully reviewed, and adjustments made as may be appropriate and agreed upon among the Parties, to ensure full compliance with the spirit and letter of the City's policies and commitment to its goals for the significant utilization of Disadvantaged Business Enterprises as Contractors, vendors or suppliers on Project Work.

<u>Section 4.5</u> <u>Employment of City Residents and Targeted Workers.</u>

(a) In recognition of the City's mission to serve the City and its residents, the Unions and Contractors agree that, to the extent allowed by law, and as long as they possess the requisite skills and qualifications, residents of the City of San Diego, hereafter "City Residents", shall be first referred for Project Work. A "City Resident" is defined as a City of San Diego permanent resident at the time of initial employment on a Covered Project or a Veteran residing anywhere. The

list of qualifying zip codes for City Residents is included within Attachment B-1, Workforce Dispatch Request Form.

- (b) The Contractors and Unions agree to work together to achieve a goal of at least thirty-five (35) percent of the total construction craft hours worked on each Covered Project be performed by City Residents.
- (c) The Contractors and Unions agree to work together to achieve a goal of at least ten (10) percent of the total construction craft hours worked on each Covered Project be performed by Targeted Workers. Hours worked by Targeted Workers who are also City Residents may be applied to the City Resident participation goal.
- (d) Professional services agreements entered into by the City for covered surveying or inspection services, which are separate and apart from the Construction Contract for a Covered Project, are exempt from the foregoing City Resident and Targeted Worker hiring goals.
- (e) To facilitate the dispatch of City Residents, as well as all Contractor requests for referral and dispatch of workers from the applicable Union referral system, all Contractors are required to utilize the Workforce Dispatch Request Form for Covered Projects, a sample of which is attached as Attachment B-1.
- (f) The Project Labor Coordinator shall work with the Unions and Contractors in the administration, monitoring, and the reporting of the foregoing City Resident and Targeted Worker hiring goals.
- (g) The Parties recognize that the Pure Water Program Phase I Projects have multiple funding sources. If a particular funding source applied by the City to a Covered Project does not allow geographic preference for hiring local craft workers, the foregoing City Resident participation requirement will not be applicable to that Covered Project. The City reserves the right to apply Pure Water Program Phase I funding as it chooses and will make every effort to fund the Covered Projects to encourage inclusivity of City Residents.

<u>Section 4.6</u> <u>Core Employees.</u> This Section only applies to Contractors who are not directly signatory to an applicable Schedule A.

(a) <u>Disadvantaged Business Enterprise.</u> The Parties recognize the City's interest in promoting competition and inclusion of Disadvantaged Business Enterprises, which may not be signatory to a current Schedule A. In order to promote participation and attract Disadvantaged Business Enterprises to work

under this Agreement, and subject to the limitations set forth below, each Contractor that is a Disadvantaged Business Enterprise may first employ three (3) of its core employees per craft on each Covered Project prior to employing an employee through the appropriate Union hiring hall. The next (fourth) employee shall be hired from the appropriate Union hiring hall and thereafter, such Contractor may employ, as needed, two (2) additional Core Employees in an alternating manner with Union referrals, up to a total of five (5) Core Employees. Thereafter, all additional employees in the affected trade or craft shall be requested and referred from the appropriate Union hiring hall.

The foregoing Core Employee hiring procedure for Disadvantaged Business Enterprises is subject to the following limitations:

- (1) Disadvantaged Business Enterprises with an individual subcontract value of \$500,000 or less and;
- (2) Disadvantaged Business Enterprises are limited to utilizing the foregoing Core Employee hiring procedure to one (1) subcontract per Covered Project and;
- (3) The total value of all subcontracts utilizing the foregoing Core Employee hiring procedure shall not exceed ten (10) percent of the total value of each Covered Project; and
- (4) In order to assist the Project Labor Coordinator monitor compliance with this Section, each Prime Contractor will be responsible for tracking, reporting and providing notice to the Project Labor Coordinator describing each Disadvantaged Business Enterprise subcontract that qualifies for the foregoing hiring procedure prior to work commencing.
- (b) Employers who do not qualify for the hiring procedure set forth in Section 4.6(a), and who are not otherwise signatory to a current Schedule A, may employ, as needed, first, a Core Employee, then an employee through a referral from the appropriate Union hiring hall, then a second Core Employee, then a second employee through the referral system, and so on until a maximum of three (3) Core Employees are employed per craft on each Covered Project. Thereafter, all additional employees in the affected trade or craft shall be requested and referred from the appropriate Union hiring hall in accordance with this Article. Contractors employing more than fifty (50) craft workers at the same time in a specific trade on a Covered Project may hire an additional two (2) Core Employees.

- (c) Section 4.6 only applies to Contractors who are not directly signatory to a current Schedule A for the craft worker in its employ and is not intended to limit the transfer provisions of the Schedule A of any trade. As part of this process, and in order to facilitate the contract administration procedures, as well as appropriate fringe benefit fund coverage, all Contractors shall require their Core Employees and any other persons employed other than through the referral process, to register with the appropriate Union hiring hall, if any, prior to their first day of employment working under the Construction Contract at the project site.
- (d) Prior to each Contractor performing any work on a Covered Project, each Contractor shall provide a list of Core Employees to the Project Labor Coordinator and the Council. After submitting the Core Employee list prior to commencing work, Contractors shall not make any changes or substitutions to the Core Employee list for the duration of the Covered Project. Failure to submit the Core Employee list prior to work commencing will prohibit the Contractor from using any Core Employees for 30 calendar days after the list is provided to the Project Labor Coordinator and Council.
- (e) Upon request by any Party to this Agreement, the Contractor hiring any Core Employee shall provide satisfactory proof (i.e., payroll records, quarterly tax records, and such other documentation) evidencing the Core Employee's qualification as a Core Employee to the Project Labor Coordinator and the Council.
- (f) Core Employees must meet the following eligibility requirements to qualify for employment on Covered Projects:
- (1) A Core Employee must be either a journeyperson or Apprentice and appear on the Contractor's active payroll for at least ninety (90) of the last one-hundred-eighty (180) working days prior to being designated as a Core Employee. The date a Core Employee is designated is the date the Core Employee list is submitted to the Project Labor Coordinator and Council prior to the Contractor commencing work; and
- (2) A Core Employee must possess any license required by state or federal law for the Project Work to be performed; and
- (3) A Core Employee must have the ability to safely perform the basic functions of the applicable trade.

- (g) In addition to the core employee provisions set forth herein, all Contractors may avail themselves of any opportunity provided for in the applicable Schedule A's to call for specific employees by name.
- (h) During any layoffs or reductions in workforce, Contractors shall layoff employees in an order and manner consistent with the Core Employee hiring procedures and maintain the required Core Employee-to-Union referral ratios required by this Section for the duration of each Covered Project.
- Time for Referral. If any Union's registration and referral system does not fulfill the requirements for specific classifications of covered employees (including City Residents) requested by any Contractor within forty-eight (48) hours (excluding Saturdays, Sundays, and holidays), that Contractor may employ Core Employees without reference to the ratio requirements in Section 4.6 or use employment sources other than the Union registration and referral services, and may employ applicants from any other available source. The Contractor should promptly inform the Union of any applicants hired from other sources, and such applicants shall register with the appropriate hiring hall, if any.
- <u>Section 4.8</u> <u>Lack of Referral Procedure</u>. If a signatory local Union does not have a job referral system as set forth in Section 4.3 above, the Contractors shall give the Union equal opportunity to refer applicants. The Contractors shall notify the Union of employees so hired, as set forth in Section 4.7.
- <u>Section 4.9</u> <u>Union Membership</u>. Employees are not required to become or remain union members as a condition of performing Covered Work under this Agreement. Employers shall make and transmit all deductions for union dues, fees, and assessments that have been authorized by employees in writing in accordance with the applicable Schedule A. Nothing in this Section 4.9 is intended to supersede the requirements of the applicable Schedule A's as to those Employers otherwise signatory to such Schedule A and as to the employees of those Employers who are performing Covered Work.
- <u>Section 4.10</u> Foremen. The selection and number of craft foremen and/or general foremen shall be the responsibility of the Contractor, consistent with the Schedule A's. All foremen shall take orders exclusively from the designated Contractor representatives. Craft foremen shall be designated as working foreman at the request of the Contractors.
- <u>Section 4.11</u> <u>Skilled and Trained Workforce</u>. All Contractors performing Project Work are required to provide the City with an enforceable commitment that a skilled and

trained workforce will be used to complete the construction contract or project, in accordance with City Council Resolution Number R-312062.

ARTICLE 5

UNION ACCESS AND STEWARDS

<u>Access to Project Sites</u>. Authorized representatives of the Union shall have access to Project Work, provided that they do not interfere with the work of employees and further provided that such representatives fully comply with posted visitor, security, and safety rules.

Section 5.2 Stewards.

- (a) Each signatory local Union shall have the right to dispatch a working journeyperson as a steward for each shift, and shall notify the Contractor in writing of the identity of the designated steward or stewards prior to the assumption of such person's duties as steward. Such designated steward or stewards shall not exercise any supervisory functions. There will be no non-working stewards. Stewards will receive the regular rate of pay for their respective crafts.
- (b) In addition to his/her work as an employee, the steward should have the right to receive, but not to solicit, complaints or grievances and to discuss and assist in the adjustment of the same with the employee's appropriate supervisor. Each steward should be concerned only with the employees of the steward's Contractor and not with the employees of any other Contractor. The Contractor will not discriminate against the steward in the proper performance of his/her Union duties.
- (c) When a Contractor has multiple, non-contiguous work locations at one site, the Contractor may request and the Union shall appoint such additional working stewards as the Contractor requests to provide independent coverage of one or more such locations. In such cases, a steward may not service more than one work location without the approval of the Contractor.
- (d) The stewards shall not have the right to determine when overtime shall be worked or who shall work overtime.
- <u>Section 5.3</u> <u>Steward Layoff/Discharge</u>. The Contractor agrees to notify the appropriate Union twenty-four (24) hours before the layoff of a steward, except in the case of

disciplinary discharge for just cause. If the steward is protected against such layoff by the provisions of the applicable Schedule A, such provisions shall be recognized when the steward possesses the necessary qualifications to perform the remaining work. In any case in which the steward is discharged or disciplined for just cause, the appropriate Union will be notified immediately by the Contractor, and such discharge or discipline shall not become final (subject to any later filed grievance) until twenty-four (24) hours after such notice has been given.

<u>Section 5.4</u> Employees on Non-Project Work. On work where the personnel of the City may be working in close proximity to the construction activities covered by this PLA, the Union agrees that the Union representatives, stewards, and individual workers will not interfere with the City personnel, or with personnel employed by any other employer not a Party to this PLA.

ARTICLE 6

WAGES AND BENEFITS

<u>Wages</u>. At a minimum, all employees covered by this PLA shall be classified in accordance with work performed and paid the hourly wage rates for those classifications in compliance with the Applicable Prevailing Wage Determination established pursuant to the California Labor Code by the California Department of Industrial Relations.

Section 6.2 Benefits.

(a) Subject to the exception set forth below for Disadvantaged Business Enterprises, otherwise, for all employees performing Project Work, Contractors shall pay all fringe benefits and other required employer contributions to the established Union employee benefit funds in the amounts required by the applicable Schedule A. In addition, the Contractors and Unions agree that only such bona fide employee benefits that accrue to the direct benefit of the employees (such as pension and annuity, health and welfare, vacation, apprenticeship, and training funds) shall be included in this requirement and required to be paid by the Contractor on Covered Projects. These Contractor contributions shall not exceed the contribution amounts set forth in the Applicable Prevailing Wage Determination.

<u>Union Benefit Fund Contributions for Disadvantaged Business Enterprises.</u>

Disadvantaged Business Enterprises are exempt from paying fringe benefits and

other required employer contributions on behalf of their Core Employees to the Union employee benefit funds, subject to the following exemption limitations:

- (1) The exemption is only applicable to Disadvantaged Business Enterprises with an individual subcontract value of \$500,000 or less and;
- (2) Disadvantaged Business Enterprises are limited to utilizing this exemption for one subcontract per Covered Project and;
- (3) The total value of all subcontracts utilizing this exemption shall not exceed ten (10) percent of the total value of each Covered Project; and
- (4) Disadvantaged Business Enterprises utilizing this exemption are still required to pay all fringe benefits and other required employer contributions to the established Union employee benefit funds for all employees other than their Core Employees, and must comply with the applicable prevailing wage requirements, including the payment of fringe benefits, for all employees performing Project Work; and
- (5) In order to assist the Project Labor Coordinator monitor utilization of this exemption, each Prime Contractor will be responsible for tracking, reporting and providing notice to the Project Labor Coordinator about each Disadvantaged Business Enterprise subcontract that qualifies and intends to utilize this exemption prior to work commencing.
- (b) Where applicable, the Contractor adopts and agrees to be bound by the written terms of the applicable, legally established, Union trust agreement(s) specifying the detailed basis how payments will be made into, and benefits paid out of, such trust funds for its employees. The Contractor authorizes the Parties to such trust funds to appoint trustees and successors' trustees to administer the trust funds and hereby ratifies and accepts the trustees so appointed as if made by the Contractor. The Contractor obligations to the applicable Union benefit fund(s) and trust agreement(s) are limited to work performed on a Covered Project. The applicable Union benefit funds and trust agreement(s) to each Contractor are determined by the pre-job conference and Union work assignment process described in Articles 8 and 16.
- (c) Each Contractor is required to certify to the Project Labor Coordinator that it has paid all benefit contributions due and owing to the appropriate Union trust(s) and benefit funds prior to the receipt of its final payment and/or retention. Further, upon timely notification by a Union to the Project Labor Coordinator, the Project Labor Coordinator shall work with any Contractor who is delinquent in

payments to assure that proper benefit contributions are made, to the extent of requesting the City or the prime Contractor to withhold payments otherwise due such Contractor, until such contributions have been made or otherwise guaranteed.

(d) Notwithstanding any other provisions, this Agreement is an agreement under Section 8(f) of the National Labor Relations Act (NLRA), which covers work performed in the building and construction industry. In addition, the work performed under this Agreement qualifies for the Construction Industry Exemption under the Employee Retirement and Income Security Act of 1974 ("ERISA"), as amended as well. If any Union Pension Trust Fund ("Fund") covered by the terms and conditions of this Agreement does not qualify for the Construction Industry Exemption authorized by Section 4203 (B)(1)(i), of the Employee Retirement Income Security Act of 1974 ("ERISA") as amended, 29 U.S.C. 1383(b)(1)(i), or has not taken the necessary steps to amend the Fund documents to qualify for the Construction Industry Exemption as authorized by Section 4203(B)(1)(ii) of ERISA, as amended, 29 U.S.C. 1383(b)(1)(B)(ii); and to recognize the work performed under this Agreement to qualify for the Construction Industry Exemption, the Contractors signatory to this Agreement will not be obligated to make pension fund contributions to that Fund. In such an event, the Contractor shall pay all required amounts otherwise allocated for payment toward the non-exempt Fund to the employees' wages or other bona fide retirement plan program pursuant to applicable prevailing wage requirements.

Section 6.3

<u>Wage Premiums</u>. Wage premiums, including, but not limited to, pay based on height of work, shift premiums, hazard pay, scaffold pay, and special skills shall not be applicable to work under this PLA, except to the extent provided for in any applicable prevailing wage determination.

Section 6.4

Compliance with Prevailing Wage Laws. All complaints regarding possible prevailing wage violations may be referred to the Project Labor Coordinator or Labor Compliance Program, if any, for processing, investigation and resolution, and if not resolved within thirty (30) calendar days, may be referred by any Party to the State Labor Commissioner. To facilitate compliance with applicable prevailing wage laws, the City and each Contractor agree to provide copies of certified payroll reports, redacted only to the extent required by law, to the Unions (or to any Labor Management Cooperation Committee in which a Union or its affiliate participates) within ten (10) days of their request.

WORK STOPPAGES AND LOCKOUTS

- No Work Stoppages or Disruptive Activity. The Council and the Unions signatory hereto agree that they, nor their respective officers, or agents or representatives, shall incite or encourage, condone or participate in any strike, walk-out, slowdown, picketing, observation of picket lines, or other activity of any nature or kind whatsoever, for any cause or dispute whatsoever with respect to or any way related to Project Work, or which interferes with or otherwise disrupts Project Work, or with respect to or related to the City or Contractors or subcontractors, including, but not limited to, economic strikes, unfair labor practice strikes, safety strikes, sympathy strikes, and jurisdictional strikes whether or not the underlying dispute is arbitrable. Any such actions by the Council, or Unions, or their members, agents, representatives, or the employees they represent shall constitute a material violation of this PLA. The Council and the Union shall take all steps necessary to obtain compliance with this Article.
- <u>Section 7.2</u> <u>Employee Violations</u>. The Contractor may discharge any employee violating Section 7.1 above, and any such employee will not be eligible for rehire under this PLA.
- <u>Section 7.3</u> <u>Standing to Enforce</u>. The City, the Project Labor Coordinator, or any Contractor affected by an alleged violation of Section 7.1 shall have standing and the right to enforce the obligations established therein.
- Section 7.4 Expiration of Schedule A's. If a collective bargaining agreement between a signatory Contractor and one or more of the Union(s) expires before the Contractor completes the performance of a Covered Contract for a Covered Project, and the Union or the Contractor gives notice of demand for a new or modified collective bargaining agreement, the Unions agree that they will not strike the Contractor on any Covered Project, and the Union and the Contractor agree that the expired collective bargaining agreement will continue in full force and effect for the Project Work until a new or modified collective bargaining agreement is reached between the Union and the Contractor. If the new or modified collective bargaining agreement reached between the Union and the Contractor provides that any terms of the collective bargaining agreement shall be retroactive, the Contractor agrees to comply, consistent with the terms of this PLA and the Prevailing Wage Statute, with any retroactive terms of the new or modified collective bargaining agreement which are applicable to employees of said Contractor that are employed on a Covered Project within seven (7) days at

no cost to the City. All employees shall continue to work and to perform all their obligations with respect to Project Work despite the expiration of a Schedule A agreement. Should a Contractor engaged in Project Work enter into an interim agreement with the Unions for work being performed elsewhere after the expiration, and before the renewal of a local collective bargaining agreement forming the basis for Schedule A, such interim agreement shall be utilized by that Contractor for Project Work, subject to the provisions of Section 21.3.

Section 7.5

No Lock Outs. Contractors shall not cause, incite, encourage, condone or participate in any lock-out of employees with respect to Project Work during the term of this PLA. The term "lock-out" refers only to a Contractor's exclusion of employees in order to secure collective bargaining advantage, and does not refer to the discharge, termination, or layoff of employees by the Contractor for any reason in the exercise of rights pursuant to any provision of this PLA, or any other agreement, nor does "lock-out" include the City's decision to stop, suspend, or discontinue any Project Work or any portion thereof for any reason.

Section 7.6 Best Efforts to End Violations.

- (a) If a Contractor contends that there is any violation of this Article, it shall, at least twenty-four (24) hours prior to invoking the procedures of Section 7.7, provide written notification to the Council of the involved Union(s) and to the Project Labor Coordinator, setting forth the facts which the Contractor contends violates this Article. The Council and the leadership of the involved Union(s) will immediately instruct, order, and use their best efforts to cause the cessation of any violation of the Article.
- (b) If the Union contends that any Contractor has violated this Article, it will notify the Contractor and the Project Labor Coordinator, setting forth the facts which the Union contends violate this Article, at least twenty-four (24) hours prior to invoking the procedures of Section 7.7. The Project Labor Coordinator shall promptly order the involved Contractor(s) to cease any violation of the Article.

Section 7.7

<u>Expedited Enforcement Procedure</u>. Any Party, including the City, which is an intended beneficiary of this Article, or the Project Labor Coordinator, may institute the following procedures, in lieu of or in addition to any other action at law or equity, when a breach of this Article is alleged.

(a) The Party invoking this procedure shall notify Thomas Pagan, who has been selected by the negotiating Parties, and whom the Parties agree shall be the permanent arbitrator under this procedure, or Barry Winograd, as the alternate

arbitrator under this procedure. If the permanent arbitrator is unavailable at any time, the alternate will be contacted. If neither is available, then a selection shall be made from the list of arbitrators as set forth in Article 10. Notice to the arbitrator shall be by the most expeditious means available, with notices to the Parties alleged to be in violation, and to the Project Labor Coordinator and Council. For purposes of this Article, written notice may be given by email, facsimile, hand delivery, or overnight mail and will be deemed effective upon receipt.

- (b) Upon receipt of said notice, the arbitrator named above or his/her alternate shall sit and hold a hearing within twenty-four (24) hours if it is contended that the violation still exists, but not sooner than twenty-four (24) hours after notice has been dispatched to the Council of the involved Union(s) and/or Contractor as required by Section 7.6, above.
- (c) The arbitrator shall notify the Parties of the place and time chosen for this hearing. Said hearing shall be completed in one session, which, with appropriate recesses at the arbitrator's discretion, shall not exceed twenty-four (24) hours unless otherwise agreed upon by all Parties. A failure of any Party or Parties to attend said hearings shall not delay the hearing of evidence or the issuance of any award by the arbitrator.
- (d) The sole issue at the hearing shall be whether or not a violation of this Article has in fact occurred. The arbitrator shall have no authority to consider any matter in justification, explanation, or mitigation of such violation or to award damages, (except for damages as set forth in Section 7.8 below) which issue is reserved for court proceedings, if any. The award shall be issued in writing within three (3) hours after the close of the hearing and may be issued without an opinion. If any Party desires a written opinion, one shall be issued within fifteen (15) days, but its issuance shall not delay compliance with, or enforcement of, the award. The arbitrator may order cessation of the violation of the Article and other appropriate relief, and such award shall be served on all Parties by hand or registered mail upon issuance.
- (e) Such award shall be final and binding on all Parties and may be enforced by any court of competent jurisdiction upon the filing of this PLA and all other relevant documents referred to herein above in the following manner. Written notice of the filing of such enforcement proceedings shall be given to the other Party. In any judicial proceeding to obtain a temporary order enforcing the arbitrator's award as issued under Section 7.7(d) of this Article, all Parties waive the right to a hearing and agree that such proceedings may be ex parte. Such

agreement does not waive any Party's right to participate in a hearing for a final order of enforcement. The court's order or orders enforcing the arbitrator's award shall be served on all Parties by hand or by delivery to their address as shown on this PLA (for a Union), as shown on their business contract for work under this PLA (for a Contractor) and to the representing Union (for an employee), by certified mail by the Party or Parties first alleging the violation.

- (f) Any rights created by statute or law governing arbitration proceedings inconsistent with the above procedure or which interfere with compliance hereto are hereby waived by the Parties to whom they accrue.
- (g) The fees and expenses of the arbitrator shall be equally divided between the Party or Parties initiating this procedure and the respondent Party or Parties.

Section 7.8 <u>Liquidated Damages.</u>

- (a) If the arbitrator determines in accordance with Section 7.7 above that a work stoppage has occurred, the respondent Union(s) shall, within eight (8) hours of receipt of the Award, direct all the employees they represent on the project to immediately return to work. If the craft(s) involved do not return to work by the beginning of the next regularly scheduled shift following such eight (8) hour period after receipt of the arbitrator's Award, and the respondent Union(s) have not complied with their obligations to immediately instruct, order, and use their best efforts to cause a cessation of the violation and return the employees they represent to work, then the non-complying Union(s) shall each pay a sum as liquidated damages to the City, and each will pay an additional sum per shift, as set forth in (c), below, for each shift thereafter on which the craft(s) has not returned to work.
- (b) If the arbitrator determines in accordance with Section 7.7 above that a lock out has occurred, the respondent Contractor(s) shall, within eight (8) hours after receipt of the award, return all the affected employees to work on the Project, or otherwise correct the violations found by the arbitrator. If the respondent Contractor(s) do not take such action by the beginning of the next regular scheduled shift following the eight (8) hour period, each non-complying respondent Contractor shall pay or give as liquidated damages, to the affected Union(s) (to be apportioned among the affected employees and the benefit funds to which contributions are made on their behalf, as designated by the arbitrator) and each shall pay an additional sum per shift, as set forth in (c), below, for each shift thereafter in which compliance by the respondent Contractor(s) has not been completed.

(c) The Parties agree that project delays caused by violations of this Article will cause the City to sustain damages. They agree that it would be impractical or extremely difficult to fix the amount of such damages. Therefore, the Parties agree that, in the event of a breach of either of these provisions, the Party in breach shall pay to the City the sum of not less than \$10,000.00 and no more than \$20,000.00 per shift from the time the arbitrator determines that a delay has occurred until the arbitrator determines that the project is again on construction schedule. The payment, when made, shall constitute a damages remedy of the City for the delay specified, but shall not prevent the City from seeking an injunctive or other monetary relief, including termination of this PLA. Payment of these sums as liquidated damages is not intended as a forfeiture or penalty within the meaning of California Civil Code sections 3275 or 3369, but instead, is intended to constitute liquidated damages to the City pursuant to section 1671 of the California Civil Code.

ARTICLE 8

WORK ASSIGNMENTS AND JURISDICTIONAL DISPUTES

- <u>No Jobsite Disruption</u>. There will be no strikes, work stoppages, picketing, sympathy strikes, slowdowns, or other interferences with the work because of jurisdictional disputes between Unions. The assignment of work will be solely the responsibility of the Contractor performing the work involved; and such work assignments will be in accordance with the Plan for Settlement of Jurisdictional Disputes in the Construction Industry (the "Plan") or any successor Plan.
- Section 8.2 All jurisdictional disputes on this project shall be settled and adjusted according to the present Plan established by the Building and Construction Trades Department or any other plan or method of procedure that may be adopted by the Building and Construction Trades Department. Decisions rendered shall be final and binding and conclusive on the Contractors and Unions parties to this PLA.

All jurisdictional disputes shall be resolved without the occurrence of any of the activities prohibited in Article 7 (Work Stoppages and Lockouts), and the Contractor's assignment shall be adhered to until the dispute is resolved. Individuals violating this section shall be subject to immediate discharge.

Section 8.2.1 If a dispute arising under this Article involves the Southwest Regional Council of Carpenters or any of its subordinate bodies, an arbitrator shall be chosen by the procedures specified in Article V, Section 5, of the Plan from a list composed of Thomas Pagan, Thomas Angelo, Robert Hirsch, and John Kagel, and the

arbitrator's hearing on the dispute shall be held at the offices of the Council within fourteen (14) days of the selection of the arbitrator. All other procedures shall be as specified in the Plan.

- <u>Failure to Comply.</u> If any Union or Contractor fails to immediately and fully comply with the final decision rendered by the Plan, affected Union(s) or Contractor(s) may seek legal redress for such conduct, including, but not limited to, injunctive relief and/or damages.
- <u>Section 8.4</u> Pre-job Conference. It is required that a pre-job conference be held not later than fourteen (14) calendar days prior to the start of work by each Contractor for the Covered Project in accordance with the procedure described in Article 16.

ARTICLE 9

MANAGEMENT RIGHTS

- Section 9.1 Contractor and City Rights. The Contractors and the City have the sole and exclusive right and authority to oversee and manage construction operations on Project Work without any limitations unless expressly limited by a specific provision of this PLA. In addition to the following and other rights of the Contractors enumerated in this PLA, the Contractors expressly reserve their management rights and all the rights conferred upon them by law. The Contractor's rights include, but are not limited to, the right to:
 - (a) Plan, direct, and control operations of all work; and
 - (b) Hire, promote, transfer, and layoff their own employees, respectively, as deemed appropriate to satisfy work and/or skill requirements; and
 - (c) Promulgate and require all employees to observe reasonable job rules and security and safety regulations; and
 - (d) Discharge, suspend, or discipline their own employees for just cause; and
 - (e) Utilize, in accordance with City approval, any work methods, procedures, or techniques, and select, use, and install any types or kinds of materials, apparatus, or equipment, regardless of source of manufacture or construction; and
 - (f) Assign and schedule work at their discretion; and

(g) Assign overtime, determine when it will be worked and the number and identity of employees engaged in such work, subject to such provisions in the applicable Schedule A(s) requiring such assignments be equalized or otherwise made in a nondiscriminatory manner.

Specific City Rights. In addition to the following and other rights of the City enumerated in this PLA, the City expressly reserves its management rights and all the rights conferred on it by law and contract. The City's rights (and those of the Project Labor Coordinator on its behalf) include, but are not limited to the right to:

- (a) Inspect any construction site or facility to ensure that the Contractor follows the applicable safety and other work requirements; and
- (b) At its sole option, terminate, delay, and/or suspend any and all portions of the Project Work at any time; prohibit some or all work on certain days or during certain hours of the day to accommodate the ongoing operations of the City and/or to mitigate the effect of ongoing Project Work on businesses and residents in the neighborhood of the Project sites; and/or require any other operational or schedule changes it deems necessary, in its sole judgment, to meet Project deadlines and remain a good neighbor to those in the area of the Covered Projects. (In order to permit the Contractors and Unions to make appropriate scheduling plans, the City will provide the Project Labor Coordinator, and the affected Contractor[s] and Union[s] with reasonable notice of any changes it requires pursuant to this section); and
- (c) Approve any work methods, procedures, and techniques used by Contractors whether or not these methods, procedures, or techniques are part of industry practices or customs; and
- (d) Investigate and process complaints or disagreements, through its Project Labor Coordinator.

<u>Use of Materials</u>. There should be no limitations or restrictions by the Union upon a Contractor's choice of materials or design, nor, regardless of source or location, upon the full use and utilization of equipment, machinery, packaging, precast, prefabricated, prefinished, or preassembled materials, tools, or other labor-saving devices, subject to the application of the California Public Contract and Labor Codes. Generally, the onsite installation or application of such items shall be performed by the craft having jurisdiction over such work.

Section 9.4 Special Equipment, Warranties, and Guaranties.

- (a) It is recognized that certain equipment of a highly technical and specialized nature may be installed at Covered Project sites. The nature of the equipment, together with the requirements for manufacturer's warranties, may dictate that it be prefabricated, pre-piped, and/or pre-wired and that it be installed under the supervision and direction of the City's and/or manufacturer's personnel. The Unions agree that such equipment is to be installed without incident.
- (b) The Parties recognize that the Contractor will initiate from time to time the use of new technology, equipment, machinery, tools, and other labor-savings devices and methods of performing Project Work. The Unions agree that they will not restrict the implementation of such devices or work methods. The Unions will accept and will not refuse to handle, install, or work with any standardized and/or catalogue parts, assemblies, accessories, prefabricated items, preassembled items, partially assembled items, or materials whatever their source of manufacture or construction.
- (c) If any disagreement between the Contractor and the Unions concerning the methods of implementation or installation of any equipment, device, or item, or method of work arises, or whether a particular part or pre-assembled item is a standardized or catalog part or item, the work will proceed as directed by the Contractor, and the Parties shall immediately consult over the matter. If the disagreement is not resolved, the affected Union(s) shall have the right to proceed through the procedures set forth in Article 10.

SETTLEMENT OF GRIEVANCES AND DISPUTES

Section 10.1 Cooperation and Harmony on Site.

- (a) This PLA is intended to establish and foster continued close cooperation between management and labor. The Council shall assign a representative to this Project for the purpose of assisting the local Unions, and working with the Project Labor Coordinator, together with the Contractors, to complete construction of the Project Work economically, efficiently, continuously, and without any interruption, delays, or work stoppages.
- (b) The Project Labor Coordinator, the Contractors, Unions, and employees collectively and individually, realize the importance to all Parties of maintaining continuous and uninterrupted performance of Project Work, and agree to resolve

disputes in accordance with the grievance provisions set forth in this Article or, as appropriate, those of Article 7 or 8.

The Project Labor Coordinator shall observe the processing of grievances under this Article and Articles 7 and 8, including the scheduling and arrangements of facilities for meetings, selection of the arbitrator from the agreed-upon panel to hear the case, and any other administrative matters necessary to facilitate the timely resolution of any dispute; provided, however, it is the responsibility of the principal Parties to any pending grievance to ensure the time limits and deadlines are met.

Section 10.2 Processing Grievances. Any questions arising out of and during the term of this PLA involving its interpretation and application, which includes applicable provisions of the Schedule A's, but not alleged violations of Articles 7 or 8, shall be considered a grievance and subject to resolution under the following procedures.

- Employee Grievances. When any employee subject to the Step 1. (a) provisions of this PLA feels aggrieved by an alleged violation of this PLA, the employee shall, through his local Union business representative or job steward, within ten (10) working days after the occurrence of the violation, give notice to the work site representative of the involved Contractor stating the provision(s) alleged to have been violated, the details of the alleged violation and the remedy sought to resolve the matter. A grievance shall be considered null and void if notice of the grievance is not given within the ten (10) day period. A business representative of the local Union or the job steward and the work site representative of the involved Contractor shall meet and endeavor to adjust the matter within ten (10) working days after timely notice has been given. If they fail to resolve the matter within the prescribed period, the grieving Party may, within ten (10) working days thereafter, pursue Step 2 of this grievance procedure provided the grievance is reduced to writing, setting forth the relevant information, including a short description thereof, the date on which the alleged violation occurred, and the provision(s) of the applicable agreement alleged to have been violated. Grievances and disputes settled at Step 1 shall be nonprecedential except as to the Parties directly involved.
- Union or Contractor Grievances. Should the Union(s) or any Contractor (b) have a dispute with the other Party(ies) and, if after conferring within ten (10) working days after the disputing Party knew or should have known of the facts or occurrence giving rise to the dispute, a settlement is not reached within five (5) working days, the dispute shall be reduced to writing and processed to Step 2 in

the same manner as outlined in Step 1(a) above for the adjustment of an employee complaint.

- Step 2. The business manager of the involved local Union or his designee, together with the site representative of the involved Contractor, and the labor relations representative of the Project Labor Coordinator shall meet within seven (7) working days of the referral of the dispute to this second step to arrive at a satisfactory settlement thereof. If the Parties fail to reach an agreement, the dispute may be appealed in writing in accordance with the provisions of Step 3 within seven (7) calendar days after the initial meeting at Step 2.
- Step 3. (a) If the grievance shall have been submitted but not resolved under Step 2, either the Union or Contractor Party may request in writing to the Project Labor Coordinator (with copy[ies] to the other Party[ies]) within seven (7) calendar days after the initial Step 2 meeting, that the grievance be submitted to an arbitrator selected from the agreed-upon list below, on a rotational basis in the order listed. Those arbitrators are: (1) Thomas Pagan; (2) David Hart; (3) Edna Francis; (4) Mike Rappaport; (5) Michael Prihar; (6) Fred Horowitz; and (7) Sara Adler. The decision of the arbitrator shall be final and binding on all Parties, and the fee and expenses of such arbitrations shall be borne equally by the involved Contractor(s) and the involved Union(s).
- (b) Failure of the grieving Party to adhere to the time limits established herein shall render the grievance null and void. The time limits established herein may be extended only by written consent of the Parties involved at the particular step where the extension is agreed upon. The arbitrator shall have the authority to make decisions only on issues presented and shall not have the authority to change, amend, add to, or detract from any of the provisions of this PLA.
- <u>Section 10.3</u> <u>Limit on Use of Procedures.</u> Procedures contained in this Article shall not be applicable to any alleged violation of Article 7 or 8, with a single exception that any employee discharged for violation of Section 7.2 may resort to the procedures of this Article to determine only if he/she was, in fact, engaged in that violation.
- Section 10.4 Notice. The Project Labor Coordinator (and the City, in the case of any grievance regarding the Scope of this PLA), shall be notified by the involved Contractor of all actions at Steps 2 and 3, and further, the Project Labor Coordinator shall, upon its own request, be permitted to participate fully in all proceedings at such steps.

COMPLIANCE

- Section 11.1 Compliance with All Laws. The Council and all Unions, Contractors, and their employees shall comply with all applicable federal and state laws, ordinances, and regulations including, but not limited to, those relating to safety and health, employment, and applications for employment. All employees shall comply with the safety regulations established by the City, the Project Labor Coordinator, and the Contractor. Employees must promptly report any injuries or accidents to a supervisor.
- <u>Monitoring Compliance</u>. The Parties agree that the City shall require, and that the Project Labor Coordinator and Council shall monitor, compliance by all Contractors with all federal and state laws and regulations that, from time to time may apply to Project Work. It shall be the responsibility of both the Council and the Project Labor Coordinator (on behalf of the City) to investigate or monitor compliance with these various laws and regulations. The Council may recommend to the Project Labor Coordinator and/or the City procedures to encourage compliance with these laws and regulations.
- Section 11.3 Prevailing Wage Compliance. The Council or Union may refer all complaints regarding any potential prevailing wage violation to the Project Labor Coordinator, who may process, investigate, and resolve such complaints. The Council or Union, as appropriate, shall be advised in a timely manner with regard to the facts and resolution, if any, of any complaint. It is understood that this Section does not restrict any individual rights as established under the State Labor Code, including the rights of an individual to file a complaint with the State Labor Commissioner.
- <u>Violations of Law.</u> Based upon a finding of violation by the City of a federal and state law, and upon notice to the Contractor that it is in such violation, the City, in the absence of the Contractor remedying such violation, shall take such action as it is permitted by law or contract to encourage the Contractor to come into compliance, including, but not limited to, assessing fines and penalties and/or removing the offending Contractor from Project Work.

SAFETY AND PROTECTION OF PERSON AND PROPERTY

Section 12.1 Safety.

- (a) It shall be the responsibility of each Contractor to ensure safe working conditions and employee compliance with all applicable safety laws and regulations and any safety rules contained herein or established by the City, the Project Labor Coordinator, or the Contractor. It is understood that employees have an individual obligation to use diligent care to perform their work in a safe manner and to protect themselves and the property of the Contractor and the City.
- (b) All Parties and Contractor employees shall be bound by the safety, security, and visitor rules established by the Contractor, the Project Labor Coordinator, and the City. These rules will be published and posted. An employee's failure to satisfy his/her obligations under this Section will subject him/her to discipline, up to and including discharge.
- Section 12.2 <u>Drug and Alcohol Testing Policy</u>. The Parties agree to adopt the Drug and Alcohol Testing Policy attached hereto as Attachment C, which is the exclusive Drug and Alcohol Testing Policy for Covered Projects.
- <u>Section 12.3</u> <u>Inspection</u>. The inspection of shipments of equipment, machinery, and construction materials of every kind shall be performed at the discretion of the Contractor by individuals of its choice.

ARTICLE 13

TRAVEL AND SUBSISTENCE

Section 13.1 Travel expenses, travel time, subsistence allowances and/or zone rates, and parking reimbursements shall not be applicable to work under this PLA, except to the extent provided for in any applicable prevailing wage determination. Parking for employees covered by this PLA shall be provided by the Contractor(s) according to the provision of the Schedule A(s) existing on the Effective Date of this PLA and upon presentation of proof of any expense incurred.

APPRENTICES

Importance of Training. The Parties recognize the need to maintain continuing Section 14.1 support of the programs designed to develop adequate numbers of competent workers in the construction industry, the obligation to capitalize on the availability of the local work force in the area served by the City, and the opportunities to provide continuing work on Covered Projects for City Residents and Targeted Workers. To these ends, and consistent with any laws or regulations, the Parties will facilitate, encourage, and assist City Residents and Targeted Workers commence and progress in Apprenticeship Programs and/or apprenticeship readiness programs in the construction industry leading to participation in such Apprenticeship Programs. The City, the Project Labor Coordinator, other City consultants, the Contractors, and the Council and Unions, will work cooperatively to identify, or establish and maintain, effective programs and procedures for persons interested in entering the construction industry and which will help prepare them for the entry into Apprenticeship Programs. Apprentices, if utilized, must be enrolled in a California Apprenticeship Council-approved Apprenticeship Program.

Section 14.2 Use of Apprentices.

- (a) The Unions and Contractors agree to cooperate in referring and employing Apprentices up to the maximum percentage allowed by the State Labor Code and the standards of each State-Approved Apprenticeship Program. The minimum ratios for Apprentice to journeyperson hours worked shall be in compliance, at a minimum, with the applicable provisions of the State Labor Code relating to utilization of Apprentices. The City, unless otherwise required by law, shall encourage such utilization, and, both as to Apprentices and the overall supply of experienced workers, the Project Labor Coordinator will work with the Council, Apprenticeship Programs, and Contractors to assure appropriate and maximum utilization of Apprentices and the continuing availability of both Apprentices and journey persons.
- (b) The Parties agree that all Contractors will comply with all applicable laws and regulations in the request for dispatch and employment of Apprentices.
- (c) The Parties agree that Apprentices will not be dispatched to Contractors working under this PLA unless there is a journeymen or other Contractor employee working on the Project where the Apprentice is to be employed who is

qualified to assist and oversee the Apprentice's progress through the program in which he/she is participating.

ARTICLE 15

LEGAL ACTION

Section 15.1 Legal Action. The City, Council and Unions recognize the substantial legal costs (including all attorney's fees and associated disbursements) that might accrue with regard to any legal challenge over the adoption by the City of this PLA, and related to claims directly challenging the legality of this PLA, or a particular section or language that has been adopted herein. In the event of a legal challenge, the Council, on behalf of itself and affiliated Unions, agrees to seek to intervene in the legal action and actively participate in the litigation or other action to defend the legality of this PLA, or a particular section or language herein. The failure of the Council to seek to intervene in the legal action and actively participate to defend the legality of this PLA will constitute a material breach of this PLA. In the event the Council is denied leave to intervene in the legal action, the Council shall have its counsel coordinate with the City's counsel, at the Council's own expense, regarding how the Council can best support the City's legal position.

ARTICLE 16

PRE-JOB CONFERENCE

Section 16.1 Each Contractor is required to conduct a pre-job conference with the Unions not later than fourteen (14) calendar days prior to commencing work. The purpose of the conference will be to, among other things, convey craft manpower needs, the schedule of work for the Covered Project, project work rules, and propose preliminary Union work assignments. The Project Labor Coordinator may work with the Prime Contractor and Council to facilitate the scheduling of all pre-job conferences, but ensuring each Contractor conducts a pre-job conference in accordance with this Agreement is the responsibility of the Prime Contractor. All preliminary Union work assignments shall be disclosed by each Contractor at a pre-job conference. Should there be work within the scope of a Construction Contract for a Covered Project that was not previously assigned at a pre-job conference, or additional work be added to the scope of the Covered Project, the Contractor(s) performing such work will conduct a separate pre-job conference.

Any Union in disagreement with a proposed assignment shall notify the affected Contractor of its position in writing, with a copy sent to the Project Labor Coordinator, within seven (7) calendar days after the pre-job conference occurred. Within seven (7) calendar days after the period allowed for Union notices of disagreement with the Employer's proposed assignments, but prior to the commencement of any work, the Employer shall make final assignments in writing with copies sent to the Project Labor Coordinator and Council.

ARTICLE 17

LABOR/MANAGEMENT AND COOPERATION

Section 17.1 Joint Committee. The Parties to this PLA will form a joint committee consisting of three (3) representatives selected by the Council and three (3) representatives selected by the Project Labor Coordinator, to be chaired jointly by a representative of the Project Labor Coordinator and the Council. The purpose of the Committee shall be to promote harmonious and stable labor management relations on this Project, to ensure effective and constructive communication between labor and management Parties, to advance the proficiency of work in the industry, and to evaluate and ensure an adequate supply of skilled labor for all Project Work. Representatives of the City may participate upon its request, and all Parties will be invited to attend.

<u>Section 17.2</u> <u>Functions of Joint Committee</u>. The Committee shall meet on a schedule to be determined by the Committee or at the call of the joint chairs, to discuss the administration of the PLA, the progress of the project, general labor management problems that may arise, and any other matters consistent with this PLA. Substantive grievances or disputes arising under Articles 7, 8, or 10 shall not be reviewed or discussed by this Committee, but shall be processed pursuant to the provisions of the appropriate Article.

The Project Labor Coordinator shall be responsible for scheduling of the meetings and the preparation of the agenda topics for the meetings, with input from the Unions, the Contractors, and the City. Notice of the date, time and place of meetings, shall be given to the Committee members at least three (3) days prior to the meeting. The City shall be notified of the meetings and invited to send a representative(s) to participate.

The Project Labor Coordinator shall prepare quarterly reports on Apprentice utilization and the training and employment of City Residents, and a schedule of Project work and estimated number of craft workers needed. The Committee, or

an appropriate subcommittee, may review such reports and make any recommendations for improvement, if necessary, including increasing the availability of skilled trades, and the employment of local residents or other individuals who should be assisted with appropriate training to qualify for Apprenticeship Programs.

Section 17.3 Subcommittees. The Committee may form subcommittees to consider and advise the full Committee with regard to safety and health issues affecting the Project and other similar issues affecting the overall Project, including any workers' compensation program initiated under this PLA.

ARTICLE 18

SAVINGS AND SEPARABILITY

Section 18.1 Savings Clause. It is not the intention of the City, the Project Labor Coordinator, Contractor, or the Union Parties to violate any laws governing the subject manner of this PLA. The Parties hereto agree that in the event any provision of this PLA is finally held or determined to be illegal or void as being in contravention of any applicable law or regulation, the remainder of the PLA shall remain in full force and effect unless the part or parts so found to be void are wholly inseparable from the remaining portions of this PLA. Further, the Parties agree that if and when any provision(s) of this PLA is finally held or determined to be illegal or void by a court of competent jurisdiction, the Parties will promptly enter into negotiations concerning the substantive effect of such decision for the purposes of achieving conformity with the requirements of any applicable laws and the intent of the Parties hereto. If the legality of this PLA is challenged and any form of injunctive relief is granted by any court, suspending temporarily or permanently the implementation of this PLA, then the Parties agree that all Project Work that would otherwise be covered by this PLA should be continued to be bid and constructed without application of this PLA so that there is no delay or interference with the ongoing planning, bidding, and construction of any Project Work.

<u>Section 18.2</u> <u>Effect of Injunctions or Other Court Orders</u>. The Parties recognize the right of the City to withdraw, at its absolute discretion, the utilization of the PLA as part of any bid specification should a court of competent jurisdiction issue any order, or any applicable statute that could result, temporarily or permanently, in delay of the bidding, awarding, and/or construction on the Project.

WAIVER

Section 19.1 Waiver. A waiver of or a failure to assert any provisions of this PLA by any or all of the Parties hereto shall not constitute a waiver of such provision for the future. Any such waiver shall not constitute a modification of the PLA or change in the terms and conditions of the PLA and shall not relieve, excuse or release any of the Parties from any of their rights, duties, or obligations hereunder.

ARTICLE 20

AMENDMENTS

<u>Section 20.1</u> <u>Amendments.</u> The provisions of this PLA can be renegotiated, supplemented, rescinded, or otherwise altered only by mutual agreement in writing, hereafter signed by the Parties.

ARTICLE 21

DURATION OF THE PLA

- Section 21.1 Duration. This Agreement shall be effective on June 16, 2020, provided that the Council has signed the Agreement. The Agreement shall continue in full force and effect until all of the work within the scope of a Covered Contract is completed and accepted by the City.
- **Section 21.2** Turnover and Final Acceptance of Completed Work.
 - (a) Construction of any phase, portion, section, or segment of Project Work shall be deemed complete when such phase, portion, section or segment has been turned over to the City by the Contractor and the City has accepted such phase, portion, section, or segment. As areas and systems of the Project are inspected and construction-tested and/or approved and accepted by the City or third parties with approval of the City, the PLA shall have no further force or effect on such items or areas, except when the Contractor is directed by the City to engage in repairs or modifications required by its Contract(s) with the City.
 - (b) Notice of each final acceptance received by the Contractor will be provided to the Council with the description of what portion, segment, etc. has

been accepted. Final acceptance may be subject to a "punch" list, and in such case, the PLA will continue to apply to each such item on the list until it is completed to the satisfaction of the City and Notice of Acceptance is given by the City or its representative to the Contractor.

Section 21.3 Continuation of Schedule A's. Schedule A's incorporated as part of this PLA shall continue in full force and effect, as previously stated, until the Contractor and Union Parties to the collective bargaining agreement(s), which are the basis for such Schedule A's, notify the Project Labor Coordinator of the mutually agreed upon changes in such agreements and their effective date(s).

The Parties agree to recognize and implement all applicable changes on their effective dates, except as otherwise provided by this PLA; provided, however, that any such provisions negotiated in said collective bargaining agreements will not apply to work covered by this PLA if such provisions are less favorable to the Contractor under the PLA than those uniformly required of Contractors for construction work normally covered by those agreements; nor shall any provision be recognized or applied if it may be construed to apply exclusively or predominantly to work covered by this PLA. Any disagreement between the Parties over the incorporation into a Schedule A of any such provision agreed upon in a negotiation of the local collective bargaining agreement that is the basis for a Schedule A shall be resolved under the procedures established in Article 10.

<u>Section 21.4</u> <u>Final Termination</u>. Final termination of all obligations, rights, and liabilities, and disagreements shall occur upon receipt by the Council of a Notice from the City saying that no work remains within the scope of the PLA.

Pure Water Program Phase II Projects. The City and the Unions intend to have this Agreement or a succeeding Agreement include all construction projects in Pure Water Program Phase II. The Pure Water Program Phase II Projects are in the early development stage and cannot be specifically identified at this time to be included in the scope of this Agreement. Therefore, to reopen negotiations to include Pure Water Program Phase II Projects into this Agreement, the Council shall send written notice to the City's Project Labor Coordinator after the City has approved Pure Water Program Phase II Projects' Environmental Impact Report and no later than ninety (90) days after the City's final approval of the Environmental Impact Report.

WORK AND ECONOMIC OPPORTUNITY

Section 22.1 The magnitude, duration, and complexity of the Pure Water Program Phase I Projects will require large numbers of skilled craft personnel and create significant economic opportunities for City Residents, Targeted Workers, Disadvantaged Business Enterprises and other businesses. It is therefore the understanding and intention of the Parties to use the opportunities provided by the extensive amount of work to collaborate and implement programs and procedures, which may include, for example, North America's Building Trades Unions Multi-Craft Core Curriculum (MC3) apprenticeship readiness programs, to prepare persons, especially City Residents and Targeted Workers, for entrance into Apprenticeship Programs to begin or continue their construction careers on Covered Projects. Further, the Parties agree to maximize the inclusion of Disadvantage Business Enterprises through outreach, training, and subcontracting for Covered Projects. With assistance from the Project Labor Coordinator, the City, the Contractors, the Unions and their affiliated regional and national organizations will work jointly to promptly develop and implement procedures for the identification of craft needs, the scheduling of work to facilitate the utilization of available craft workers, and the securing of services of craft workers in sufficient numbers to meet the high demands of the Project Work to be undertaken.

Section 22.2

The City, together with the Parties, supports the development of increased numbers of skilled construction workers who are City Residents and Targeted Workers to meet the labor needs of Covered Projects. Towards that end, the Parties, together with the City and its Project Labor Coordinator, agree to develop and implement a work opportunities program for City Residents and Targeted Workers to maximize construction career opportunities and create a construction career pipeline to becoming employed on Covered Projects. Further, the City together with the Parties, will create opportunities for Disadvantaged Business Enterprises consistent with the City's goals and inclusion programs for such businesses. In furtherance of the foregoing, the Council and Unions specifically agree to work with the City and the Project Labor Coordinator to:

Collaborate with existing or newly created MC3 apprenticeship readiness (a) programs in San Diego to offer opportunities for City Residents and Targeted Workers, including students, to enroll in free short-term construction apprenticeship readiness training to prepare them to enter into Apprenticeship Programs and become employed by a Contractor on a Covered Project. The

Project Labor Coordinator, with the assistance of the Parties, will assist with the recruitment, career placement, and tracking of such City Residents and Targeted Workers who graduate from these apprenticeship readiness programs; and

- (b) The Parties will cooperate and collaborate with the City and Project Labor Coordinator to conduct outreach to and include City Residents and Targeted Workers from traditionally underrepresented segments of the City's population in the construction craft workforce for each Covered Project; and
- (c) The Council will provide accurate data on a quarterly basis to the City and Project Labor Coordinator pertaining to their level of economic support provided to meet these objectives. Further, the Project Labor Coordinator shall produce detailed quarterly reports for the City and Council to measure and report the outcomes of the policies, requirements, and programs established in this Agreement; and
- (d) The Unions will partner with the City and Project Labor Coordinator to conduct outreach and recruitment activities by establishing or continuing to maintain existing centers, programs, and events to facilitate the entry of City Residents and Targeted Workers into the building and construction trades. These programs shall serve as a resource for preliminary orientation, assessment of construction aptitude, referral to MC3 apprenticeship readiness programs or Apprenticeship Programs, referral to hiring halls, and provide tailored orientation and mentoring for women and Targeted Workers; and
- (e) The Unions shall assist City Residents and Targeted Workers with contacting the Apprenticeship Programs for the crafts and trades they are interested in. The Unions shall assist City Residents and Targeted Workers who are seeking employment on Covered Projects and provide opportunities for Union membership by assessing their work experience and giving them credit for provable past experience in their relevant craft or trade, including experience gained working for non-Union Contractors. The Unions shall put on their rolls qualified bona fide City Residents and Targeted Workers for employment on Covered Projects.

Section 22.3 Joint Subcommittee on Work and Economic Opportunity. To carry out the intent and purpose of this Article, a subcommittee of the Labor Management Committee established pursuant to Article 17 shall be established, jointly chaired by a designee of the City and a designee of the Council, to oversee the effective development and implementation of the programs and policies described herein, and to work with representatives of each apprenticeship committee and representatives of the MC3 apprenticeship readiness programs to maximize

employment opportunities for City Residents and Targeted workers who reflect the diversity of the communities surrounding each Covered Project and who may not be previously qualified for the construction career opportunities created by the Covered Projects. The subcommittee will meet as necessary at the call of the joint chairs to promptly facilitate its purposes in an expeditious manner as soon as this PLA becomes effective. In addition to the joint chairs, the membership of the committee will consist of at least three (3) representatives of the signatory local Unions and three (3) representatives of Contractors (or organization to which the Contractors belong) signatory to this PLA and experienced in overseeing and participating in Apprenticeship Programs.

ARTICLE 23

HELMETS TO HARDHATS

- <u>Section 23.1</u> <u>Veterans Entry into Building and Construction Trades.</u> The Parties recognize a desire to facilitate the entry into the building and construction trades of Veterans who are interested in careers in the building and construction industry. The Contractors and Unions agree to utilize the services of the Center for Military Recruitment, Assessment and Veterans Employment (hereinafter "Center") and the Center's "Helmets to Hardhats" program to serve as a resource for preliminary orientation, assessment, and construction aptitude, referral to Apprenticeship Programs or hiring halls, counseling and mentoring, support network, employment opportunities, and other needs as identified by the Parties.
- Section 23.2 Integrated Database. The Unions and Contractors agree to coordinate with the Center to create and maintain an integrated database of Veterans interested in working on this Covered Project and of apprenticeship and employment opportunities for this Covered Project.

In witness whereof, the Parties have caused this Project Labor Agreement for City of San Diego Pure Water Program Phase I Projects to be executed as of the date and year above stated.

Dated: July 9, 2020

SAN DIEGO BUILDING AND CONSTRUCTION TRADES COUNCIL

DocuSigned by:

By:

Tom Lemmon, Business Manager

ADB86106CE1E414...

SIGNATORY UNIONS AND (See Attached)

SIGNATORY UNIONS	5 6 4
DocuSigned by:	DocuSigned by:
By: Michael Patterson 38B4C81867E341A	By: Unis Miramontes By: 997D1F49D5364AD
Allied Workers Local 5	Boilermakers Local 92
By: Chad Boggio Chad Boggio	
Bricklayer & Allied Crafts Local 4	Cement Masons Local 500 / Area 744
By:	By: Frank Belio, Jr. For BM Gazzaniga
Electrical Workers Local 569 — Docusigned by:	Elevator Constructors Local 18
Ву:	By: David Osborne
Glaziers. Floor Coverings & Painters Local 139	Iron Workers Local 229 DocuSigned by:
By: Valentine K. Macedo	By:
Laborers Local 89	Plasterers Local 200
By: Ptasterandophopolen oca	By: Korald & Situal
Plasterer Tenders Local 1414	Operating Engineers Local 12
By:	By:
Operating Engineers Local 12	Operating Engineers Local 12
By: 363A0846ZOA48F	By:
Plumbers & Pipefitters Local 230	Road Sprinkler Fitters Local 669
By: Paul Colmercero	Dave Gauthier
Roofers & Waterproofers Local 45	By: Sheet Metal Workers Local 206
By: B569A3D2C62940C	By: Douglas K Tracy By: Douglas K Tracy
Laborers Local 1184	Sheet Metal Workers Local 206
By: Ed Liam	By: Jose Estrada
Laborers Local 345	Teamsters Local 166
By: Ricardo Perry 8c144FFD6F5F464	By: 3380E1140A31459
UA Local 345 DocuSigned by:	Tradeshow & Sign Craft Local 831
Stephon Araisan	Days Renión
By: Southwest Regional Council of Carpenters	By: As Locarb 300 Laborers Local 300
Southwest Regional Council of Carpenters	Laudicis Local 300

<u>ATTACHMENT A – LETTER OF ASSENT</u>

To be signed by all Contractors awarded work covered by the Project Labor Agreement prior to commencing work.



DATE 12/01/2022

Project Labor Coordinator City of San Diego Address 1200 3rd Ave., Ste. 200, MS 56P San Diego, CA 92101-4905

Attention: Brittany Friedenreich

Re: City of San Diego Project Labor Agreement for PQPS Oxygenation System

Dear Sir:

This is to confirm Blue Pacific Engineering Construction, Inc. agrees to be party to and bound by the City of San Diego Project Labor Agreement for Construction of PQPS Oxygenation System project, effective June 16, 2020, as such Agreement may from time to time be amended by the negotiating Parties or interpreted pursuant to its terms. Such obligation to be a Party and bound by this Agreement shall extend to all work covered by the Agreement undertaken by this Company on the Project pursuant to City Contract No. K-23-2080-DBB-3 PQPS Oxygenation System, and this Company shall require all of its subcontractors of whatever tier to be similarly bound for all work within the scope of the Agreement by signing and furnishing to you an identical Letter of Assent prior to their commencement of work.

Sincerely,

Blue Pacific Engineering Construction, Inc.

By:

Shahram Elihu - President

[Copies of this Letter must be submitted to the Project Labor Coordinator and to the Council consistent with Article 3, Section 3.3(b)]

ATTACHMENT B-1 – WORKFORCE DISPATCH REQUEST FORM

The City of San Diego's Project Labor Agreement for Pure Water Program Phase I Projects establishes a goal of at least thirty-five percent (35%) of the total craft hours on each Covered Project be performed by City Residents. The Unions and Contractors agree that, to the extent allowed by law, and as long as they possess the requisite skills and qualifications, City Residents shall be first referred for Project Work. A "City Resident" is defined as a City of San Diego permanent resident at the time of initial employment on a Covered Project or a Veteran residing anywhere.

*The list of qualifying zip codes for City Residents includes: 92014, 92037, 92038, 92067, 92093, 92101, 92102, 92103, 92104, 92105, 92106, 92107, 92108, 92109, 92110, 92111, 92113, 921 14, 92115, 92116, 92117, 92119, 92120, 92121, 92122, 92123, 92124, 92126, 92127, 92128, 92129, 92130, 92131, 92132, 92134, 92137, 92138, 92139, 92145, 92154, 92166, 92167, 92169, 92171, 92173, 92177.

CONTRACTOR USE ONLY

Please complete and fax or email this form to the applicable union to request craft workers that fulfill the hiring requirements for this project. After faxing your request, please call the Local to verify receipt and substantiate their capacity to furnish workers as specified below. Please print your Fax or Email Transmission Verification Reports and keep copies for your records.								
	Local Union	and#						
TO:		Email						
		Fax						
			C'1 60	D: D :	4 7 1 6	Y 1.		
CC.	City of San			Diego Proj	ect Labor C	coordinator		
CC:		Email						
		Fax						
	Con	tractor						
		ued by						
FROM:		Email						
		Phone						
		Fax						
LINION		DIZEI	D DEOLIECT.					
UNION			R REQUEST:	Louenoumorco	or Appropria	City Posident and	or Votoron	# of Workers
Craft Classification			or Apprentice □APP	City Resident and/or Veteran YES*		# Of WOIKEIS		
			 		YES*			
			□ JM	□APP	YES*			
			□ JM	□APP				
			□ JM	□APP	YES*			
WORKE	R REPORT	TING I	INSTRUCTIONS:	:				
Reporting								
Reporting								
Project Na								
Project Lo								
Reporting	To:							
On Site Ph								
Special Ins	tructions:							
			UNION	USE	O N	LY		
Please compl	lete the "Union U	Use Only	" section and fax or email				Labor Coordi	nator.
	Dispatch Rece patch Receive	_						
	`							
Date wor	ker(s) Dispato			Veteran (Y	7/N)	Zip Code	TM	or App
Name			v eter an ()	./11/)	Zip Couc	I JN	**	
							+	
							\Box JM	I □APP

<u>ATTACHMENT B-2 – CONTRACTOR CORE WORKFORCE FORM</u>

CONTRACTOR INFORMATION								
Project Name:								
Contractor/Firm	Name:							
Prime Tier:								
Submitted by:								
Email:			Pho	one:				
In accordance with the Project Labor Agreement, Article 4, Section 4.6 (f), a Core Employee must be either a journeyperson or Apprentice and appear on the Contractor's active payroll for at least ninety (90) of the last one-hundred-eighty (180) working days prior to being designated as a Core Employee; and must possess any license required by state or federal law for the Project Work to be performed; and must have the ability to safely perform the basic functions of the applicable. Prior to each Contractor performing any work on a Covered Project, each Contractor shall provide a list of Core Employees to the Project Labor Coordinator and the Council. After submitting the Core Employee list prior to commencing work, Contractors shall not make any changes or substitutions to the Core Employee list for the duration of the Covered Project. Failure to submit the Core Employee list								
*	•	g will prohibit the Contractor for the description of the Project Labor Coordinates to the Project Coo	0 .		oloyees for	30 calendar		
Please check all that apply:								
Our firm will not be self-performing any work on this project. We will be subcontracting our work to:								
PLA Section 4.6 regarding Core Employees is not applicable to Contractors that are <u>signatory</u> to one or more Schedule As, which are the Master Labor Agreements of the Unions. If your company is signatory, please list the union and local number below. For crafts that you are not signatory, please complete the core employee list below.								
Indicate Signatory Union Trade: Local #								
e	Indicate Signatory Union Trade: Local #							
_	Indicate Signatory Union Trade: Local #							
mulcate Sign	паюту С	mon frace.		_ Locai	π			
☐ We are not a union signatory contractor and will be using core employees on this project as indicated below:								
Craft/Trade		Employee Name	MC3 Apprentice Y/N?	Last 4 SSN	Hire Date	Date Last Employed		

<u>ATTACHMENT C – DRUG AND ALCOHOL TESTING POLICY</u>

The Parties recognize the problems that drug and alcohol abuse have created in the construction industry and the need to develop drug and alcohol abuse prevention programs. Accordingly, the Parties agree that in order to enhance the safety of the workplace and to maintain a drug and alcohol-free work environment, individual Contractors shall require applicants or employees to undergo drug and alcohol testing in accordance with this PLA and this policy, Attachment C – Drug and Alcohol Testing Policy, hereafter "Policy."

- It is understood that the use, possession, transfer, or sale of illegal drugs, narcotics, or
 other unlawful substances, as well as being under the influence of alcohol and the
 possession of or consuming alcohol is absolutely prohibited while employees are on the
 Contractor's job premises or while working on any jobsite in connection with work
 performed under the PLA.
- 2. No Contractor may implement a drug and alcohol testing program that does not conform in all respects to the provisions of this Policy.
- 3. No Contractor may implement drug and alcohol testing at any jobsite unless written notice is given to the Union setting forth the location of the jobsite, a description of the project under construction, and the name and telephone number of the Prime Contractor's project manager. Said notice shall be provided at the pre-job conferences for each Covered Project. Failure to give such notice shall make any drug and alcohol testing engaged in by the Contractor a violation of the Agreement and subject to the Article 10 grievance procedure.
- 4. A Contractor who elects to implement drug and alcohol testing pursuant to this Policy shall require all craft employees on the Covered Project to be tested. With respect to individuals who become employed on the Covered Project subsequent to the proper implementation of a valid drug and alcohol testing program, such test shall be administered upon the commencement of employment on the project, whether by referral from a Union Dispatch Office, transfer from another project, or another method. Individuals who were employed on the project prior to proper implementation of a valid drug and alcohol testing program may only be subjected to testing for the reasons set forth in paragraphs 5(g)(l) through 5(g)(3) and paragraphs 6(a) through 6(e) of this Policy. Refusal to undergo such testing shall be considered sufficient grounds to deny employment on the project.
- 5. The following procedure shall apply to all drug and alcohol testing:
 - a. The Contractor may request urine samples only. The applicant or employee shall not be observed when the urine specimen is given. An applicant or employee, at his or her sole option, shall, upon request, receive a blood test in lieu of a urine test. No employee of the Contractor shall draw blood from a bargaining unit employee, touch

or handle urine specimens, or in any way become involved in the chain of custody of urine or blood specimens. A Union Business Representative, subject to the approval of the individual applicant or employee, shall be permitted to accompany the applicant or employee to the collection facility to observe the collection, bottling, and sealing of the specimen.

- b. A Contractor may request an applicant or employee promptly, within four (4) hours of the Contractor's request, perform an alcohol breathalyzer test at a certified laboratory only, and cutoff levels shall be those mandated by applicable state or federal law.
- c. The testing shall be done by a laboratory approved by the Substance Abuse & Mental Health Services Administration (SAMHSA), which is chosen by the Contractor and the Union.
- d. An initial test shall be performed using the Enzyme Multiplied Immunoassay Technique (EMIT). In the event a question or positive result arises from the initial test, a confirmation test must be utilized before action can be taken against the applicant or employee. The confirmation test will be by Gas Chromatography/Mass Spectrometry (GC/MS). Cutoff levels for both the initial test and confirmation test will be those established by SAMHSA and this Policy. Should these SAMHSA levels be changed during the course of the PLA or new testing procedures are approved, then these new regulations will be deemed as part of this existing PLA. Confirmed positive samples will be retained by the testing laboratory in secured long-term frozen storage for a minimum of one (1) year. Handling and transportation of each sample must be documented through strict chain-of-custody procedures.
- e. In the event of a confirmed positive test result, the applicant or employee may request, within forty-eight (48) hours, a sample of his/her specimen from the testing laboratory for purposes of a second test to be performed at a second laboratory, designated by the Union and approved by SAMHSA. The retest must be performed within ten (10) days of the request. Chain of custody for this sample shall be maintained by the Contractor between the original testing laboratory and the Union's designated laboratory. Retesting shall be performed at the applicant's or employee's expense. In the event of conflicting test results, the Contractor may require a third test, at the Contractor's expense.
- f. If, as a result of the above testing procedure, it is determined that an applicant or employee has tested positive, this shall be considered sufficient grounds to deny the applicant or employee his/her employment on the project.
- g. No individual who tests negative for drugs and alcohol pursuant to the above procedure and becomes employed on the project shall again be subjected to drug and alcohol testing with the following exceptions:
 - 1) Employees who are involved in industrial accidents resulting in damage to plant, property, or equipment or injury to him/her or others may be tested for drugs or alcohol pursuant to the procedures stated hereinabove.

- 2) The Contractor may test employees following thirty (30) days' advance written notice to the employee(s) to be tested and to the applicable Union. Notice to the applicable Union shall be sent by certified mail to the affected Union with a copy to the Project Labor Coordinator. Such testing shall be pursuant to the procedures stated hereinabove.
- 3) The Contractor may test an employee where the Contractor has reasonable cause to believe that the employee is impaired from performing his/her job. Reasonable cause shall be defined as being aberrant or unusual behavior, the type of which is a recognized and accepted symptom of impairment (e.g., slurred speech, unusual lack of muscular coordination). Such behavior must be actually observed by at least two (2) persons, one (1) of whom shall be a supervisor who has been trained to recognize the symptoms of drug and alcohol abuse or impairment and the other of whom shall be the Job Steward. If the Job Steward is unavailable or there is no Job Steward on the Covered Project, the other person shall be a member of the applicable Union's bargaining unit. Testing shall be pursuant to the procedures stated hereinabove. Employees who are tested pursuant to the exceptions set forth in this paragraph and who test positive will be removed from the Contractor's payroll.
- h. Applicants or employees who do not test positive shall be paid for all time lost while undergoing drug and alcohol testing. Payment shall be at the applicable wage and benefit rates set forth in the applicable Union's Master Labor Agreement. Applicants who have been dispatched from the Union and who are not put to work pending the results of a test will be paid waiting time until such time as they are put to work. It is understood that an applicant must pass the test as a condition of employment. Applicants who are put to work pending the results of a test will be considered probationary employees.
- 6. The Contractors will be allowed to conduct periodic jobsite drug and alcohol testing on the Project under the following conditions:
 - a. The entire jobsite must be tested, including any employee or subcontractor's employee who worked on that project three (3) working days before or after the date of the test:
 - b. Jobsite testing cannot commence sooner than fifteen (15) days after start of the work on the project;
 - Prior to start of periodic testing, a Business Representative will be allowed to conduct an educational period on company time to explain periodic jobsite testing program to affected employees;
 - d. Testing shall be conducted by an SAMHSA-certified laboratory, pursuant to the provisions set forth in paragraph 5 hereinabove.
 - e. Only two (2) periodic tests may be performed in a twelve (12)-month period.

- 7. It is understood that the unsafe use of prescribed medication, or where the use of prescribed medication impairs the employee's ability to perform work, is a basis for the Contractor to remove the employee from the jobsite.
- 8. Any grievance or dispute that may arise out of the application of this Policy shall be subject to the grievance and arbitration procedures set forth in the PLA.
- 9. The establishment or operation of this Policy shall not curtail any right of any employee found in any law, rule, or regulation. Should any part of this Policy be found unlawful by a court of competent jurisdiction or a public agency having jurisdiction over the Parties, the remaining portions of the Agreement shall be unaffected, and the Parties shall enter negotiations to replace the affected provision.
- 10. Present employees, if tested positive, shall have the prerogative for rehabilitation program at the employee's expense. When such program has been successfully completed, the Contractor shall not discriminate in any way against the employee. If work for which the employee is qualified exists, he/she may be reinstated.
- 11. The Contractor agrees that results of urine and blood tests performed hereunder will be considered medical records held confidential to the extent permitted or required by law. Such records shall not be released to any persons or entities other than designated Contractor representatives and the applicable Union. Such release to the applicable Union shall only be allowed upon the signing of a written release by the employee, and the information contained therein shall not be used to discourage the employment of the individual applicant or employee on any subsequent occasion.
- 12. Employees who seek voluntary assistance for substance abuse may not be disciplined for seeking such assistance. Requests from employees for such assistance shall remain confidential and shall not be revealed to other employees or management personnel without the employee's consent. Employees enrolled in substance abuse programs will be subject to all Contractor rules, regulations, and job performance standards with the understanding that an employee enrolled in such a program is receiving treatment for an illness.
- 13. The Contractor shall indemnify and hold the Union harmless against any and all claims, demands, suits, or liabilities that may arise out of the application of this Policy.
- 14. This Policy shall constitute the only Policy in effect between the Parties concerning drug and alcohol abuse, prevention, and testing. Any modifications thereto must be accomplished pursuant to collective bargaining negotiations between the Parties.

SPECIMEN REPORTING CRITERIA

Initial Test Analyte	Initial Test Cutoff ¹	Confirmatory Test Analyte	Confirmatory Test Cutoff Concentration
Marijuana metabolites (THCA) ²	50 ng/ml ³	THCA	15 ng/ml
Cocaine metabolite (Benzoylecgonine)	150 ng/ml 3	Benzoylecgonine	100 ng/ml
Codeine/ Morphine	2000 ng/ml	Codeine Morphine	2000 ng/ml 2000 ng/ml
Hydrocodone/ Hydromorphone	300 ng/ml	Hydrocodone Hydromorphone	100 ng/ml 100 ng/ml
Alcohol	0.02%	Ethanol	0.02%
Oxycodone/ Oxymorphone	100 ng/ml	Oxycodone Oxymorphone	100 ng/ml 100 ng/ml
6-Acetylmorphine	10 ng/ml	6-Acetylmorphine	10 ng/ml
Phencyclidine	25 ng/ml	Phencyclidine	25 ng/ml
Amphetamine/ Methamphetamine	500 ng/ml	Amphetamine Methamphetamine	250 ng/ml 250 ng/ml
MDMA ⁴ /MDA ⁵	500 ng/ml	MDMA MDA	250 ng/ml 250 ng/ml
Initial Test Analyte	Initial Test Cutoff	Confirmatory Test Analyte	Confirmatory Test Cutoff Concentration
Barbiturates	300 ng/ml	Barbiturates	200 ng/ml
Benzodiazepines	300 ng/ml	Benzodiazepines	300 ng/ml
Methadone ⁶	300 ng/ml	Methadone	100 ng/ml
Methaqualone	300 ng/ml	Methaqualone	300 ng/ml
Propoxyphene	300 ng/ml	Propoxyphene	100 ng/ml

Immunoassay: The test must be calibrated with one analyte from the group identified as the target analyte. The cross-reactivity of the immunoassay to the other analyte(s) within the group must be 80 percent or greater; if not, separate immunoassays must be used for the analytes within the group.

Alternate technology: Either one analyte or all analytes from the group must be used for calibration, depending on the technology. At least one analyte within the group must have a concentration equal to or greater than the initial test cutoff or, alternatively, the sum of the analytes present (i.e., equal to or greater than the laboratory's validated limit of quantification) must be equal to or greater than the initial test cutoff.

- ² An immunoassay must be calibrated with the target analyte, 9-tetrahydrocannabinoJ-9- carboxylic acid (THCA).
- ³ Alternate technology (THCA and benzoylecgonine): The confirmatory test cutoff must be used for an alternate technology initial test that is specific for the target analyte (i.e., 15 ng/ml for THCA, 100 ng/ ml for benzoylecgonine).
- ⁴ Methylenedioxymethamphetamine (MDMA)
- ⁵ Methylenedioxyamphetamine (MDA)
- ⁶ Employees with a prescription for methadone who are using the medication as prescribed, and are not impaired and can safely perform their work, will not be considered to have violated this Policy.

¹ For grouped analytes (i.e., two or more analytes that are in the same drug class and have the same initial test cutoff):

MEMORANDUM OF UNDERSTANDING REGARDING "QUICK" DRUG SCREENING TESTS PURSUANT TO ATTACHMENT C – DRUG AND ALCOHOL TESTING POLICY

It is hereby agreed between the Parties hereto that a Contractor who has otherwise properly implemented drug and alcohol testing, as set forth in the Policy, shall have the right to offer an applicant or employee a "quick" drug screening test. This "quick" screen test shall consist either of the "ICUP" urine screen or similar test or an oral screen test. The applicant or employee shall have the absolute right to select either of the two "quick" screen tests, or to reject both and request a full drug test.

An applicant or employee who selects one of the "quick" screen tests, and who passes the test, shall be put to work immediately. An applicant or employee who fails the "quick" screen test, or who rejects the "quick" screen tests, shall be tested pursuant to the procedures set forth in the Policy. The sample used for the "quick" screen test shall be discarded immediately upon conclusion of the test. An applicant or employee shall not be deprived of any rights granted to them by the Policy as a result of any occurrence related to the "quick" screen test.

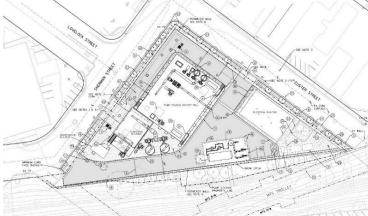
APPENDIX A - SAN DIEGO PURE WATER PROGRAM PHASE I COVERED PROJECTS

1. Morena PS/PL Construction Package 1: Morena Pump Station

- Associated Pure Water Project: Morena PS/PL Project
- Summary: The package is the construction of a new pump station that will transport approximately 32 mgd of wastewater to the NCWRP, where it will be treated before being sent to the NCPWF for further purification. Construction of the pump station will be on Sherman Street.
- Summary of Major Construction Package Components
 - 4+1 Dual Stage Sewer Pump Station
 - Screening Facility
 - High Purity Oxygen System
 - 48-inch to 60-inch diameter influent diversion sewers in Friars Road
 - 66-inch Overflow Sewer
 - Electrical and Instrumentation

Morena Pump Station Rendering and Site Plan





2. Morena PS/PL Construction Package 2: Morena Northern Alignment and Tunnels

- Associated Pure Water Project: Morena PS/PL Project
- Summary: Two pipelines that will start at approximately Genesee Avenue/Highway 52, and will continue through University City to the NCWRP. Three short length tunnels are included in this section, each approximately 1000 feet; one at Highway 52, one at Rose Creek in University City and one at Interstate 805. One pipeline will transport wastewater to the NCWRP, while the other will transport salt and contaminants removed from the water at the NCPWF to the Point Loma Wastewater Treatment Plant.
- Summary of Major Construction Package Components
 - 4 miles of 48-inch force main
 - 4 miles of 36-inch brine/centrate pipeline
 - Tunnel crossing of I-805
 - Tunnel crossing of MTS/NCTD railroad at Rose Creek Canyon
 - Tunnel crossing at San Clemente Creek

Morena Conveyance Northern, Middle and Southern Segments Site Plan



3. Morena PS/PL Construction Package 3: Morena Middle Alignment

- Associated Pure Water Project: Morena PS/PL Project
- Summary: Two pipelines will start at Iroquois Avenue and will terminate at Genesee Avenue/Highway 52. One pipeline will transport wastewater to the NCWRP, while the other will transport salt and contaminants removed from the water at the NCPWF to the Point Loma Wastewater Treatment Plant.
- Summary of Major Construction Package Components
 - 3.6 miles of 48-inch welded steel force main
 - 3.6 miles of 36-inch brine/centrate high density polyethylene pipeline

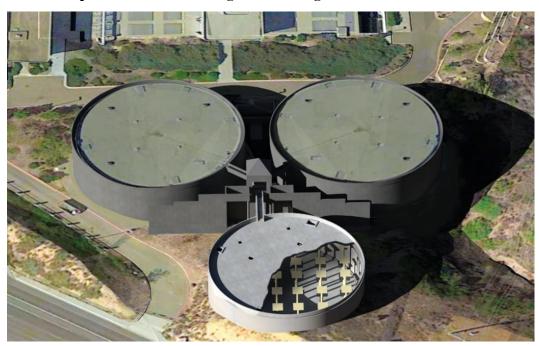
4. Morena PS/PL Construction Package 4: Morena Southern Alignment

- Associated Pure Water Project: Morena PS/PL Project
- Summary: Two pipelines will start at Sherman Street, follow West Morena Boulevard and terminate at Iroquois Avenue. One pipeline will transport wastewater to the NCWRP, while the other will transport salt and contaminants removed from the water at the NCPWF to the Point Loma Wastewater Treatment Plant. A 36-inch diameter welded steel water transmission main will be constructed and a 16 inch steel water distribution main will be replaced by 16 inch PVC in this package.
- Summary of Major Construction Package Components
 - 3.2 miles of 48-inch force main
 - 3.2 miles of 30-inch brine/centrate pipeline
 - Brine/centrate pressure reducing station
 - 3.2 Miles of existing 16-inch steel water distribution main replacement with PVC
 - 3.3 miles of new 36-inch water transmission main

5. NCWRP Expansion Construction Package 1: NCWRP Flow Equalization Basin

- Associated Pure Water Project: NCWRP Expansion
- Summary: This package includes the construction of one concrete equalization tank that will balance high/low wastewater flows from primary effluent and will provide for consistent flow to the biological treatment basins.
- Summary of Major Construction Package Components
 - 2.35-million-gallon flow equalization basin
 - Grading, yard piping and stormwater basin
 - Electrical and instrumentation

NCWRP Equalization Basin Package 1 Rendering



6. NCWRP Construction Packages 2 and 3: NCWRP Expansion and NCPWF Influent Conveyance

- Associated Pure Water Project: NCWRP Expansion
- Summary: This package will increase the amount of recycled water that the plant produces to meet the needs of both the non-potable reuse recycled water system and the new NCPWF. Plant expansion includes the construction of a 42.5 mgd pump station that will convey water to the NCPWF across Eastgate Mall Road.
- Summary of Major Construction Package Components
 - Plant expansion from 30 mgd to 52 mgd
 - 42-mgd Influent Pump Station and pipeline to the NCPWF
 - New primary clarifies, new bioreactor basins and retrofit of existing basins, secondary clarifiers, new tertiary filter, chemical facilities, and yard piping
 - Equipment and electrical substation replacements
 - Electrical and instrumentation

NCWRP Expansion Rendering



7. NCPWF Construction Package 1: NCPWF and NCPW Pump Station

- Associated Pure Water Project: NCWPF
- Summary: A new Pure Water Facility will be built on Eastgate Mall across the street from the existing NCWRP to clean the recycled water further and produce 30 mgd of a safe, high-quality drinking water source. A new pump station will be constructed adjacent to the NCPWF on Eastgate Mall Road to pump an annual average of 30 mgd to Miramar Reservoir. The package includes widening a portion of Eastgate Mall Road.
- Summary of Major Construction Package Components
 - New 34-mgd Pure Water Facility, including:
 - Ozone Generation and Contactor
 - Biologically Active Carbon (BAC) Filters
 - Membrane Filtration (MF) System
 - Reverse Osmosis (RO)
 - Ultraviolet Disinfection and Advanced Oxidation (UV/AOP)

- Chemical Feed Systems
- Operations Building
- 30-mgd Pump Station (3 + 1 vertical turbine pumps)
- Electrical and instrumentation

NCPWF and NCPW Pump Station Rendering



8. NCPW PS/PL Construction Package 1: NCPW Pipeline and Dechlorination Facility

- Associated Pure Water Project: NCPW PS/PL
- Summary: This package includes infrastructure to convey 30 mgd of purified water produced by the NCPWF to Miramar Reservoir. The pipeline will start on Eastgate Mall, follow Miramar Road, continue through Scripps Ranch and end at Miramar Reservoir. The package includes the replacement of 6.4 miles of asbestos cement watermains with PVC.
- Summary of Major Construction Package Components
 - 8 Miles of 48-inch welded steel pipe transmission main (purified water pipeline)
 - Dechlorination Facility
 - Standpipe
 - 6.4 miles of watermain replacement of 6, 12 and 16-inch asbestos cement (AC) pipe with 16-inch polyvinylchloride (PVC) pipe.

Pure Water Pipeline Alignment



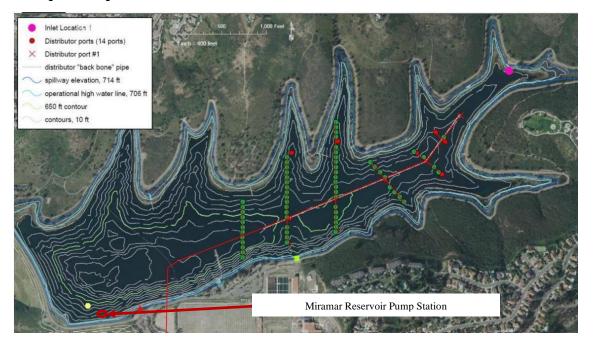
Dechlorination Facility Rendering



9. NCPW PS/PL Construction Package 2: Subaqueous Pipeline and Miramar Reservoir Pump Station Improvements

- Associated Pure Water Project: NCPW PS/PL
- Summary: This package includes 0.9 miles of pipeline with duckbill outlets placed at the bottom of Miramar Reservoir together with the rehabilitation of a 100 mgd pump station that delivers raw water from Miramar Reservoir to the Miramar Water Treatment Plant.
- Summary of Major Construction Package Components
 - 54-inch to 8-inch Subaqueous pipe
 - 94 Dual duckbill valve outlet ports
 - Miramar Reservoir Pump Station Improvements
 - Electrical and instrumentation

Subaqueous Pipeline Site Plan



10. MBC Construction Package 1: Metropolitan Biosolids Center Improvements

- Associated Pure Water Project: MBC Improvements
- Summary: This package will consist of improvements to the existing City biosolids center.
- Summary of Major Construction Package Components
 - Thickening centrifuges, sludge feed and polymer pumps, transfer pumps and supply pipeline
 - Digester mixing pump replacements, nozzles, overflow lines, biogas compressors, flare and biogas pipeline
 - Dewatering sludge feed pumps and polymer pumps
 - Centrate Pump Station pump and VFD replacements
 - Electrical and instrumentation

Metropolitan Biosolids Center Improvements Site Plan



APPENDIX B

MEMORANDUM OF UNDERSTANDING #1

PROJECT LABOR AGREEMENT SECTION 3.1

The City and the Parties agree that Project Work includes all onsite physical craft work that is part of startup and commissioning, including, but not limited to, system flushes and testing, loop checks, rework and modifications, and functional and operational testing up to and including the final running test. It is understood that the City's personnel and/or its representatives, together with the manufacturer's and/or vendor's representatives, and/or plant operating personnel may supervise and direct the startup, commissioning, rework, and modification activity, and that the onsite physical craft work is typically performed as part of a joint effort with these representatives and personnel. A manufacturer or its representatives may perform industry standard startup and commissioning work to satisfy its guarantee or warranty on a piece of equipment, and such work will be exempt from the Project Labor Agreement to the extent the work is excluded by Section 3.2(e) and/or Section 3.2(f).

MEMORANDUM OF UNDERSTANDING #2

NO DISCRIMINATION AND HARASSMENT

The City hereby provides notice that the City and its Contractors must not unlawfully discriminate, harass, or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, sexual orientation, physical disability (including HIV and AIDS), mental disability, medical condition (cancer), age (over 40), marital status, denial of family care leave, or genetic information, gender, gender identity, gender expression, or military and veteran status. The City and Contractors will ensure that the evaluation and treatment of their employees and applicants for employment are free from such discrimination and harassment. The City and Contractors must comply with the provisions of the Fair Employment and Housing Act and the applicable regulations promulgated thereunder. (Govt. Code §12990, subs. (a)-(f) et seq.; Cal. Code Regs., tit. 2 §7285, et seq.) These terms will be incorporated into every contract and subcontract for the Covered Project.

Dated: 9-18-20		SAN DIEGO BUILDING AND CONSTRUCTION TRADES COUNCIL
		m
	By:	

Tom Lemmon, Business Manager

FIRST AMENDMENT

CITY OF SAN DIEGO PROJECT LABOR AGREEMENT FOR CONSTRUCTION OF PURE WATER PROGRAM PHASE I PROJECTS

This First Amendment is entered into pursuant to Article 20, Section 20.1, of the above-referenced Project Labor Agreement ("PLA"), effective June 16, 2020. The San Diego Building and Construction Trades Council (hereinafter "Council"), the signatory Craft Unions (hereinafter, together with the Council, collectively, the "Union" or "Unions"), and the Contractors performing work on Covered Projects agree to amend Appendix A – San Diego Pure Water Program Phase I Covered Projects to include the following additional Covered Projects:

11. Central Area Small-Scale Facility

- Associated Pure Water Project: Pure Water Phase II
- Summary: In preparation for the design of full-scale facilities, a Central Area Small-Scale Facility (CASSF) consisting of water reclamation processes (secondary/tertiary treatment consisting of biological nutrient removal (BNR) and membrane bioreactors (MBR)) and advanced water purification (AWP) process trains (ozone/BAC, membrane filtration, reverse osmosis, and UV/AOP) will be constructed and used to determine parameters for full scale design and demonstrate compliance with recycled water objectives. The CASSF will be located at Point Loma Wastewater Treatment Plant (PLWTP) with provision for drawing either primary effluent or degritted sewage or a mix of both in any proportion to the CASSF.
- Summary of Major Construction Package Components
 - o Influent wastewater pipeline
 - Secondary treatment consisting of biological nutrient removal and membrane bioreactor
 - o Ozone treatment
 - Biological activated carbon
 - o Membrane filtration
 - o Reverse osmosis
 - Ultraviolet/advanced oxidation process
 - Instrumentation and controls

12. Pure Water Genesee Avenue Median Improvements

- Associated Pure Water Project: Morena PS/PL Project
- Summary: Medians will be constructed along Genesee Ave between Nobel Dr and SR-52 and along Governor Dr between Genesee Ave and Radcliffe Dr.

Page 1 of 3

- Summary of Major Construction Package Components
 - o Removal of existing AC
 - o Install medians with a sinuous pattern of cobble, flat concrete, and shrubs/groundcover
 - o Temporary irrigation

13. Penasquitos Pump Station Oxygenation System

- · Associated Pure Water Project: NCPWF
- Summary: Septic water from the Penasquitos Pump Station has been linked to the poor
 performance of the processes at the NCWRP. The addition of high-purity oxygen can
 effectively prevent septicity by increasing the dissolved oxygen concentration in the
 wastewater and maintaining an aerobic environment during conveyance of wastewater
 from the PQPS to the NCWRP
- Summary of Major Construction Package Components:
 - High purity oxygenation system
 - o Communication system

The Unions and Contractors agree this First Amendment to the PLA represents the entire understanding of the parties and affects only Appendix A. All other terms and conditions of the PLA remain in full force and effect.

Dated:	SAN DIEGO BUILDING AND CONSTRUCTION TRADES COUNCIL			
	By: Carol Kim Carol Kim. Business Manager			

SIGNATORY UNIONS

	DocuSigned by:		DocuSigned by:
By:	Michael Patterson	Ву:	Luis Miramontes
	Allied Workers Local 5		Boilesmakers Local 92
	DocuSigned by:		DocuSigned by:
By:	Cluris Brisson	By:	Jack Alvarado
	Bricktown & Willied Crafts Local 4		Comenti Masons Local 500 / Area 744
Ву:	200_	Ву:	Tony Garzaniga
	Electificat Workers Local 569 Docusigned by:		Elevator Constructors Local 18
D (_	
By:	Ernesto Toscano	By:	Beau Coleman
/	Glaziers Floor Coverings & Painters Local 1399		Trons Workers Local 229

Page 2 of 3

	Locusigned by:		Docusigned by:
Ву:	Val Macedo	Ву:	Tom Castleman
	Laborers/Lucul 89		Plasters Edear 200
	DocuSigned by:		
By:	Vince Uribe	By:	
	Plasten Tonders Local 1414		Operating Engineers Local 12
By:		By:	
	Operating Engineers Local 12		Operating Engineers Local 12
By:	Steve Beringer	D.,,	
Dy.	Ptumbers & Pipefitters Local 230	By:	Todd Barry
	DocuSigned by:		Roadsprinkler Fitters Local 669
By:	Paul Colmenero	Ву:	Dave Gauthier
- 1	Renturse Waterproofers Local 45	-5.	Sheet Manals Workers Local 206
	DocuSigned by:		onder and one of the original or
Ву:	IVI IRA	By:	
	Lab69493 C26281 1184		Sheet Metal Workers Local 206
(— DocuSigned by:		DocuSigned by:
By:	Ed learn	By:	Inco Februada
(Laborerschoual 345		Tomsters Local 166
1	DocuSigned by:		DocuSigned by
By:	Rivarda Dovo 2	By:	Ernesto Toscano
(U& 1,00215345		Traiteshowsee Sign Craft Local 831
Ву:		By:	SERGIO RASCON
	Southwest Regional Council of Carpenters		Labbrets Escal 300

By:		By:	
	Laborers Local 89		Plasters Local 200
Ву:		By:	
	Plaster Tenders Local 1414	- J	Operating Engineers Local 12
Ву:		By:	
	Operating Engineers Local 12		Operating Engineers Local 12
Ву:		By:	
	Plumbers & Pipefitters Local 230	annial annual control of the control	Road Sprinkler Fitters Local 669
Ву:		By:	
	Roofers & Waterproofers Local 45	anacorna.	Sheet Metal Workers Local 206
Ву:		By:	
	Laborers Local 1184		Sheet Metal Workers Local 206
Ву:		By:	
	Laborers Local 345	Personal Control	Teamsters Local 166
Ву:		By:	
	UA Local 345		Tradeshow & Sign Craft Local 831
Ву:		Ву:	
1	Southwest Regional Council of Carpenters		Laborers Local 300
Ву:	Jon Preciado		
(Southern Galifornia District Council of		
	Laborers		

By:	Laborers Local 89	By:	
	Laborers Local 89		Plasters Local 200
By:		By:	
	Plaster Tenders Local 1414		Operating Engineers Local 12
By:	Coxald Siforski	By:	July Home
	Operating Engineers Local 12		Operating Engineers Local 12
By:		By:	
	Plumbers & Pipefitters Local 230		Road Sprinkler Fitters Local 669
Ву:	Roofers & Waterproofers Local 45	By:	
	Roofers & Waterproofers Local 45		Sheet Metal Workers Local 206
By:	Laborers Local 1184	By:	
	Laborers Local 1184	-	Sheet Metal Workers Local 206
By:		By:	
	Laborers Local 345	,	Teamsters Local 166
By:		By:	
•	UA Local 345	. Dy.	Tradeshow & Sign Craft Local 831
By:		By:	
	Southwest Regional Council of Carpenters	. ,	Laborers Local 300

ATTACHMENT G

CONTRACT AGREEMENT

ATTACHMENT G

CONTRACT AGREEMENT

CONSTRUCTION CONTRACT

This contract is made and entered into between THE CITY OF SAN DIEGO, a municipal corporation, herein called "City", and Blue Pacific Engineering & Construction, herein called "Contractor" for construction of PQPS Oxygenation System; No. K-23-2080-Bid DBB-3; in the total of **FOUR MILLION** THREE **HUNDRED** amount NINETY ONE **THOUSAND** SEVEN HUNDRED SIXTY SEVEN **DOLLARS** (\$4,391,767), which is comprised of the Base Bid, consisting of an amount not to exceed FOUR MILLION THREE HUNDRED NINETY ONE THOUSAND SEVEN HUNDRED SIXTY SEVEN DOLLARS (\$4,391,767).

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

- 1. The following are incorporated into this contract as though fully set forth herein:
 - (a) The attached Faithful Performance and Payment Bonds.
 - (b) The attached Proposal included in the Bid documents by the Contractor.
 - (c) Reference Standards listed in the Instruction to Bidders and the Supplementary Special Provisions (SSP).
 - (d) That certain documents entitled **PQPS Oxygenation System**, on file in the office of the Purchasing & Contracting Department as Document No. **B-21001**, 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 **PQPS Oxygenation System**, Bid Number **K-23-2080-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 and is approved by the City Attorney in accordance with San Diego Charter Section 40.

CONTRACT AGREEMENT (continued)

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

THE CITY OF SAN DIEGO	APPROVED AS TO FORM			
By Styrkes Caman	Mara W. Elliott, City Attorney By Elegibeth Cuson			
Print Name: Stephen Samara Principal Contract Specialist Purchasing & Contracting Dept.	Print Name: <u>Slizabeth Cason</u> Deputy City Attorney			
Date: 12/20/2022	Date: 12/20/2022			
CONTRACTOR By MAN				
Print Name: Shahram Elihu				
Title: President				
Date: 10/27/2022				
City of San Diego License No.: B2010019 6				
State Contractor's License No.: 824455				
DEPARTMENT OF INDUSTRIAL RELATIONS (DIR) F	REGISTRATION NUMBER: 100003217			

CERTIFICATIONS AND FORMS

The Bidder, by submitting its electronic bid, agrees to and certifies under penalty of perjury under the laws of the State of California, that the certifications, forms and affidavits submitted as part of this bid are true and correct.

BIDDER'S GENERAL INFORMATION

To the City of San Diego:

Pursuant to "Notice Inviting Bids", specifications, and requirements on file with the City Clerk, and subject to all provisions of the Charter and Ordinances of the City of San Diego and applicable laws and regulations of the United States and the State of California, the undersigned hereby proposes to furnish to the City of San Diego, complete at the prices stated herein, the items or services hereinafter mentioned. The undersigned further warrants that this bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

The undersigned bidder(s) further warrants that bidder(s) has thoroughly examined and understands the entire Contract Documents (plans and specifications) and the Bidding Documents therefore, and that by submitting said Bidding Documents as its bid proposal, bidder(s) acknowledges and is bound by the entire Contract Documents, including any addenda issued thereto, as such Contract Documents incorporated by reference in the Bidding Documents.

NON-COLLUSION AFFIDAVIT TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID UNDER 23 UNITED STATES CODE 112 AND PUBLIC CONTRACT CODE 7106

State of California

County of San Diego

The bidder, being first duly sworn, deposes and says that he or she is authorized by the party making the foregoing bid that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

COVID-19 VACCINATION ORDINANCE

CERTIFICATION OF COMPLIANCE

I hereby certify that I am familiar with the requirements of San Diego Ordinance No. O-21398 implementing the City's Mandatory COVID-19 Vaccination Policy.

TERMS OF COMPLIANCE

The City's Mandatory COVID-19 Vaccination Policy, outlined in San Diego Ordinance O-21398 (Nov. 29, 2021), requires ALL City contractors, who interact in close contact with City employees while providing contracted services indoors in City facilities or while performing bargaining unit work while indoors, to be fully vaccinated against COVID-19, effective January 3, 2022, as a condition for provision or continued provision of contracted services.

- 1. "City contractor" means a person who has contracted with the City of San Diego to provide public works, goods, services, franchise, or consultant services for or on behalf of the City, and includes a subcontractor, vendor, franchisee, consultant, or any of their respective officers, directors, shareholders, partners, managers, employees, or other individuals associated with the contractor, subcontractor, consultant, or vendor. "Person" means any natural person, firm, joint venture, joint stock company, partnership, association, club, company, corporation business trust or organization.
- 2. "Fully vaccinated" means a person has received, at least 14 days prior, either the second dose in a two-dose COVID-19 vaccine series or a single-dose COVID-19 vaccine, or otherwise meets the criteria for full vaccination against COVID-19 as stated in applicable public health guidance, orders, or law. Acceptable COVID-19 vaccines must be approved by the U.S. Food and Drug Administration (FDA) or authorized for emergency use by the FDA or the World Health Organization.
- 3. "Close contact" means a City contractor is **within 6 feet** of a City employee for a **cumulative total of 15 minutes or more over a 24-hour period** (for example, three individual 5-minute exposures for a total of 15 minutes).
- 4. City contractors who interact in close contact with City employees must fully comply with the City's Mandatory COVID-19 Vaccination Policy, which may include a reporting program that tracks employee vaccination status.
- 5. City contractors with employees or subcontractors who interact in close contact with City employees must certify that those members of their workforce, and subcontractors regardless of tier, who work indoors at a City facility, are fully vaccinated and that the City contractor has a program to track employee compliance.
- 6. City contractors that have an Occupational Safety and Health Administration compliant testing program for members of their workforce, as a reasonable accommodation, may be considered for compliance.

Non-compliance with the City's Mandatory COVID-19 Vaccination Policy may result in termination of a contract for cause, pursuant to the City's General Terms and Provisions, Reference Standards, and the San Diego Municipal Code.

DRUG-FREE WORKPLACE

I hereby certify that I am familiar with the requirements of San Diego City Council Policy No. 100-17 regarding Drug-Free Workplace as outlined in the WHITEBOOK, Section 5-1.3, "Drug-Free Workplace", of the project specifications, and that;

This company has in place a drug-free workplace program that complies with said policy. I further certify that each subcontract agreement for this project contains language which indicates the subcontractor's agreement to abide by the provisions of subdivisions a) through c) of the policy as outlined.

AMERICANS WITH DISABILITIES ACT (ADA) COMPLIANCE CERTIFICATION

I hereby certify that I am familiar with the requirements of San Diego City Council Policy No. 100-4 regarding the Americans With Disabilities Act (ADA) outlined in the WHITEBOOK, Section 5-1.2, "California Building Code, California Code of Regulations Title 24 and Americans with Disabilities Act". of the project specifications, and that:

This company has in place workplace program that complies with said policy. I further certify that each subcontract agreement for this project contains language which indicates the subcontractor's agreement to abide by the provisions of the policy as outlined.

CONTRACTOR STANDARDS - PLEDGE OF COMPLIANCE

I declare under penalty of perjury that I am authorized to make this certification on behalf of the company submitting this bid/proposal, that as Contractor, I am familiar with the requirements of City of San Diego Municipal Code § 22.3004 regarding Contractor Standards as outlined in the WHITEBOOK, Section 5-1.4, ("Contractor Standards and Pledge of Compliance"), of the project specifications, and that Contractor has complied with those requirements.

I further certify that each of the Contractor's subcontractors has completed a Pledge of Compliance attesting under penalty of perjury of having complied with City of San Diego Municipal Code § 22.3004.

EQUAL BENEFITS ORDINANCE CERTIFICATION

I declare under penalty of perjury that I am familiar with the requirements of and in compliance with the City of San Diego Municipal Code § 22.4300 regarding Equal Benefits Ordinance.

EQUAL PAY ORDINANCE CERTIFICATION

Contractor shall comply with the Equal Pay Ordinance (EPO) codified in the San Diego Municipal Code (SDMC) at section 22.4801 through 22.4809, unless compliance is not required based on an exception listed in SDMC section 22.4804.

Contractor shall require all of its subcontractors to certify compliance with the EPO in their written subcontracts.

Contractor must post a notice informing its employees of their rights under the EPO in the workplace or job site.

By signing this Contract with the City of San Diego, Contractor acknowledges the EPO requirements and pledges ongoing compliance with the requirements of SDMC Division 48, section 22.4801 et seq., throughout the duration of this Contract.

PRODUCT ENDORSEMENT

I declare under penalty of perjury that I acknowledge and agree to comply with the provisions of City of San Diego Administrative Regulation 95.65, concerning product endorsement. Any advertisement identifying or referring to the City as the user of a product or service requires the prior written approval of the City.

AFFIDAVIT OF DISPOSAL

(To be submitted upon completion of Construction pursuant to the contracts Certificate of Completion)

WHEREAS, on the _	DAY OF		, 2	the undersigned
entered into and ex	recuted a contract with the City	y of San Diego, a munici	pal corporation	ı, for:
	PQPS O	xygenation System		_
		(Project Title)		
WHEREAS , the spec surplus materials r	ribed in said contract and ider cification of said contract requ esulting from this project have completed and all surplus mate	ires the Contractor to a ve been disposed of in	ffirm that "all b	orush, trash, debris, and
terms of said contra	in consideration of the final pact, the undersigned Contractoneen disposed of at the follow	or, does hereby affirm th	_	
and that they have	been disposed of according to	all applicable laws and	regulations.	
Dated this	DAY OF		.	
Ву:				
Cor	ntractor			
ATTEST:				
State of	County of			
	DAY OF, 2 luly commissioned and sworn,		gned, a Notary	Public in and for said
known to me to be whose name is sub	thescribed thereto, and acknowle	Contractor i dged to me that said Co	named in the intractor execu	foregoing Release, and ted the said Release.
Notary Public in and	d for said County and State			

LIST OF SUBCONTRACTORS

*** PROVIDED FOR ILLUSTRATIVE PURPOSES ONLY *** TO BE SUBMITTED IN ELECTRONIC FORMAT ONLY*** SEE INSTRUCTIONS TO BIDDERS, FOR FURTHER INFORMATION

In accordance with the requirements of the "Subletting and Subcontracting Fair Practices Act", Section 4100, of the California Public Contract Code (PCC), the Bidder is to list below the name, address and license number of each Subcontractor who will perform work, labor, render services or specially fabricate and install a portion [type] of the work or improvement, in an amount of or in excess of 0.5% of the Contractor's total Bid. Failure to comply with this requirement may result in the Bid being rejected as non-responsive. The Contractor is to list only one Subcontractor for each portion of the Work. The Bidder's attention is directed to the Special Provisions – General; Paragraph 2-3 Subcontracts, which stipulates the percentage of the Work to be performed with the Bidder's own forces. The Bidder is to also list all SLBE, ELBE, DBE, DVBE, MBE, WBE, OBE, SDB, WoSB, HUBZone, and SDVOSB Subcontractors for which the Bidders are seeking recognition towards achieving any mandatory, voluntary, or both subcontracting participation percentages.

NAME, ADDRESS AND TELEPHONE NUMBER OF SUBCONTRACTOR	CONSTRUCTOR OR DESIGNER	SUBCONTRACTOR LICENSE NUMBER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB®	WHERE CERTIFIED@	CHECK IF JOINT VENTURE PARTNERSHIP
Name:							
Name:							

1	As appropriate, Bidder shall identify Subcontractor as one of	the following and sh	all include a valid proof of certification (except for OBE, SLBE and	d 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 certif	ied by:		
	City of San Diego	CITY	State of California Department of Transportation	CALTRANS
	California Public Utilities Commission	CPUC		
	State of California's Department of General Services	CADoGS	City of Los Angeles	LA
	State of California	CA	U.S. Small Business Administration	SBA

The Bidder will not receive any subcontracting participation percentages if the Bidder fails to submit the required proof of certification.

NAMED EQUIPMENT/MATERIAL SUPPLIER LIST

*** PROVIDED FOR ILLUSTRATIVE PURPOSES ONLY *** TO BE SUBMITTED IN ELECTRONIC FORMAT ONLY *** SEE INSTRUCTIONS TO BIDDERS FOR FURTHER INFORMATION

NAME, ADDRESS AND TELEPHONE NUMBER OF VENDOR/SUPPLIER	MATERIALS OR SUPPLIES	DOLLAR VALUE OF MATERIAL OR SUPPLIES	SUPPLIER (Yes/No)	MANUFACTURER (Yes/No)	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB®	WHERE CERTIFIED②
Name:						
Name:						
As appropriate, Bidder shall identify Vendo Certified Minority Business Enterprise Certified Disadvantaged Business Enterprise	M prise DE	BE Certif BE Certif	ied Woman Bu ied Disabled Ve	of certification (except siness Enterprise eteran Business Enterp	prise	WBE DVBE

U	As appropriate, bidder shall identify veridor/supplier as one	of the following and	Shall include a valid proof of certification (except for OBE, 3LBE a	aliu ELDE).
	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 cer	tified by:		
	City of San Diego	CITY	State of California Department of Transportation	CALTRANS
	California Public Utilities Commission	CPUC		
	State of California's Department of General Services	CADoGS	City of Los Angeles	LA
	State of California	CA	U.S. Small Business Administration	SBA

The Bidder will not receive any subcontracting participation percentages if the Bidder fails to submit the required proof of certification.

ELECTRONICALLY SUBMITTED FORMS

FAILURE TO FULLY <u>COMPLETE</u> AND SUBMIT ANY OF THE FOLLOWING FORMS WILL DEEM YOUR BID NON-RESPONSIVE.

PLANETBIDS WILL NOT ALLOW FOR BID SUBMISSIONS WITHOUT THE ATTACHMENT OF THESE FORMS

The following forms are to be completed by the bidder and submitted (uploaded) electronically with the bid in PlanetBids.

- A. BID BOND See Instructions to Bidders, Bidders Guarantee of Good Faith (Bid Security) for further instructions
- **B. CONTRACTOR'S CERTIFICATION OF PENDING ACTIONS**
- C. MANDATORY DISCLOSURE OF BUSINESS INTERESTS FORM
- D. DEBARMENT AND SUSPENSION CERTIFICATION FOR PRIME CONTRACTOR
- E. DEBARMENT AND SUSPENSION CERTIFICATION FOR SUBCONTRACTORS, SUPPLIERS AND MANUFACTURERS

BID BOND

See Instructions to Bidders, Bidder Guarantee of Good Faith (Bid Security)

KNOW ALL MEN BY THESE PRESENTS,						
That BLUE PACIFIC ENGINEERING CONSTRUCTIOn and NATIONWIDE MUTUAL INSURANCE COMPANY and firmly bound unto The City of San Diego of 10% OF THE TOTAL BID AMOUNT for the payment bind ourselves, our heirs, executors, administrators, so firmly by these presents.	as Surety, are held hereinafter called "OWNER," in the sum tof which sum, well and truly to be made, we					
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 PQPS OXYGENATION SYSTEM; BID NO.: K-23-2080-DBB-3						
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, this24TH	_day of AUGUST, 20_22					
BLUE PACIFIC ENGINEERING CONSTRUCTION, INC. (SEAL) (Principal)	NATIONWIDE MUTUAL INSURANCE COMPANY (SEAL) (Surety)					
SHAHRAM ELIHU, PRESIDENT (SEAL AND NOTABIAL ACKNOWLEDGEMENT OF SUBET)	By: (Signature) MARK D. IATAROLA, ATTORNEY-IN-FACT					

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

CIVIL CODE § 1189

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document. State of California SAN DIEGO County of before me, SANDRA FIGUEROA, NOTARY PUBLIC 8/24/2022 Here Insert Name and Title of the Officer MARK D. IATAROLA personally appeared _____ Name(s) of Signer(s) who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument. I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing SANDRA FIGUEROA paragraph is true and correct. COMM. # 2334108 SAN DIEGO COUNTY WITNESS my hand and official seal. OTARY PUBLIC-CALIFORNIAZ MY COMMISSION EXPIRES 7 SEPTEMBER 22, 2024 Place Notary Seal and/or Stamp Above Signature of Notary Public - OPTIONAL -Completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document. **Description of Attached Document** Title or Type of Document:

☐ Guardian of Conservator ☐ Trustee

____Number of Pages: __

□ Attorney in Fact

□ Guardian of Conservator

Signer's Name: __

□ Individual

□ Other: _

☐ Corporate Officer — Title(s): __

Signer is Representing: _

☐ Partner — ☐ Limited ☐ General

Signer is Representing: ___

Document Date: __

□ Individual

□ Trustee

□ Other:

Signer(s) Other Than Named Above: _
Capacity(ies) Claimed by Signer(s)
Signer's Name: MARK D. IATAROLA

☐ Corporate Officer – Title(s): _____

☐ Partner — ☐ Limited ☐ General

凶 Attorney in Fact

Power of Attorney

KNOW ALL MEN BY THESE PRESENTS THAT:

Nationwide Mutual Insurance Company, an Ohio corporation

hereinafter referred to severally as the "Company" and collectively as "the Companies" does hereby make, constitute and appoint:

HELEN MALONEY; JOHN G MALONEY; MARK D IATAROLA; SANDRA FIGUEROA; TRACY LYNN RODRIGUEZ;

each in their individual capacity, its true and lawful attorney-in-fact, with full power and authority to sign, seal, and execute on its behalf any and all bonds and undertakings, and other obligatory instruments of similar nature, in penalties not exceeding the sum of

UNLIMITED

and to bind the Company thereby, as fully and to the same extent as if such instruments were signed by the duly authorized officers of the Company; and all acts of said Attorney pursuant to the authority given are hereby ratified and confirmed.

This power of attorney is made and executed pursuant to and by authority of the following resolution duly adopted by the board of directors of the Company:

"RESOLVED, that the president, or any vice president be, and each hereby is, authorized and empowered to appoint attorneys-in-fact of the Company, and to authorize them to execute and deliver on behalf of the Company any and all bonds, forms, applications, memorandums, undertakings, recognizances, transfers, contracts of indemnity, policies, contracts guaranteeing the fidelity of persons holding positions of public or private trust, and other writings obligatory in nature that the business of the Company may require; and to modify or revoke, with or without cause, any such appointment or authority; provided, however, that the authority granted hereby shall in no way limit the authority of other duly authorized agents to sign and countersign any of said documents on behalf of the Company."

"RESOLVED FURTHER, that such attorneys-in-fact shall have full power and authority to execute and deliver any and all such documents and to bind the Company subject to the terms and limitations of the power of attorney issued to them, and to affix the seal of the Company thereto; provided, however, that said seal shall not be necessary for the validity of any such documents."

This power of attorney is signed and sealed under and by the following bylaws duly adopted by the board of directors of the Company.

Execution of Instruments. Any vice president, any assistant secretary or any assistant treasurer shall have the power and authority to sign or attest all approved documents, instruments, contracts, or other papers in connection with the operation of the business of the company in addition to the chairman of the board, the chief executive officer, president, treasurer or secretary; provided, however, the signature of any of them may be printed, engraved, or stamped on any approved document, contract, instrument, or other papers of the Company.

IN WITNESS WHEREOF, the Company has caused this instrument to be sealed and duly attested by the signature of its officer the 20th day of August, 2021.

Antonio C. Albanese, Vice President of Nationwide Mutual Insurance Company

SEAL

STATE OF NEW YORK COUNTY OF NEW YORK: ss

On this 20th day of August, 2021, before me came the above-named officer for the Company aforesaid, to me personally known to be the officer described in and who executed the preceding instrument, and he acknowledged the execution of the same, and being by me duly sworn, deposes and says, that he is the officer of the Company aforesaid, that the seal affixed hereto is the corporate seal of said Company, and the said corporate seal and his signature were duly affixed and subscribed to said instrument by the authority and direction of said Company.

ACKNOWLEDGMENT

Stephanie Rubino McArthur Notary Public, State of New York No. 02MC6270117 Qualified in New York County Commission Expires October 19, 2024 Scylanie Brinero Matte

Notary Public

My Commission Expires

October 19, 2024

CERTIFICATE

I, Laura B. Guy, Assistant Secretary of the Company, do hereby certify that the foregoing is a full, true and correct copy of the original power of attorney issued by the Company; that the resolution included therein is a true and correct transcript from the minutes of the meetings of the boards of directors and the same has not been revoked or amended in any manner; that said Antonio C. Albanese was on the date of the execution of the foregoing power of attorney the duly elected officer of the Company, and the corporate seal and his signature as officer were duly affixed and subscribed to the said instrument by the authority of said board of directors; and the foregoing power of attorney is still in full force and effect.

IN WITNESS WHEREOF, I have hereunto subscribed my name as Assistant Secretary, and affixed the corporate seal of said Company this 24TH day of AUGUST 2022

Assistant Secretary

BDJ 1(08-21)00

CONTRACTOR'S CERTIFICATION OF PENDING ACTIONS

As part of its bid or proposal (Non-Price Proposal in the case of Design-Build contracts), the Bidder shall provide to the City a list of all instances within the past 10 years where a complaint was filed or pending against the Bidder in a legal or administrative proceeding alleging that Bidder discriminated against its employees, subcontractors, vendors or suppliers, and a description of the status or resolution of that complaint, including any remedial action taken.

CHECK ONE BOX ONLY. Х 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 LITIGATION RESOLUTION/REMEDIAL LOCATION **DESCRIPTION OF CLAIM S**TATUS CLAIM (Y/N) **ACTION TAKEN** Blue Pacific Engineering Construction, Inc. Contractor Name: Shahram Elihu President Certified By Title Name 09/02/2022 Date

USE ADDITIONAL FORMS AS NECESSARY

Signature

Mandatory Disclosure of Business Interests Form

BIDDER/PROPOSER INFORMATION

Legal Name			DBA
Blue Pacific Engineering	g Construction, Inc.	Blue Pacific Engine	ering & Construction
Street Address	City	State	Zip
3750 Convoy Street, Suite 306, San Diego		CA	92111
Contact Person, Title		Phone	Fax
Shahram Elihu, Preside	ent	858-956-1456	

Provide the name, identity, and precise nature of the interest* of all persons who are directly or indirectly involved** in this proposed transaction (SDMC § 21.0103).

- * The precise nature of the interest includes:
- the percentage ownership interest in a party to the transaction,
- the percentage ownership interest in any firm, corporation, or partnership that will receive funds from the
- transaction, the value of any financial interest in the transaction,
- any contingent interest in the transaction and the value of such interest should the contingency be satisfied, and any
- philanthropic, scientific, artistic, or property interest in the transaction.
- ** Directly or indirectly involved means pursuing the transaction by:
- communicating or negotiating with City officers or employees,
- submitting or preparing applications, bids, proposals or other documents for purposes of contracting with the City,
- or directing or supervising the actions of persons engaged in the above activity.

Name	Title/Position
Shahram Elihu	President
City and State of Residence	Employer (if different than Bidder/Proposer)
San Diego CA	
Interest in the transaction	
100% Ownership of Blue	Pacific Engineering Construction, Inc.

. Name	Title/Position				
City and State of Residence	Employer (if different than Bidder/Proposer)				
nterest in the transaction					

* Use Additional Pages if Necessary *

Under penalty of perjury under the laws of the State of California, I certify that I am responsible for the completeness and accuracy of the responses contained herein, and that all information provided is true, full and complete to the best of my knowledge and belief. I agree to provide written notice to the Mayor or Designee within five (5) business days if, at any time, I learn that any portion of this Mandatory Disclosure of Business Interests Form requires an updated response. Failure to timely provide the Mayor or Designee with written notice is grounds for Contract termination.

Shahram Elihu, President	Let full	09/02/2022
Print Name, Title	Signature	Date

Failure to sign and submit this form with the bid/proposal shall make the bid/proposal non-responsive. In the case of an informal solicitation, the contract will not be awarded unless a signed and completed Mandatory Disclosure of Business Interests Form is submitted.

DEBARMENT AND SUSPENSION CERTIFICATION

PRIME CONTRACTOR

FAILURE TO COMPLETE AND SUBMIT AT TIME OF BID SHALL RENDER BID NON-RESPONSIVE

EFFECT OF DEBARMENT OR SUSPENSION

To promote integrity in the City's contracting processes and to protect the public interest, the City shall only enter into contracts with responsible- bidders and contractors. In accordance with San Diego Municipal Code §22.0814 (a): *Bidders* and *contractors* who have been *debarred* or *suspended* are excluded from submitting bids, submitting responses to requests for proposal or qualifications, receiving *contract* awards, executing *contracts*, participating as a *subcontractor*, employee, agent or representative of another *person* contracting with the City.

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 Names of the Principal Individual owner(s).

The names of all persons interested in the foregoing proposal as Principals are as follows:

NAME		TITLE
Shahram Elihu	1	President

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.

The Bidder, under penalty of perjury, certifies that, except as noted below, he/she or any person associated therewith in the capacity of owner, partner, director, officer, manager:

- Is not currently under suspension, debarment, voluntary exclusion, or determination of ineligibility by any Federal,
 State or local agency;
- has not been suspended, debarred, voluntarily excluded or determined ineligible by any Federal, State or local agency within the past 3 years;
- does not have a proposed debarment pending; and
- has not been indicted, convicted, or had a civil judgment rendered against it by a court of competent jurisdiction in any matter involving fraud or official misconduct within the past 3 years.

Exceptions will be considered in determining bidder responsibility. For any exception noted above, indicate below to whom it applies, initiating agency, and dates of action.

Contractor Name: Blue Pacific Engineering Construction, Inc.

Certified By Shahram Elihu Title President

Name

Date 09/02/2022

Signature

NOTE: Providing false information may result in criminal prosecution or administrative sanctions.

DEBARMENT AND SUSPENSION CERTIFICATION

SUBCONTRACTORS, SUPPLIERS AND MANUFACTURERS *TO BE COMPLETED BY BIDDER*

FAILURE TO COMPLETE AND SUBMIT AT TIME OF BID SHALL RENDER BID NON-RESPONSIVE

Names of the Principal individual owner(s)

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 Names of the Principal Individual owner(s) for their subcontractor/supplier/manufacturers.

Please	indicate if principal owner is serving	g in the capa	city of	subcontractor, su	applier, and/or	manufacturer:	
X	SUBCONTRACTOR		SU	PPLIER		MANUFACTURER	
	NAME				TITLI		
0	Constructor						
	F.D. Thomas, Inc						
	Frank Daniel Thor	mas		(8)	RMO CEO P	RES	
X	SUBCONTRACTOR		SU	PPLIER		MANUFACTURER	
	NAME				TITLI		
	Supplier (test	ing)					
	MTGL Inc.					a .	
	Steven Koch			RMO	CEO PRES		
X	SUBCONTRACTOR		SU	PPLIER		MANUFACTURER	
	NAME				TITLI		
	Constructor					4	
	Leed Electric Inc.			RMO CEO PRES			
	SEYED ALI JAMA	LI .			RIVIO CEO P	KES	
X	SUBCONTRACTOR		SU	PPLIER		MANUFACTURER	
	NAME				TITLE		
	Constructor						
	AB Hashmi						
	Amahad Hashmi			RMO CEO PRES			
Contra	actor Name: Blue Pacific Engine	ering Con	struc	tion, Inc.			
Certified By Shahram Elihu				Title	President		
Name					Date	09/02/2022	
		e					

*USE ADDITIONAL FORMS AS NECESSARY**

City of San Diego

CITY CONTACT: Brittany Friedenreich, Senior Contract Specialist, Email: BFriedenreic@sandiego.gov
Phone No. (619) 533-3104

ADDENDUM A





FOR

PQPS OXYGENATION SYSTEM

BID NO.:	K-23-2080-DBB-3
SAP NO. (WBS/IO/CC):	B-21001
CLIENT DEPARTMENT:	2000
COUNCIL DISTRICT:	5
PROJECT TYPE:	ВР

BID DUE DATE:

2:00 PM SEPTEMBER 2, 2022

CITY OF SAN DIEGO'S ELECTRONIC BIDDING SITE, PLANETBIDS

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

ENGINEER OF WORK

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

8/18/2022 Seal:



2) For City Engineer

8/18/2022 Seal:



A. CHANGES TO CONTRACT DOCUMENTS

The following changes to the Contract Documents are hereby made effective as though originally issued with the bid package. Bidders are reminded that all previous requirements to this solicitation remain in full force and effect.

B. BIDDER'S QUESTIONS

- Q1. "The specified plans show in drawing M7, Items #13 'Plug Valves' It is not shown that these are actuated valves for the oxygenated discharge from the OPV prior to introduction into the header of the FM. Can you confirm that the city's intention is to only manually control OPV discharge (oxygenated side stream) into the FM header?"
- A1. The plug valves are meant for manually controlled isolation.
- Q2. Can the contractor use the existing overhead crane for their installations? And if so, what is the capacity of this crane?
- A2. Contractor shall coordinate and provide 48 hours advance notice to City's Construction Manager prior to utilizing the crane. For any reasons should the crane require services or is out of commission, it shall be the contractor's responsibility to seek alternative solution to continue with the work progress without claiming delays to the City. The overhead crane in the motor level is rated for 10 tons.

A. ATTACHMENTS

- To Attachment E, Supplementary Special Provisions, Technicals, Section 40 61 13, PROCESS CONTROL SYSTEM GENERAL PROVISIONS, pages 527 through 540, DELETE in their entirety and SUBSTITUTE with pages 6 through 22 of this Addendum.
- 2. To Attachment E, Supplementary Special Provisions, Technicals, **PURE WATER TASK ORDER 44, PQPS OXYGENATION SYSTEM LIST OF SPECIFICATIONS,** page 69, **DELETE** in its entirety and **SUBSTITUTE** with page 23 of this Addendum.
- 3. To Attachment E, Supplementary Special Provisions, Technicals, **ADD** Section **43 05 11 GENERAL REQUIREMENTS FOR EQUIPMENT** with pages 24 thru 30 of this Addendum.

4. To Attachment E, Supplementary Special Provisions, Technicals, Section 46 51 50, OXYGENATION SYSTEM, PART 1, GENERAL, sub-section 1.06, SUBMITTALS, page 706, DELETE in its entirety and SUBSTITUTE with the following:

1.06 SUBMITTALS

A. Action Submittals:

- 1. Comply with procedures as described in Section 01 33 00 SUBMITTAL PROCEDURES.
- 2. Provide submittals that conform to the requirements of this Section. Sections to be marked up and submitted include:
 - a. This section
 - b. Section 43 05 11 GENERAL REQUIREMENTS FOR EQUIPMENT
 - c. Section 43 05 13 RIGID EQUIPMENT MOUNTS
 - d. Section 43 05 21 COMMON MOTOR REQUIREMENTS FOR EQUIPMENT
- 3. Provide shop drawings which at a minimum include detailed mechanical drawings, arrangements, weights, locations and layout, power and control wiring diagrams, loop diagrams, utility requirements, make and model information on pumps and motors, performance data on pumping equipment and installation manuals.

B. Informational Submittals:

- Comply with procedures as described in Section 01
 33 00 SUBMITTAL PROCEDURES.
- 2. Provide required certificates of compliance, certificates of warranty, and user manuals.

C. Closeout Submittals:

 Comply with procedures as described in Section 01 78 23 OPERATION AND MAINTENANCE DATA. 2. Provide manufacturer's certification of installation, test reports and service records for maintenance performed during installation.

B. PLANS

- To Drawing Sheet Numbers 40933-01-D, 40933-4-D, 40933-9-D, 40933-10-D, 40933-11-D, 40933-17-D through 40933-32-D, and 40933-44-D through 40933-48-D, DELETE in their entirety and REPLACE with Drawing Sheets provided, pages 31 through 56 of this Addendum.
- 2. **ADD** Drawing Sheet Number **40933-52-D**, page 57 of this Addendum.

Rania Amen, Director Engineering & Capital Projects Department

Dated: *August 23, 2022*

San Diego, California

RA/AJ/ks

SECTION 40 61 13

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

PART 1 GENERAL

1.01 SUMMARY

- A. This section specifies general requirements applicable to the specifications for the process control, instrumentation, communication, network, and signal systems. This work will be referenced as the Process and Instrumentation Control System (PICS).
- B. System overview. Detailed requirements are in individual related specification sections.
 - 1. Field Instrumentation:
 - a. New and modified field instruments.
 - 2. Process Control Hardware:
 - a. Expansion of an existing control system.
 - b. Field controllers use programmable logic controllers (PLC).
 - c. New control panels.
 - d. Modification of existing control panels
 - 3. Process Control Software, Programming, and Integration:
 - a. Expansion of an existing control system.
 - b. Integrated hardware and software across controllers and operator interface systems from separate manufacturers.
 - c. All programming and integration by supplier.
 - d. Coordinated programming and testing responsibilities between supplier and Owner.
 - e. Integration with packaged system controls in other sections.
 - f. Integration with existing plant network and communication system.
 - 4. Communications and Networking
 - a. Interface to existing Owner networks.
 - b. Hardwired fiber-optic and copper communications systems.
- C. Related sections: The requirements of this section are applicable to work specified in Section 40 61 21 PROCESS CONTROL SYSTEM TESTING.

1.02 REFERENCES

- A. Abbreviations:
 - 1. dBm: decibel-milliwatts
 - 2. DCS: distributed control system
 - 3. DCU: distributed control unit, or digital control unit.

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

- 4. HIM: human interface module
- 5. HMI: human-machine interface
- 6. OIT: operator interface terminal
- 7. PCS: plant control system
- 8. PICS: Process and Instrumentation Control System
- 9. PLC: programmable logic controller
- 10. RTU: remote terminal unit
- 11. SCADA: supervisory control and data acquisition
- 12. SI: Systems Integrator

B. Definitions General:

- 1. General: Definitions of terminology related to Instrumentation and Industrial Electronic Systems used in the specifications as defined in IEEE 100, ISA 51.1, and NEMA ICS 1.
- 2. Data sheets: Data sheets refer to ISA 20 or ISA TR20.00.01, as referenced within ISA-20-1981 specification.
- 3. Two-wire transmitter: A transducer that derives operating power supply from the signal transmission circuit and requires no separate power supply connections. A two-wire transmitter produces a 4- to 20-milliampere current regulated signal in a series circuit with a 24-volt direct current (VDC) driving potential and a maximum circuit resistance of 600 ohms.
- 4. Four-wire transmitter: A transducer that derives operating power from separate power supply connections. A four-wire transmitter produces a 4- to 20-milliampere current regulated signal in a series circuit with a maximum circuit resistance of 600 ohms. Four-wire transmitters typically require 120-volt alternating current (VAC) or 24VDC input power supply.
- 5. Galvanic isolation: An electrical node having no direct current path to another electrical node. Galvanic isolation refers to a device with electrical inputs and/or outputs that are isolated from ground, the device case, the process fluid, and separate power supply terminals. Inputs and/or outputs may be externally grounded without affecting the characteristics of the devices or providing a path for circulation of ground currents.
- 6. Panel: An instrument support system that may be a flat surface, partial enclosure, or complete enclosure for instruments and other devices used in process control systems including consoles, cabinets, and racks. Panels provide mechanical protection, electrical isolation, and environmental protection from dust, dirt, moisture, and chemical contaminants that may be present in the atmosphere.
- 7. Systems Integrator: A firm engaged in the business of detailed control system design and engineering, instrumentation component purchase, system and panel assembly, control device programming, and implementing of the specified process control and industrial automation systems.

C. Definitions—Signal Types:

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

40 61 13 - 2

APRIL 2022

- 1. Analog, low level: Signal with full output level of 100 millivolts or less including thermocouples and resistance temperature detectors.
- 2. Analog, high level: Signals with full output level greater than 100 millivolts but less than 30 volts, including 4 to 20 mA transmission.
- 3. Audio signals, high level: Audio signals exceeding plus 4 dBm, including loudspeaker circuits.
- 4. Digital code: Coded information from the output of an analog-to-digital converter or digital transmission terminal.
- 5. Discrete control or events: Dry contact closures and signals monitored by solidstate equipment, relays, or control circuits.
- 6. Discrete control or events, low voltage: Dry contact closures and signals monitored by solid-state equipment, relays, or control circuits operating at less than 30 volts and 250 milliamperes.
- 7. Modulated signals: Signals from modems or low-level audio signals. Normal signal level: plus 4 dBm to minus 22 dBm. Frequency range is 300 to 10,000 hertz.
- 8. Pulse frequency: Counting pulses emitted from speed or flow transmitters.
- 9. Radio frequency (RF) signals: Continuous wave alternating current signals with fundamental frequency greater in a range of 310 kilohertz to 300 gigahertz.

D. Definition—Drawing Types:

- 1. Elementary or schematic diagram:
 - a. Use graphic symbols to indicate the electrical connections and functions of a specific circuit arrangement. The schematic diagram facilitates tracing of the circuit and its functions without regard to the actual physical size, shape, or location of the component devices or parts.
 - b. Indicate connections to internal and external components connected to the panel. Note which devices are external to the panel.
 - c. Depicted in ladder logic format.
 - d. Indicates contact arrangement of internal and external devices such that circuits are complete and match equipment furnished.
 - e. Indicates equipment designations/tag numbers to match contract drawings and P&IDs.
- 2. Block diagram: A diagram of a system, instrument, computer, or program in which selected portions are represented by annotated boxes and interconnecting lines.
- 3. Network block diagram:
 - a. A diagram of the overall control system, containing annotated boxes showing the primary network components (controllers, hubs, routers, switches, computers, displays).
 - b. Include annotated interconnecting lines showing the system communication media and communication protocols.
 - c. Indicate manufacturer and model of the primary network components and software.

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

d. Indicates functions performed by each device (e.g., Historical Data Server, Field controller, Database Server, Operator workstation, etc.)

4. Connection diagram:

- a. Purpose is to show wiring requirements between internal panel components.
- b. Show components of a control panel in an arrangement similar to the actual panel layout.
- c. Indicate internal wiring between components.
- d. Show terminal blocks used for internal wiring and field wiring, with identification as such.
- e. Indicate insulation color code, signal polarities, wire numbers, and terminal block numbers.

5. Interconnection diagram:

- a. Purpose is to show wiring requirements between panels, standalone devices, components, and instruments.
- b. Indicate wire numbers, cable numbers, raceway numbers, terminal box numbers, terminal block numbers, panel numbers, and field device tag numbers.
- c. Show external connections between terminals of equipment and outside points, such as motors and auxiliary devices.
- d. Indicate references to connection diagrams that interface to the interconnection diagrams.
- e. Interconnection diagrams are to be of the continuous line type. Show bundled wires as a single line with the direction of entry/exit of the individual wires clearly shown. Wireless diagrams and wire lists are not acceptable.
- f. Show termination of each cable. Clearly mark each termination point. Show each wire's identification as actually installed. The wire identification for each end of the same wire shall be identical. Identify devices and equipment.
- g. Depict terminal blocks as actually installed and identified in the equipment with individual terminal identification.
- h. Indicate external jumpers, shielding, and grounding terminations.
- i. Indicate polarities for signal and DC circuit.
- j. Depict spare wires and cables installed or slated for installation.

6. Arrangement, layout, or outline drawings:

- a. Show the physical space and mounting requirements of a piece of equipment.
- b. Indicate ventilation requirements and space provided for connections or the location to which connections are to be made.
- c. Indicate clearance requirements for ventilation and access.
- d. Show the dimensioned external and interior control panel views with components and Bill of Material.

7. Loop diagrams:

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

- a. Prepared per City Standard format.
 - 1) The loop drawing and DCS standards are available on the City's website under the Clean Water Operations Management Network (COMNET) Project Standards and Procedures Manual webpage.
- b. Show device element wiring of the system. Indicate device terminations, with terminal numbers.
- c. Show circuits for hardwired device interlocks.
- d. Show circuit cable and wire cable numbers, signal polarities, and terminal block numbers.
- e. Show connection to power supplies. Include alternating current (AC) and direct current (DC) power supplies and circuit information for instruments furnished under this contract.
- f. Indicate controller or I/O card address/node, rack, slot, and point wiring terminals.
- g. Show DCS interface
- h. Show power supplies for signal loops. Indicate in which panel components reside and power originates with circuit numbering/name. Where new/modified loops connect to an existing power supply, show the existing power supply name, location, and circuit.
- i. Indicate surge protection type, manufacturer, and model number (i.e., types include floating ground reference or grounded reference).
- j. Show new and modified terminal blocks with numbering in new and existing panels.
- k. Indicate signal loop grounding terminations.
- I. Indicate loop numbers, wire numbers, and cable numbers used in field wiring and panel wiring.
- m. Indicate field element being controlled or monitored (i.e., normally open contact from relay CR17, or FIT 365).

E. Reference Standards:

- 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 prevail.
- 2. Unless otherwise specified, references to documents mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids).
- 3. If referenced documents have been discontinued by the issuing organization, references to those documents 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 mean the specific document version associated with that date,

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

APRIL 2022

regardless of whether the document has been superseded by a version with a later date, discontinued, or replaced.

Reference	Title
CGA G-4.1	Cleaning Equipment For Oxygen Service
IEEE 100	Standard Dictionary of Electrical and Electronics Terms
ISA 5.4	Instrument Loop Diagrams
ISA 20	Specification Forms for Process Measurement and Control Instrumentation, Primary Elements, and Control Valves
ISA 51.1	Process Instrumentation Terminology
ISA TR20.00.01	Specification Forms for Process Measurement and Control Instruments Part 1: General Considerations
NEMA ICS 1	General Standards for Industrial Control and Systems

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

- 1. Coordinate the process and instrumentation control system for proper operation with related equipment and systems specified in other Divisions.
- 2. Integrate equipment in conformance with the drawings, specifications, and recommendations of the equipment manufacturer and the related processes equipment manufacturers.
- Obtain manufacturer's technical information for items of equipment not provided with, but connected to, the control system. Provide the necessary coordination and components for correct signal interfaces between equipment and the control system.
- 4. Coordinate interface requirements and schedule with other project subcontractors and equipment suppliers.
- 5. Present to the Construction Manager conflicts between the plans, specifications, manufacturer/vendor drawings, and installation instructions, etc. for resolution before proceeding.

B. Pre-submittal conference:

- 1. Schedule a pre-submittal conference with the Contractor, Systems Integrator, Owner, Engineer, and Construction Manager within 30 calendar days after Contract award to discuss the work, equipment, and submittal format, and to establish the framework for project coordination and communication.
- 2. Provide the following materials 10 days prior to the conference:
 - a. Proposed Systems Integrator that will meet the qualifications requirements of this section.
 - b. Indicate full conformance with the specification sections covered by this section with a contract deviations request. Requested contract deviations to reference and to be attached to the applicable contract specifications and drawings. Provide justification for requested deviations.

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

APRIL 2022

- c. Proposed "equal" products that differ from specified manufacturers/models with comparative listing of the published specifications for the specified item and the proposed item.
- d. Project schedule with deliverables and milestones through project completion.
- e. Sample submittal drawings, as specified to be provided for this project. Samples can be a copy from a previous project provided that represents the format being proposed for this project.
 - 1) Control system block diagram.
 - 2) Documented controller and operator interface program.
 - 3) Control panel schematic diagram.
 - 4) Interconnection diagram.
 - 5) Analog and discrete loop diagrams.
 - 6) Control panel arrangement drawing.
- 3. The pre-submittal conference will not replace the Product and Shop Drawing Submittal review process.

1.04 SUBMITTALS

- A. Procedures: Section 01 33 00 SUBMITTAL PROCEDURES.
- B. This article indicates general requirements applicable to all PICS submittals. Additional information to be submitted with each section will be listed under Action Submittals or Closeout Submittals in this and each related section.
- C. Submit all information for sections covered by a submittal as a complete package in one submittal. Partial submittals of a section from multiple vendors showing contractor's division of equipment, labor, or portions of the work are not acceptable.
- D. Include a table of contents in each submittal divided by specification section and content of each section such as drawings and components. Clearly indicate the article or paragraph to which each table of content item applies.
- E. Related sections indicate additional detail for each submittal.
- F. Bookmark PDF submittals to match the table of contents of each submittal. Submitted information is to conform to the following:
 - 1. Shop Drawings: Prepare drawings in MicroStation with borders and title blocks identifying the project, system, revisions to the drawing, and type of drawing. Include a date and description for each revision of a drawing including the date and description of the revisions. Drawing prints shall be 11" by 17" with a minimum lettering size of 1/8". Coordinate the version of MicroStation with the Owner. Generate drawings in adherence to Owner's drawing standards.
 - Product Literature: Provide manufacturer's specifications, data sheets, and catalog literature for the equipment and components that clearly and unambiguously show what is being provided and that it meets the requirements

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

specified. Indicate provided and available options, materials of construction, environmental characteristics, electrical characteristics, and connection requirements. Include only applicable information.

G. Conformance with Contract Documents:

- 1. Provide a copy of sections applicable to the submittal group with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements.
- 2. Check-marks (✓) denote full compliance with a paragraph as a whole. Underline deviations and denote them with a number in the margin to the right of the identified paragraph. Paragraph portions not underlined signify specification compliance. Include a detailed, written justification for each deviation. Show conformance with all paragraphs in a section. Failure to include a copy of the marked-up specification sections and justification(s) for requested deviations is cause for rejection of the entire submittal with no further consideration.
- 3. Mark 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, to show specific changes necessary for the equipment proposed in the submittal. If no changes are required, mark the drawing or drawings "no changes required." Failure to include copies of the relevant drawings with the submittal is cause for rejection of the entire submittal with no further review. Contract drawings include the following:
 - a. Network system block diagrams
 - b. Cabinet and panel arrangement drawings
 - c. Control single-line diagrams
 - d. Equipment installation details
- 4. Show conformance across suppliers and vendors in one submittal. Partial submittals from multiple vendors showing contractor's division of labor or portions of the work are not acceptable.
- 5. Provide a detailed written request and explanation for each deviation. Failure to include a copy of the marked-up specification sections and drawings, along with justification(s) for requested deviations to the contract requirements, with the submittal, is cause for rejection of the entire submittal with no further consideration.
- H. Closeout submittal general requirements.
 - Procedures: Section 01 78 23 OPERATION AND MAINTENANCE DATA.
 - 2. Provide record drawing prints of drawings and schedules following project startup, but prior to acceptance of the work, showing the final constructed state of the process instrumentation and control systems.
 - 3. Include the following in each operation and maintenance manual:
 - a. Final reviewed submittals, including revised as-built record drawings.

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

- b. Manufacturer's operation and maintenance instructions, edited for this project.
- c. Written record of menu configuration, jumpers, switch settings, and other configurable parameters for each instrument.
- d. Final application software configurations, in the software native format. Include a comprehensive report print-out from each controller CPU in full color. Provide in Adobe PDF format on compact disc media.
- e. Final network equipment software configurations.
- 4. Markup of existing O&M documentation that show modifications to existing panels, communications, and loops/wiring.
- 5. Maintenance Material Submittals
 - a. Provide one listing of spare parts that is divided by specification section.
 - b. Include list prices for spare parts, expendable supplies, and tools.
 - c. Indicate spare parts packaging and storage methods.
 - d. Indicate spare parts or components that could be deleted or reduced based on manufacturer's recommendations.
 - e. Indicate where manufacturer's recommendations exceed the spare parts specified.
 - f. Obtain spare parts from the equipment manufacturer. Do not provide third-party equivalent replacements.
 - g. Packaging, Testing, and Storage:
 - 1) Provide protective toolboxes for special tools.
 - 2) Test spare boards, circuit cards, power supplies, and similar spare electronic assemblies on site prior to acceptance.
 - 3) Carefully repackage operable parts. Immediately remove inoperable parts from the site and order replacement parts. Test replacement parts prior to acceptance.
 - 4) Package spare parts for protection against dirt and moisture. Label each package as to its contents with a description and part number.
 - 5) Do not place spare parts for different equipment items in the same package.

1.05 ACTION SUBMITTALS

- A. Quality Assurance (within 30 days of contract Notice to Proceed):
 - 1. Systems Integrator qualifications per paragraph 1.08, Quality Assurance.
 - 2. Project personnel qualifications per paragraph 1.08, Quality Assurance.
- B. System Overview
 - 1. Network block diagram
 - 2. System description
- C. PLC Panel Arrangement Drawings

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

D. Control Single Line Drawings

E. Loop Diagrams

- 1. Contractor is responsible for the overall development, coordination efforts and final delivery of Loop Diagrams. Special requirements are outlined below.
- 2. Loop diagrams shall be submitted in accordance with o1 33 00, Submittal Procedures, and the special requirements of this section. All Loop Diagrams will conform to ISA 5.4 to verify DCS interface with all controllers, instrumentation and devices provided or installed under the project. The loop diagrams shall also define all interfaces with equipment provided by skid mounted or Foreign Device interfaces.
- Loop diagrams shall be developed utilizing a three-sheet format. A sample of the City's Standard three-sheet format will be provided to the Contractor after NTP. The following three-sheet format is required:
 - a. Sheet 1: Provide 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 Number (three for four digit number based on the loop number), and Tag suffix.
 - 2) Equipment Service.
 - 3) Device Type.
 - 4) Location.
 - 5) Device Manufacturer.
 - 6) Model Number.
 - 7) Specification Number.
 - 8) Area Contractor (if applicable).
 - 9) Submittal Number.
 - 10) Calibrated Range/Remarks.
 - 11) Data Sheet Number.
 - 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 Setpoint.
 - 17) Loop Diagram Number (reflecting the filed instrument tag number).
 - 18) Loop Diagram File Name.
 - 19) Interconnect Drawing File Name.
 - b. Sheet 2: Loop Diagrams meeting the requirements of ISA 5.4, except that intermediate terminal junction boxes may be omitted, and shall 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. Datalinks, third-party I/O and bus connections shall also be shown.

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

- 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 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
YL	Ready Signal/Status
ZL	In Computer Status
ZSO	Device Open
ZSC	Device Closed
YL	Motor Run
HS	Equipment Start/Stop

- 4. The Contractor in concert with their I&C subcontractor shall be responsible for the preliminary development of all Loop Diagram in the format specified. The Contractor shall develop a "draft" of each loop drawing.
- 5. The Contractor will then coordinate with the DCS Controls Programmer (DCSCP), delivering draft Loop Diagrams to the DCSCP. The DCSCP shall be responsible for filling out the DCS related addressing, software-level information, DCS termination numbering, etc..
- 6. The Contractor will receive the draft loop diagrams from the DCSCP and shall finalize all Loop Diagram in Microstation. The Contractor shall ensure that all "as-constructed" information (such as I/O wiring being re-addressed at the DCS) has been incorporated into the finalized Loop Diagrams.
- 7. The Contractor shall deliver the finalized Loop Diagram to the project Engineer. The Design Engineer is responsible for Quality Assurance/Quality Control of the final loop drawings and shall check all loop drawings against design P&IDs, electrical design, and the Contractors field as constructed drawings. The Contractor is responsible for all coordination with the Design Engineer and shall incorporate all changes and corrections required by the Design Engineer.
- 8. The Contractor shall prepare and delver all Loop Diagram packages in accordance with these specifications. Note: All Loop Diagram shall be submitted to the City's representative prior to the start of any DCS cutover.
- 9. The City's representative will review and approve the Loop Diagram Submittal in accordance with Section 01 3300, Submittal Procedures. The Contractor is responsible foe making all changes and annotation to the final loop drawings

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

40 61 13 - 11

APRIL 2022

as may be dictated during various testing procedures. Red-line mark-up of all annotated Loop Diagram shall be delivered to the City's representative at the conclusion of the DCS testing activities.

1.06 CLOSEOUT SUBMITTALS

A. Provide record drawing prints of drawings and schedules following project startup, but prior to acceptance of the work, showing the final constructed state of the process instrumentation and control systems.

B. As-Built Drawings

- 1. As-built drawings shall be prepared in accordance with Section 01 33 00, Submittal Procedures, with the following exceptions and changes:
 - a. The Contractor shall keep current and approved set of complete Loop Diagram and schematic diagram which shall include all field panel wiring, all piping and tubing runs, all routing, all mounting details, all point-to -point diagram with cable, wire, tube and termination numbers. These drawings shall include all instruments and all instrument elements for the complete instrument loop as provide under equipment and electrical requirements of the Contract.
 - b. Two copies of each as-built drawing under this Section shall be submitted to the City's representative after completion of field checkout but before placing the system in service to the Owner's use.
 - c. Drawings shall be submitted in electronic (Microstation) and PDF format.

1.07 QUALITY ASSURANCE

- A. All work covered by this section and Section 40 61 21 PROCESS CONTROL SYSTEM TESTING shall be the responsibility of a single Systems Integrator as defined within this article.
- B. The instrumentation and control system functions are shown on the drawings and specified in subsequent sections of Division 40. The Systems Integrator drawings and integration practices shall be as defined in IEEE 100, ISA 51.1, and NEMA ICS 1.
- C. Demonstrate the overall system performance to the Owner for acceptance.
- D. Systems Integrator qualifications:
 - 1. Evidence of Experience—Company specializing in the products and work of this section and related sections:
 - a. Documented experience with the equipment specified as well as overall systems responsibility for systems of similar size and complexity.

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

- b. Experience in performing similar successful projects (equipment type, software type, Systems Integrator responsibilities, complexity, and dollar value of work performed by Systems Integrator).
- c. End-user satisfaction of projects based on end-user interviews by the Owner or Engineer. Submit project descriptions of projects completed with contact names, addresses, and telephone numbers from the project Owner, General Contractor, and Principal Design Firm.
- d. Panel fabrication and staging facilities adequate to provide services for this project. Demonstrate by including the following:
 - 1) Minimum 10,000 square feet of dedicated space for panel fabrication and testing.
 - 2) Panel shop shall be UL 508 recognized to produce panels to UL 508 and UL 698 standards and labeling.
- e. Financial resources available and projected for successful completion of this project. Submit financial data for Systems Integrator division when subsidiary to a parent corporation. Include 2 years of financial data:
 - 1) Financial statement.
 - 2) Balance sheet.
 - 3) Dun & Bradstreet Report.
- E. Systems Integrator Personnel Qualifications: Provide qualified personnel to complete the work specified for this project. Demonstrate by including the following:
 - 1. Organization chart and resumes for proposed project personnel showing experience for the proposed roles on this project.
 - 2. Training and certification information. Completion of the following training courses or appropriate portions thereof or possession of the following certifications included with the Systems Integrator's personnel experience requirements described above:
 - a. Project manager: Control System Engineer (CSE) registration, Professional Engineer (PE) registration, or Project Management Professional (PMP) certification.
 - b. Systems engineer: Control System Engineer (CSE) registration, Professional Engineer (PE) registration, or completion of the relevant core courses in the Engineering Skills Training program as certified by ISA.
 - c. Programmer: Certified by the software/hardware manufacturer for the software and hardware being used on the project, or Control System Engineer (CSE), or Professional Engineer (PE) registration.
 - d. Field instrument technician: Certified Control Systems Technician (CCST) registration or completion of the relevant core courses in the Technical Skills Training program as certified by ISA.
 - e. The certification requirements shown in a thru d above may be waived by the Owner's CSE based on the qualifications and verifiable related experience of the Systems Integrator's personnel proposed.

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

1.08 ENVIRONMENTAL CONDITIONS

- A. Ambient conditions: Per Section 01 61 00 COMMON PRODUCT REQUIREMENTS
- B. Corrosive locations: Per Section 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL.
- C. Hazardous (Classified) areas: Per Section 26 05 00 COMMON WORK RESULTS FOR ELECTRICAL and on the contract drawings.
- D. Seismic: Brace equipment and supports per Section 01 73 24 DESIGN REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS AND NON-BUILDING STRUCTURES.

PART 2 PRODUCTS

2.01 CONTROL SYSTEM

A. Owner's DCS is Ovation by Emerson.

2.02 EQUIPMENT/MATERIALS

- A. General requirements:
 - 1. New.
 - 2. Free from defects.
 - Rated for the installed environment.
- B. Similar control system components, instrument, instrument accessory, and devices used throughout the work shall be manufactured by one firm, where possible.
- C. The components, modules, devices, and control system equipment shall be recognized industrial-quality products. Recognized commercial- or office-grade products are prohibited.
- D. Use electronic equipment of solid-state construction with printed or etched circuit boards of glass epoxy of sufficient thickness to prevent warping.
- E. Printed circuit boards in field-mounted equipment are to be coated with 2 mils of conformal coating in compliance with MILSPEC MIL-I-46058C.
- F. Equipment supports: shall be 316L stainless steel, as shown or specified.

2.03 SOFTWARE

A. Software packages are to be latest versions available or compatible with the Owner's existing DCS software.

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

APRIL 2022

B. Provide licenses required for the software required to program the Process Control System.

2.04 ENCLOSURES

A. Table A specifies the instrument and control panel enclosure material and minimum NEMA rating for the location and application where not identified in other specification sections.

Table A	
Location	Enclosure Material and NEMA Rating
Indoor: architecturally finished area	NEMA 12: mild steel
Indoor: electrical room	NEMA 12: mild steel
Indoor: process areas	NEMA 4X: 316 stainless steel
Indoor: corrosive area	NEMA 4X: 316 stainless steel
Outdoor: corrosive area	NEMA 4X: 316 stainless steel
Outdoor: non-corrosive areas	NEMA 4X: 316 stainless steel
Corrosive area (hypochlorite)	NEMA 4X: non-metallic
Classified area	NEMA 7: galvanized malleable iron or aluminum or NEMA 4X and UL listed or FM approved for the hazardous area. Where no such enclosure is available, enclosure ratings shall be for the indoor or outdoor area and shall be made intrinsically safe.
Classified and corrosive area	NEMA 7: iron or aluminum with factory-applied corrosion-resistant coating or NEMA 4X and UL listed or FM approved for the hazardous area. Where no such enclosure is available, enclosure ratings shall be for the indoor or outdoor area and shall be made intrinsically safe.

2.05 NAMEPLATES

- A. Provide nameplates for field-mounted instrument, analyzer, or equipment covered by this section with the following requirements:
 - 1. Include the equipment or instrument loop title and the instrument or equipment tag number, where nameplate engraving is not specified or shown.
 - 2. Machine engraved white phenolic with black 5/32-inch-high lettering, as minimum, unless otherwise specified or shown.
- B. Nameplate wording may be changed without additional cost or time, if changes are made prior to commencement of engraving.
- C. Attach nameplates to support hardware with a minimum of two self-tapping type 316 stainless steel screws in a readily visible location so the nameplate will remain to identify the service when the device is removed. Attach field instrument nameplates with braided stainless-steel straps where not stand-mounted.

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify field measurements prior to fabrication.

3.02 INSTALLATION

A. General:

- 1. Install equipment in locations that are accessible for operation and maintenance services.
- Installation, calibration, settings, and testing procedures are specified in Section 40 61 13 PROCESS CONTROL SYSTEM GENERALPROVISION Section 40 06 70 SCHEDULES FOR INSTRUMENTATION OF PROCESS SYSTEM.

B. Field Equipment:

- 1. Space instruments and cabinets from concrete walls by 5/8 inch with framing channel between instrument or cabinet and wall. Add supports to block wall to avoid damage to the wall.
- Design support systems, including panels, in accordance with Section 01 73 24 DESIGN REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS AND NON-BUILDING STRUCTURES to prevent deformation greater than 1/8 inch in any direction under the attached equipment load and under an external load of 200 pounds.
- In wet or outdoor areas, make conduit penetrations into instrument housing or panels through the bottom (preferred) or side of enclosures to minimize water entry from around or from inside of conduits. Provide conduit hubs for connections and waterproof mastic for moisture sealant.
- 4. Provide nameplates for field-mounted equipment. Attach nameplates in a readily visible location, but such that if the field device is replaced, the nameplate will remain to identify the service.

3.03 FIELD QUALITY CONTROL

- A. Delivery Inspection: Notify the Owner's Representative upon arrival of material or equipment to be incorporated into the work. Remove protective covers or otherwise provide access in order that the Owner's Representative may inspect such items.
- B. Inspection and Installed Tests: Refer to Section 40 61 21 PROCESS CONTROL SYSTEM TESTING.

3.04 CLEANING

A. All instrumentation shall be factory cleaned for Oxygen Service in accordance with Section 46 31 59 OXYGEN CLEANING.

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

- B. Execute final cleaning prior to final project assessment.
- C. Clean surfaces exposed to view, remove temporary labels, stains, and foreign substances.
- D. Replace filters of operating equipment.
- E. Remove waste and surplus materials, rubbish, and construction facilities from site.

END OF SECTION

PROCESS CONTROL SYSTEM GENERAL PROVISIONS

PURE WATER TASK ORDER 44 PQPS OXYGENATION SYSTEM LIST OF SPECIFICATIONS

SECTION DIVISION 43	TITLE PROCESS GAS AND LIQUID HANDLING, PURIFICATION, AND STORAGE
43 05 11 43 05 13 43 05 14	GENERAL REQUIREMENTS FOR EQUIPMENT RIGID EQUIPMENT MOUNTS MACHINE ALIGNMENT
43 05 21 43 23 03	COMMON MOTOR REQUIREMENTS FOR EQUIPMENT GENERAL REQUIREMENTS FOR CENTRIFUGAL PUMPS
43 23 89.13	HORIZONTAL VARIABLE SPEED NON-CLOG CENTRIFUGAL PUMPS
DIVISION 46	WATER AND WASTEWATER EQUIPMENT
46 51 50	OXYGENATION SYSTEM
46 31 59	OXYGEN CLEANING

SECTION 43 05 11 GENERAL REQUIREMENTS FOR EQUIPMENT

PART 1 GENERAL

1.01 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 his own material and equipment takeoff lists as necessary to meet the requirements of this project manual.

1.02 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 his 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 Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). 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

AUGUST 23, 2022 **ADDENDUM A** PAGE 24 OF 57

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: 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 his responsibility to the Owner for performance of all systems as provided in the General Conditions of the Contract Documents.
- D. 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 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.

E. 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:

a.
$$U_{per} = 6.015 \frac{GW}{N}$$

b. Where:

1) $U_{per} =$ permissible imbalance, ounce-inches, maximum

2) G Balance quality grade, millimeters per second

3) W Weight of the balanced assembly, pounds mass

4) 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 G2.5 (G = 2.5 mm/sec) or better in accordance with ANSI S2.19.

PART 2 PRODUCTS

2.01 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.

2.02 **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

ADDENDUM A PAGE 26 OF 57 AUGUST 23, 2022 PQPS Oxygenation System

- 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 gauge.
- 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.

2.03 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.

2.04 PUMP SHAFT SEALS

A. General: Seals for water and wastewater pump shafts shall be either stuffing box or mechanical seals. For industrial wastewater service, or for fluids other than water or municipal wastewater, the recommendations of the seal manufacturer shall be followed for selection of appropriate seals. Unless specified otherwise, stuffing boxes and mechanical seals shall conform to the requirements set forth in this paragraph.

B. Mechanical Seals:

- 1. Unless otherwise specified in the detailed pump specifications, mechanical seals shall be split mechanical seals requiring no field assembly, other than assembly around the shaft and insertion into the pump. They shall be self-aligning, and self-centering, single seals. They shall be of a nondestructive (nonfretting) type requiring no wearing sleeve for the shaft. Shafts for pumps specified with mechanical seals shall be furnished with no reduction in size through the seal area (no shaft sleeve). Where the detailed specifications call for cartridge instead of split seals, all other requirements of this paragraph apply.
- Metal parts shall be Type 316 or 316L stainless steel. Springs shall be Hastelloy C, Elgiloy, or other Duplex SS selected for resistance to chloride attack. Rotary faces shall be silicon carbide or chrome oxide. Stationary faces shall be silicon carbide for solids bearing fluid service and carbon for clean

AUGUST 23, 2022 ADDENDUM A PAGE 27 OF 57

- water service. Elastomers shall be ethylene propylene or fluorocarbon. Mechanical seals shall be suitable for operation between full vacuum (0 psia) up to 200 percent of the maximum specified operating pressure, but in any event not less than 200 psig.
- Seal chambers shall be provided with vented solids removal restriction bushings except for enclosed line shaft pumps where the seal barrier fluid is used for line shaft bearing lubrication. The bushing shall both control the amount of flushing water flow and restrict solids and gas accumulation from the seal face area.

4. Candidate seals include:

- a. Chesterton 442 seals provided with Chesterton/SpiralTrac solids removal restriction bushings Version N or D, as recommended by EnviroSeal Engineering Products, Ltd, Nova Scotia, Canada.
- b. AESSEAL RDS seals with Cyclops bushing.
- c. John Crane 3710 seals with Type 24SL bushing.
- 5. Seals on pumps for contaminated water service (sludge, grit, wastewater, scum, reclaimed water, etc.) shall be drilled and tapped for connection of a clean water flushing supply.
- 6. Seals for all vertical pumps (whether column or volute type) shall be provided with a second flush connection. Vertical pumps shall have a vent valve attached to the mechanical seal to eliminate air from the seal chamber prior to pump start; start-up procedures shall include venting instructions; and for remotely started pumps, the vent system shall be automated. Where specified in the detailed specifications, permissive confirmation automatic vent systems shall be provided.

C. Shaft Packing:

- 1. Where shaft packing is specified, stuffing boxes shall be tapped to permit introduction of seal liquid and shall hold a minimum of five rows of packing. Stuffing boxes shall be face attached. Stuffing box and shaft shall be suitable for field installation, without machining or other modifications, of the mechanical seal specified in paragraph 2.04 Mechanical Seals for the applicable pump and operating conditions.
- 2. Unless otherwise specified, lantern rings shall be bronze or Teflon, packing shall be die molded packing rings of non-asbestos material suitable for the intended service and as recommended by the manufacturer, and glands shall be bronze, two piece split construction. Lantern rings shall be of two piece construction and shall be provided with tapped holes to facilitate removal. Lantern rings shall be drilled and tapped 1/4 NC 20. The impeller end of the packing on all but line shaft pumps with external source water lubricated bearings shall be fitted with a SpiralTrac, Version P packing protection system as manufactured by EnviroSeal Engineering Products, Ltd, Nova Scotia, Canada.
- 3. The section of each shaft or impeller hub that extends through or into the stuffing box shall be fitted with a replaceable stainless steel sleeve with a Brinell hardness of not less than 500. The sleeve shall be held to the shaft to prevent rotation and shall be gasketed to prevent leakage between the shaft and the sleeve. Minimum shaft sleeve thickness shall be 3/8 inch.

AUGUST 23, 2022 ADDENDUM A PAGE 28 OF 57

2.05 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.

2.06 GUARDS

A. Exposed moving parts shall be provided with guards which meet all applicable OSHA requirements. Guards shall be fabricated of 14 gauge 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.

2.07 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.

2.08 GAUGE TAPS, TEST PLUGS AND GAUGES

A. Gauge taps shall be provided on the suction and discharge sides of pumps, blowers and compressors. Pressure and vacuum gauges shall be provided where specified. Gauge taps, test plugs, and gauges shall be as specified in Division 40.

2.09 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

A. The Contractor shall provide for each item of mechanical equipment a supply of the required lubricant adequate to last through the specified commissioning period. Lubricants shall be of the type recommended by the equipment manufacturer and shall be products of the Owner's current lubricant supplier. The Contractor shall limit the various types of lubricants by consolidating them, with the equipment manufacturer's approval, into the least number of different types. Not less than 90 days before the date shown in his construction schedule for starting, testing and adjusting equipment (Section 01 45 33 SPECIAL INSPECTION, OBSERVATION, AND TESTING), the Contractor shall provide the Owner with three copies of a list showing the required lubricants, after consolidation, for each item of mechanical equipment. The list shall show estimated quantity of lubricant needed for a full year's operation, assuming the equipment will be operating continuously.

2.11 ANCHOR BOLTS

A. Anchor bolts shall be designed for lateral forces for both pullout and shear as determined by the equipment manufacturer. Unless otherwise stated in the individual equipment specifications, anchor bolt materials shall conform to the provisions of Section 05 05 19 POSTINSTALLED CONCRETE ANCHORS.

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 ferrous metal items 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

3.01 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

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

CONTRACTOR'S RESPONSIBILITIES

- I. PURSUANT TO SECTION 4216 OF THE CALIFORNIA GOVERNMENT CODE, AT LEAST TWO WORKING DAYS PRIOR TO EXCAVATION, YOU MUST CONTACT THE REGIONAL NOTIFICATION CENTER (E.G., UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA) AND OBTAIN AN INQUIRY IDENTIFICATION
- 2. NOTIFY SDG&E AT LEAST 10 WORKING DAYS PRIOR TO EXCAVATING WITHIN 10 FEET OF SDG&E UNDERGROUND HIGH VOLTAGE TRANSMISSION POWER LINES (I.E., 69 KV AND HIGHER).
- 3. LOCATIONS SHOWN FOR EXISTING UTILITIES ARE BASED ON A SEARCH OF THE AVAILABLE RECORD INFORMATION ONLY AND ARE SOLELY FOR THE CONTRACTORS CONVENIENCE. THE CITY DOES NOT GUARANTEE THAT IT HAS REVIEWED ALL AVAILABLE DATA. THE CONTRACTOR SHALL POTHOLE ALL EXISTING UTILITIES EITHER SHOWN ON THE PLANS, REFERENCED RECORD DRAWINGS OR MARKED IN TECH FIELD IN ACCORDANCE WITH THE SPECIFICATIONS.

CONSTRUCTION STORM WATER PROTECTION NOTES

- I. TOTAL SITE DISTURBANCE AREA (ACRES) 0.025 HYDROLOGIC UNIT/WATERSHED - PENASQUITOS HU/LOS PENASQUITOS WATERSHED HYDROLOGIC SUBAREA NAME AND No. - POWAY (#906.2)
- 2. THE CONTRACTOR SHALL COMPLY WITH THE REQUIREMENTS OF THE ■ WPCP
 - THE PROJECT IS SUBJECT TO MUNICIPAL STORM WATER PERMIT No. R9-2013-0001 AS AMENDED BY R9-2015-0001 AND R9-2015-0100.
 - THE PROJECT IS SUBJECT TO MUNICIPAL STORM WATER PERMIT No. R9-2013-0001 AS AMENDED BY R9-2015-0001 AND R9-2015-0100 AND CONSTRUCTION GENERAL PERMIT ORDER 2009-0009-DWQ AS AMENDED BY ORDER 2010-0014-DWQ AND 2012-0006-DWQ. TRADITIONAL: RISK LEVEL I \(\sigma \) 2 \(\sigma \) 3

MAR

LUP: TYPE I 2 3 3 3. CONSTRUCTION SITE PRIORITY

□ASBS □HIGH □ MEDIUM ■LOW

PERMANENT STORM WATER BMP CATEGORY

☐ PRIORITY DEVELOPMENT PROJECT

■ STANDARD DEVELOPMENT PROJECT

☐ PDP EXEMPT

□ NOT SUBJECT TO PERMANENT STORM WATER REQUIREMENTS

DISCIPLINE CODE

- G GENERAL
- CIVIL
- S STRUCTURAL
- MECHANICAL
- E ELECTRICAL I INSTRUMENTATION

PROJECT TEAM

CIVIL, MECHANICAL, BROWN AND CALDWELL ELECTRICAL, AND 451 A ST INSTRUMENTATION SUITE 1500

> SAN DIEGO, CA 92101 (858) 514-8822

(619) 280-9307

STRUCTURAL

MARTIN & LIBBY STRUCTURAL ENGINEERS 4452 GLACIER AVENUE SAN DIEGO, CA 92120

PROJECT DATA

PROJECT CODE INFORMATION ZONING: 2016 CALIFORNIA BUILDING CODE AS ADOPTED BY THE CITY OF SAN DIEGO OCCUPANCY: TYPE F-I BASIC ALLOWABLE AREA: UNLIMITED

ACTUAL FLOOR AREA: 26,729 SQ FT TYPE OF CONSTRUCTION: TYPE I-B PROJECT LEGAL DESCRIPTION

PORTIONS OF THE NW 1/4 OF THE SE, 1/4, SE 1/4 OF THE NE 1/4, AND A PORTION OF LOT 2, SECTION 20, T 145, R2 W, S.B.M.

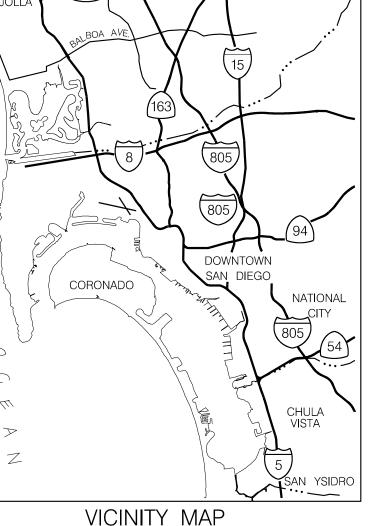
10150 CARA WAY SAN DIEGO, CA 92129

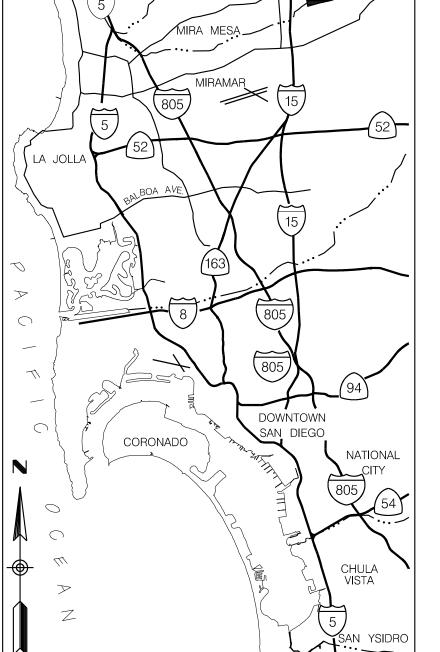
PROJECT ADDRESS

OWNER REPRESENTATIVE

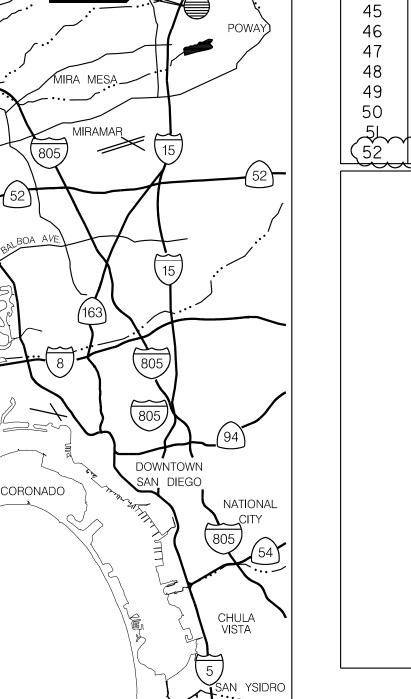
ANTHONY VAN 9192 TOPAZ WAY SAN DIEGO, CA 92123

858-292-6492 NOT TO SCALE CONSTRUCTION CHANGE / ADDENDUM WARNING CHANGE DATE AFFECTED OR ADDED SHEET NUMBERS APPROVAL NO. G-I, G-4, S-2, S-3, S-4, S-I0, S-II, S-I2, S-I3, S-I4, S-I5, M-I, M-2, M-3, M-4, M-5, M-6, M-7, M-8, M-9, M-I0, I-I, I-2, 1-3, 1-4, 1-5, NEW SHEET M-II NOT MEASURE THEN DRAWING IS





NOT TO SCALE.



The City of

SAN DIEGO

KIKA COURT RTU PANEL 1-6 1-7 NETWORK CONTROL SYSTEM BLOCK DIAGRAM INSTALLATION DETAILS MECHANICAL DETAILS 3/A KIKA COURT-POWAY AR/AV VAULT RD PQPS SEWER PUMP STATION CITY OF SAN DIEGO APN: 3150405200 SCRIPPS POWAY PKWY 21-VD LOCATION MAP

COVER SHEET

GENERAL - OVERALL SITE PLAN

STRUCTURAL - GENERAL NOTES

STRUCTURAL - GENERAL NOTES

STRUCTURAL - GENERAL NOTES

STRUCTURAL - TYPICAL DETAILS

STRUCTURAL SECTION A

STRUCTURAL SECTION B

MECHANICAL SECTION A

MECHANICAL SECTION B

MECHANICAL SECTION C

MECHANICAL DETAILS I

MECHANICAL DETAILS 2

ELECTRICAL - DETAILS

STRUCTURAL - FLOOR PLAN LEVEL A

STRUCTURAL - FLOOR PLAN LEVELS B AND C

STRUCTURAL - FLOOR PLAN LEVELS DIAND D2

STRUCTURAL - EQUIPMENT PLANS AND ELEVATIONS

MECHANICAL - ENLARGED FLOOR PLAN LEVELS A, B, AND C

MECHANICAL - AIR COMPRESSOR AREA ENLARGED PLAN

MECHANICAL - ENLARGED FLOOR PLAN LEVELS DI, D2, AND D3

MECHANICAL - FLOOR PLAN LEVELS A, B, AND C

MECHANICAL - FLOOR PLAN LEVELS DI AND D2

ELECTRICAL - SYMBOLS AND ABBREVIATIONS I

ELECTRICAL - SYMBOLS AND ABBREVIATIONS 2

ELECTRICAL - SINGLE LINE DIAGRAM

KIKA COURT ELECTRICAL SITE PLAN

PIPING AND INSTRUMENTATION DIAGRAM

PIPING AND INSTRUMENTATION DIAGRAM 2

PIPING AND INSTRUMENTATION DIAGRAM 3

PIPING AND INSTRUMENTATION DIAGRAM 4

ELECTRICAL - SWITCHBOARD SINGLE LINE DIAGRAM

ELECTRICAL - POWER PLAN LEVELS A, B, AND C

ELECTRICAL - POWER PLAN LEVELS DI AND D2

ELECTRICAL - KIKA COURT SINGLE LINE DIAGRAM

ELECTRICAL - INSTRUMENTATION PLAN LEVELS A, B, AND C

PIPING AND INSTRUMENTATION DIAGRAM SYMBOLS AND ABBREVIATIONS

NOT TO SCALE

ADDENDUM A

ELECTRICAL - AIR COMPRESSOR AREA ENLARGED POWER AND INSTRUMENTATION PLAN

G-2

C-I

C-2

C-3

S-I

S-2

S-3

S-4

S-6

S-7

S-9

S-I0

S-II

S-I4

M-3

M-I 0

E-I

E-2

E-3

E-4

E-5

E-6

E-7

E-8

E-9

E-I0

E-II

|-|

1-2

I-3

1-4

1-5

10

 \Box

12

13

17

20

22

23

24

25

26

27

28

29

30

32

33

34

37

38

40

42

43

44

GENERAL - NOTES, ABBREVIATIONS, SYMBOLS, AND LEGEND

CIVIL - BMP MAP FOR STANDARD DEVELOPMENT PROJECTS

CIVIL - BMP MAP FOR STANDARD DEVELOPMENT PROJECTS

GENERAL - PROCESS SCHEMATIC AND DESIGN CRITERIA

CIVIL - VAN ACCESSIBLE PARKING STALL MODIFICATIONS

WORK TO BE DONE

- I. TEMPORARY DRAIN FORCEMAIN TO FACILITATE PIPING CONNECTIONS AND EMPTY THE PUMP STATION WET WELL FOR DURATION OF PIPING WORK (NIGHT WORK MAY BE REQUIRED).
- 2. CONSTRUCT PUMP PEDESTAL. PROVIDE AND INSTALL SIDE STREAM PUMP AND MOTOR IN PUMP ROOM (LEVEL D). MAKE CONNECTIONS TO WET WELL PUMP SUCTION PIPING, AND CONNECT PUMP DISCHARGE PIPING TO RAW SEWAGE HEADER.
- 3. CONSTRUCT MODIFICATIONS TO EXISTING EQUIPMENT PAD, PROVIDE AND INSTALL OXYGENATION PRESSURE VESSEL, APPURTENANCES, AND CONTROL PANEL IN MOTOR ROOM (LEVEL B), MAKE ALL NECESSARY PIPING AND WIRING CONNECTIONS.
- 4. CONSTRUCT NEW EQUIPMENT PADS. PROVIDE AND INSTALL OXYGEN GENERATION SYSTEM, BOOSTER PUMP, OXYGEN TANK, OXYGEN BUFFER TANK, AND ALL RELATED APPURTENANCES IN WORK AREA (LEVEL A) INCLUDING CONNECTION TO SEWER FORCE MAIN.
- 5. CONSTRUCT NEW EQUIPMENT PADS. PROVIDE AND INSTALL AIR COMPRESSOR, NOISE ENCLOSURE, WEATHER CANOPY, AND COMPRESSED AIR STORAGE TANK. MAKE ALL NÉCESSARY PIPING CONNECTIONS (LEVEL A -OUTSIDE BLOWER BUILDING).
- 6. PROVIDE AND INSTALL COMPRESSED AIR PIPING CONNECTING COMPRESSED AIR STORAGE TANK TO OXYGENATION SYSTEM (OUTSIDE THROUGH ODOR CONTROL AND CHEMICAL AREAS).
- 7. PERFORM THE FOLLOWING ELECTRICAL AND INSTRUMENTATION WORK: a. PROVIDE AND INSTALL NEW SWITCHBOARD AND MINI-POWER ZONE TO PROVIDE POWER TO NEW LOADS AS SHOWN ON ELECTRICAL DRAWINGS. NEW SWITCHBOARD SHALL CONNECT TO EXISTING SWITCHBOARD WITHIN PENASQUITOS PUMP STATION ELECTRICAL ROOM.
- b. PROVIDE REQUIRED CONNECTIONS TO ALL POWER AND CONTROL/INSTRUMENTATION LOADS WITHIN PROJECT SCOPE FROM SOURCE UNTIL FINAL TERMINATION.
- C. AT KIKA COURT VAULT, CONTRACTOR SHALL INSTALL OFF-GAS OXYGEN SENSOR AND ASSOCIATED PIPING AND COALESCING FILTER, PROVIDE RTU, AND CONSTRUCT 120V POWER FEEDS, FOR 120V OFF-GAS OXYGEN SENSORS AND RTUS, CONDUITS, WIRING, AND ASSOCIATED APPURTENANCES BASED ON EXISTING FIELD CONDITIONS. UNDERGROUND BURIED CONDUITS SHALL BE PVC COATED RGS.
- 8. PROVIDE AND INSTALL INTERCONNECTION OF VENDOR EQUIPMENT. PROVIDE CONNECTION BETWEEN VENDOR EQUIPMENT AND EXISTING DCS AT THE STATION.
- 9. CONDUCT ALL TESTS DESCRIBED IN ATTACHMENT E, SECTION 01091014 TESTING AND STARTUP.
- IO. MODIFY EXISTING VAN ACCESSIBLE PARKING STALL AS SHOWN ON THE DRAWINGS. REFER TO SHEET C-3 (40933-07-D).

A (II. PIPING SIZES AND ROUTING ARE DEPENDENT ON THE FINAL OXYGENATION SYSTEM MANUFACTURER SELECTED AND MAY DIFFER FROM SIZES AND ROUTING SHOWN ON DRAWINGS, CONTRACTOR SHALL PROVIDE PIPING SIZED BY SELECTED MANUFACTURER REQUIREMENTS TO ENSURE PROJECT GOALS ARE MET, AT NO ADDITIONAL COST TO THE CITY.

DEFERRED SUBMITTALS:

- I. EQUIPMENT COVER AS DESCRIBED IN SHEET S-2. CONTRACTOR TO SUBMIT THIS DEFERRED SUBMITTAL TO THE E.O.R. AND BUILDING DEPARTMENT.
- 2. CUT SHEETS FOR THE OXYGEN BUFFER TANK (TNK-0025-1) AND THE OXYGEN STORAGE TANK (TNK-0023-1) RELATED TO TA PERMIT# 190214 OR ANY OTHER INFORMATION AS REQUIRED BY THE SAN DIEGO FIRE-RESCUE DEPARTMENT. CONTRACTOR TO SUBMIT CUT SHEETS DIRECTLY TO THE E.O.R. AND SAN DIEGO FIRE-RESCUE DEPARTMENT.
- * ALLOWABLE WORK HOURS ARE FROM 6:30 AM TO 3:30 PM CONTRACTOR SHALL OBTAIN APPROVAL FROM OWNER FOR ANY WORK OUTSIDE THESE HOURS.
- * NOISE AT FENCE LINE NOT TO EXCEED 60 dBA
- * NOTICE OF EXEMPTION (NOE) FROM CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) AVAILABLE UPON REQUEST FROM CITY'S PROJECT MANAGER

DECLARATION OF RESPONSIBLE CHARGE

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.

SPEC. NO. 2080



APRIL 5, 2022

DATE

CITY OF SAN DIEGO, CALIFORNIA

G-1

B-21001

PLANS FOR THE CONSTRUCTION OF PENASQUITOS PUMP STATION OXYGENATION SYSTEM

COVER SHEET

1101 10 001 12											"50 —
AS-BUILT INF	FORMATION		CONSULTA	NT				CAPITAL PROJE F 52 SHEETS			SEWER N/A
MATERIALS PIPE CL 235 (WATER)	MANUFACTURER -		Ctootoo	Brown AND .	PROFESSIONAL T. OCCIANO STATES	FOR CITY ENGINEER ALICE ALTES PRINT DCE NAME		A 5/10/2 DATE C6828 RCE#		_	ANTHONY VAN PROJECT MANAGER CHECKED BY: REYNALDO NOVENCIDO
PIPE SDR 35 (SEWER)	-		Stantec	Caldwell i	No. C63566	DESCRIPTION	BY	APPROVED	DATE F		PROJECT ENGINEER
GATE VALVES	-			Julianott		ORIGINAL	ВС	April Atta	5/10/22		282-1737
FIRE HYDRANTS	-			MADTIN CLIDDY	OF CALIFORN	A ADDENDUM A	ВС	Alin Alto	8/18/22		CCS27 COORDINATE
SEWER MANHOLES	-			MARTIN & LIBBY STRUCTURAL ENGINEERS				1 1			1922444-6298407
REHABILITATE SEWER MANHOLES	-			4452 Glacier Avenue, San Diego, CA 92120 Ph (619) 280-9307 F (619) 284-3533	04-05-2022						CCS83 COORDINATE
REHABILITATE SEWER MAIN	-			(,,	CONTRACTOR			NPT DATE			40933–01–D
		_		Λ COPP	ECT SPELLING IN NOTE LA	ND NOTE 5 ADD	NOTE II				

IP_PWP:d0l98l5l\40933-0l-D_G0l.dgn 18-AUG-2022 10:44 therencia August 23, 2022 PQPS Oxygenation System

CORRECT SPELLING IN NOTE I AND NOTE 5, ADD NOTE II, ADD DEFERRED SUBMITTALS, UPDATE WORKING HOURS, ADD NEW DRAWING M-II(40933-52-D) TO SHEET INDEX, CHANGE TOTAL NUMBER OF SHEETS

ADDENDUM Page 31 of 57

DIAMETER

3"

I", 2"

4"

l", 2"

8", I2"

PIPING SCHEDULE

MATERIAL

EPOXY LINED AND COATED STEEL

EPOXY LINED AND COATED STEEL

STEEL STAINLESS STEEL A

ABBREVIATION

FOR ADDITIONAL PIPING REQUIREMENTS, SEE SPECIFICATION SECTION 40 05 02

CA

OXG

SERVICE

RAW SEWAGE/OXYGEN GAS RS/OXG

COMPRESSED AIR

OXYGEN GAS

RAW SEWAGE

VENT

DRAIN

DESIGN CRITERIA

10150 CARA WAY SAN DIEGO, CA 92129

22 MGD 5 MGD

7.5 MGD CURRENT PEAK FLOW: O MGD CURRENT LOW FLOW:

OXYGENATION SYSTEM REQUIREMENTS

ODOR CONTROL AND MAINTAIN PURPOSE: AEROBIC CONDITIONS

ANTICIPATED OXYGEN

4,200 LB/DAY CONSUMPTION:

GENERATED ON SITE OXYGEN SOURCE: OXYGEN GENERATOR TYPE: SWING ADSORPTION

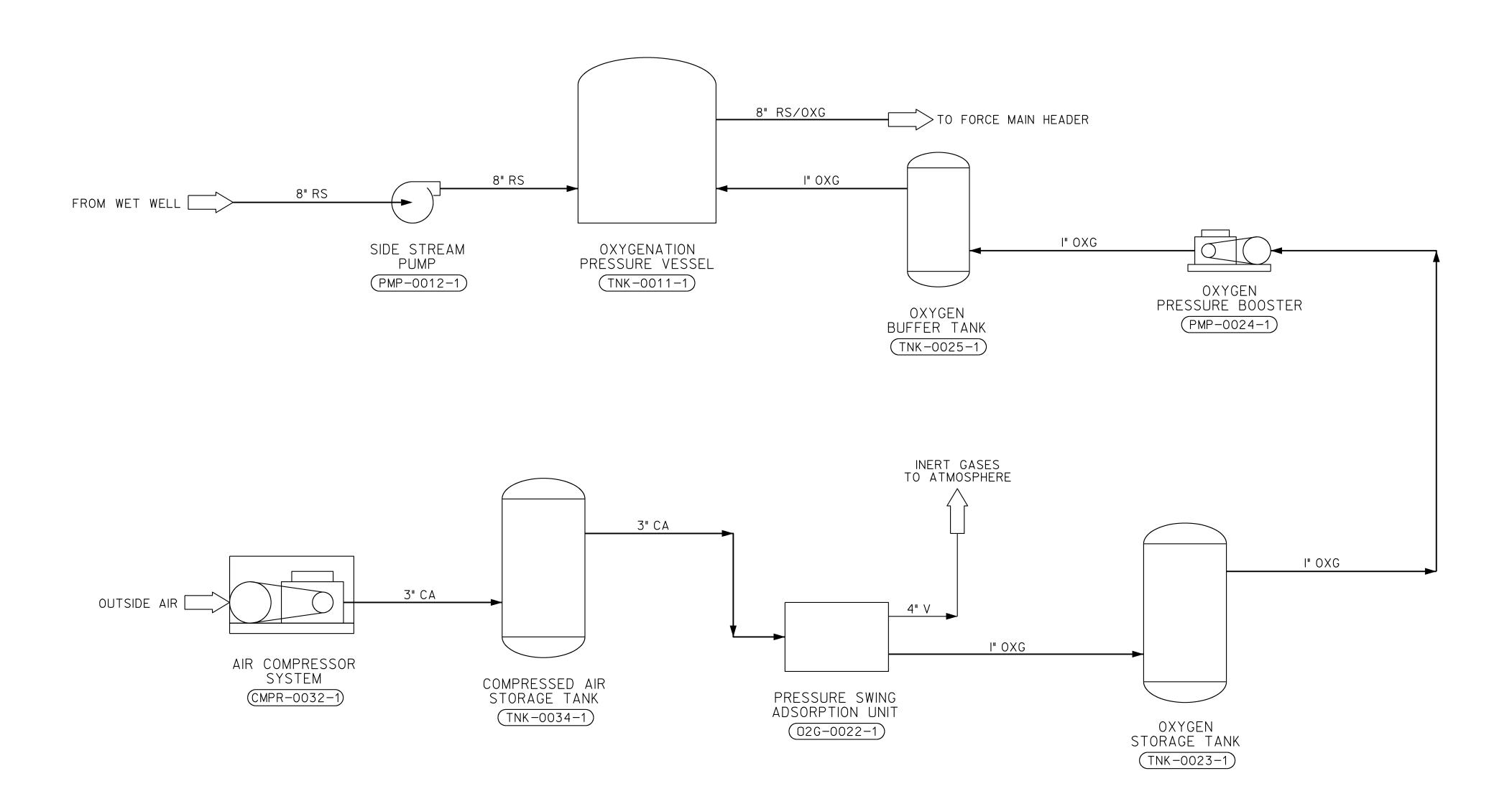
DISSOLVED OXYGEN AT FORCE MAIN DISCHARGE:

2 mg/L

DISSOLVED SULFIDE AT FORCE MAIN DISCHARGE:

LESS THAN O.I mg/L

PIPING SIZES AND ROUTING ARE DEPENDENT ON THE FINAL OXYGENATION SYSTEM MANUFACTURER SELECTED AND MAY DIFFER FROM SIZES AND ROUTING SHOWN ON DRAWINGS. CONTRACTOR SHALL PROVIDE PIPING SIZED BY SELECTED MANUFACTURER REQUIREMENTS TO ENSURE PROJECT GOALS ARE MET, AT NO ADDITIONAL COST TO THE CITY.



G-4

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

> GENERAL PROCESS SCHEMATIC AND DESIGN CRITERIA

WBS <u>B-21001</u> ENGINEERING AND CAPITAL PROJECTS
SHEET 04 OF 52 SHEETS FOR/CITY/ENGINEER ANTHONY VAN 5/10/2022 PROJECT MANAGER

CITY OF SAN DIEGO, CALIFORNIA

CONTRACTOR

MARTIN & LIBBY

STRUCTURAL ENGINEERS
4452 Glocier Avenue, Son Diego, CA 92120
Ph (619) 280–9307 F (619) 284–3533

CONSULTANT

Stantec

Brown ANI Caldwell

DESCRIPTION ORIGINAL ВC ADDENDUM A

ALICE ALTES
PRINT DCE NAME C68286 RCE# REYNALDO NOVENCIDO DATE FILMED APPROVED PROJECT ENGINEER 5/10/22 282-1737 CCS27 COORDINATE 922444-6298407 CCS83 COORDINATE NPT DATE 40933-04-D NOC DATE

DEFERRED SUBMITTALS

- PLANS FOR THE DEFERRED SUBMITTAL ITEMS LISTED BELOW SHALL BE SUBMITTED TO THE CITY OF SAN DIEGO IN A TIMELY MANNER BUT NOT LESS THAN 30 BUSINESS DAYS PRIOR TO INSTALLATION. ALL COMMENTS RELATED TO THE DEFERRED SUBMITTAL MUST BE ADDRESSED TO THE SATISFACTION OF THE BUILDING DEPARTMENT PRIOR TO APPROVAL.
 - A. APPROXIMATELY($||'-0|'\rangle(W) \times (|4'-9|')(L) \times 8'-0|'(H)$ EQUIPMENT COVER CONSTRUCTED OF STRUCTURAL AND/OR LIGHT-GAUGE STEEL MEMBERS WITH WATERTIGHT STANDING-SEAM METAL ROOF MATCHING PUMP STATION ARCHITECTURE. COVER SHALL BE ANCHORED ON WEST SIDE TO THE EXISTING CONCRETE BUILDING AND BE SUPPORTED BY NEW COLUMNS AND FOUNDATIONS ON EAST
- 2. PRIOR TO COMPLETE DESIGN CONTRACTOR SHALL SUBMIT PRELIMINARY PLANS THAT INCLUDE STRUCTURE DIMENSIONS, LOCATION, AND MATERIALS TO E.O.R. FOR REVIEW AND COMMENT.
- 3. DEFERRED SUBMITTALS SHALL BE SUBMITTED TO E.O.R. FOR REVIEW PRIOR TO SUBMITTAL TO BUILDING DEPARTMENT AND SHALL INCLUDE LOADS APPLIED TO THE EXISTING STRUCTURE.
- 4. CONTRACTOR IS RESPONSIBLE FOR SUBMITTING DEFERRED ITEMS TO E.O.R. AND BUILDING DEPARTMENT.

SOILS CONDITION & FOUNDATION

- I. THE DESIGN IS BASED UPON:
 - A. THE ALLOWABLE SOIL BEARING PRESSURE IS 2000 P.S.F. AT A MINIMUM OF 12" BELOW LOWEST ADJACENT PAD GRADE FOR DEAD PLUS LIVE LOADS. ALL SOIL PRESSURE VALUES MAY BE INCREASED BY为WHEN CONSIDERING TRANSIENT LOADS DUE TO WIND OR SEISMIC FORCES.
 - B. A SOIL PASSIVE PRESSURE OF 150 P.S.F. PER FOOT OF DEPTH.
 - C. A SLIDING COEFFICIENT OF 0.25.
- 2. FOOTING ELEVATIONS SHOWN ARE FOR BIDDING PURPOSES ONLY AND ARE ASSUMED TO BE IN SUITABLE BEARING MATERIALS. THE ACTUAL ADEQUACY OF THE BEARING MATERIAL SHALL BE DETERMINED BY A REPRESENTATIVE OF THE GEOTECHNICAL ENGINEER PRIOR TO PLACING OF REINFORCING OR POURING OF CONCRETE. AND FOOTING ELEVATIONS SHALL BE ADJUSTED. OR OTHER REMEDIAL ACTION TAKEN, AS DIRECTED BY THIS REPRESENTATIVE AND APPROVED BY THE OWNER AND THE ENGINEER.
- 3. IF THE BUILDING INSPECTOR SUSPECTS EXPANSIVE SOILS BASED ON OBSERVATION OF THE FOUNDATION EXCAVATION. HE MAY REQUIRE SOIL EXPANSION INDEX TESTS.
- 4. CONTRACTOR SHALL PROVIDE FOR PROPER DEWATERING OF EXCAVATIONS FROM SURFACE WATER, GROUND WATER. SEEPAGE. ETC.
- 5. FOOTING BACKFILL AND UTILITY TRENCH BACKFILL WITHIN THE BUILDING PERIMETER SHALL BE MECHANICALLY COMPACTED IN LAYERS, TO THE APPROVAL OF THE GEOTECHNICAL ENGINEER. FLOODING WILL NOT BE PERMITTED.

CONCRETE

- ALL CONCRETE SHALL BE NORMAL WEIGHT, 150 P.C.F. U.O.N. USE I-INCH NOMINAL AGGREGATE WITH WATER/CEMENT RATIO NOT TO EXCEED 0.50.
- 2. CONCRETE STRENGTHS:

STRENGTH ITEM OF SLUMP CONSTRUCTION (P.S.I.) (INCHES) MAX

EQUIPMENT PADS 4,000 4

3. CONCRETE PROTECTION FOR REINFORCEMENT. THE FOLLOWING MINIMUM CONCRETE COVER SHALL BE PROVIDED FOR REINFORCEMENT:

MIN COVER (INCHES)

- A. CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH:......3
- B. CONCRETE EXPOSED TO EARTH OR WEATHER:
- C. CONCRETE NOT EXPOSED TO WEATHER OR IN CONTACT WITH GROUND:

SLABS. WALLS

BEAMS, COLUMNS PRIMARY REINFORCEMENT.

- 4. ANCHOR BOLTS AND DOWELS: SECURELY HELD IN PLACE PRIOR TO PLACING CONCRETE.
- PIPES. DUCTS. VENTS AND SIMILAR OPENINGS ARE NOT PERMITTED UNLESS SHOWN ON THE STRUCTURAL DRAWINGS.
- CHAMFER: 3/4" ON ALL EXPOSED CORNERS.
- 7. THE ENGINEER SHALL BE NOTIFIED 2 WORK DAYS IN ADVANCE OF ALL CONCRETE PLACEMENT.
- FORMS FOR CONCRETE SHALL BE LAID OUT AND CONSTRUCTED TO PROVIDE THE SPECIFIED CAMBERS SHOWN ON THE DRAWINGS.
- 9. THE CONCRETE THICKNESS SHALL BE MAINTAINED UNLESS OTHERWISE SHOWN.
- CEMENT SHALL BE ASTM CI50 TYPE II OR TYPE V. USE TYPE V CEMENT AND CONCRETE COMPLYING WITH ACI 318 SECTION 19.3.2 WHEN CONCRETE IS EXPOSED TO SOILS CONTAINING SULFATES.
- CONTRACTOR SHALL SUBMIT CONCRETE MIX DESIGNS TO THE ENGINEER FOR REVIEW (AND APPROVAL) PRIOR & TO PLACING CONCRETE.
- 12. WHERE CONTINUOUS BARS ARE CALLED OUT. PROVIDE TIED CONTACT SPLICES AS REQUIRED. STAGGER SPLICES OF ALTERNATE BARS BY THE FULL SPLICE LENGTH.
- 13. CONCRETE MIXES MAY CONTAIN FLY ASH. THE FLY ASH SHALL CONFORM TO ASTM C618 CLASS F AND THE LOSS OF IGNITION SHALL BE LIMITED TO 2%. THE ADDITION RATE SHALL NOT EXCEED 15% OF THE CEMENT WEIGHT. THE CONTRACTOR SHALL SUBMIT ALL CERTIFICATES SHOWING THE FLY ASH CONFORMS TO THE ABOVE CRITERIA.

CONCRETE (CONTINUED)

- 14. AGGREGATE FOR HARD ROCK CONCRETE SHALL CONFORM TO ALL REQUIREMENTS AND TESTS OF ASTM C33 AND PROJECT SPECIFICATIONS. EXCEPTIONS MAY BE USED ONLY WITH PERMISSION OF THE STRUCTURAL ENGINEER.
- 15. CONSTRUCTION JOINTS IN FOUNDATIONS SHALL BE RAISED TO MINIMUM 1/4" AMPLITUDE. ALL LAITANCE SHALL BE REMOVED AT THE CONSTRUCTION JOINT AND CONCRETE SURFACES SHALL BE MOISTENED TO A SATURATED SURFACE DRY CONDITION PRIOR TO PLACING CONCRETE OVER THE CONSTRUCTION JOINT.
- 16. LOCATION OF ALL CONSTRUCTION, CONTROL AND WEAKENED PLANE JOINTS NOT SPECIFICALLY SHOWN ON THE DRAWINGS SHALL BE REVIEWED BY THE ENGINEER PRIOR TO PLACING REBAR.
- 17. 3/4" TO I" DIAMETER CONDUIT PENETRATIONS THROUGH SLABS ARE PERMITTED BUT MUST BE SPACED NO CLOSER THAN 3 DIAMETERS ON CENTER AND ARE LIMITED TO PENETRATIONS IN A ISQUARE FOOT AREA. ADJACENT AREAS OF PENETRATIONS SHALL BE A MINIMUM OF 4 FEET APART CLEAR. PENETRATIONS SHALL NOT INTERRUPT REINF (FIELD LOCATE EXISTING REINF AS NEEDED).

REINFORCING STEEL

- REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF ASTM A615 GRADE 60.
- 2. ALL BARS SHALL BE DEFORMED BARS U.O.N.
- 3. VERTICAL REINFORCEMENT SHALL BE DOWELED TO THE SUPPORTING MEMBERS WITH THE SAME SIZE AND SPACING OF REINFORCEMENT AS CALLED FOR IN THE DRAWINGS OR STANDARD NOTES.
- 4. WELDING OF REINFORCEMENT IS NOT PERMITTED.
- 5. SPACER TIES: FURNISH #3 TIES AT 24" O.C. IN ALL BEAMS AND FOOTINGS, UNLESS OTHERWISE SHOWN IN DETAILS.

DRILLED IN ANCHORS AND BARS

- ALL ANCHORS SHALL BE ICC APPROVED.
- 2. ALL ANCHORS SHALL BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURER'S APPROVED RESEARCH REPORT. SUBSTITUTIONS ARE REQUIRED TO BE REVIEWED BY THE ENGINEER TO A SIMILAR ACCEPTABLE PERFORMANCE IN ACCORDANCE WITH THE APPROPRIATE ICC-ES REPORT.



- 3. DRILLED IN ADHESIVE ANCHORS FOR CONCRETE SHALL
 - HILTI HIT-RE 500 V3+HAS B7 . ESR-3814
- 4. UNLESS OTHERWISE SHOWN, PROVIDE A MINIMUM OF 6×DIAMETER EDGE DISTANCES AND 12×DIAMETER SPACING OF ANCHORS.
- 5. FOR EXTERIOR USE DRILLED IN ANCHORS AND THREADED ROD ASSEMBLIES SHALL BE STAINLESS STEEL.
- 6. DRILLED IN ANCHORS SHALL NOT BE INSTALLED IN CONCRETE OR MASONRY THAT HAS NOT REACHED THE SPECIFIED 28 DAY STRENGTH.
- 7. SPECIAL INSPECTION IN ACCORDANCE WITH CHAPTER 17 OF THE CBC MUST BE PROVIDED FOR ALL ANCHOR INSTALLATIONS. THE SPECIAL INSPECTOR MUST BE ON THE JOBSITE DURING ANCHOR INSTALLATION TO VERIFY ANCHOR TYPE. ANCHOR DIMENSIONS, CONCRETE TYPE. CONCRETE COMPRESSIVE STRENGTH, HOLE DIMENSIONS, HOLE CLEANING PROCEDURES, ANCHOR SPACING, EDGE DISTANCES, CONCRETE THICKNESS, ANCHOR EMBEDMENT, AND TIGHTENING TORQUE. THE SPECIAL INSPECTOR MUST VERIFY THE INSTALLATIONS OF EACH TYPE AND SIZE OF ADHESIVE ANCHOR BY CONSTRUCTION PERSONNEL ON SITE.

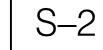
CONSULTANT

Stantec

Brown AND Caldwell

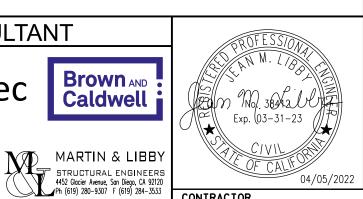
GROUT FOR COLUMN/EQUIPMENT BASES

- GROUT SHALL BE NON-SHRINK TYPE CONFORMING TO ASTM CIIO7 WITH A 28 DAY COMPRESSION STRENGTH EQUAL TO 7000 P.S.I. MINIMUM.
- 2. GROUTING PROCEDURES, INCLUDING PREPARATION, MIXING, PLACING AND CURING, SHALL BE AS RECOMMENDED BY THE MANUFACTURER OF THE GROUT.
- DATA FOR GROUT SHALL BE SUBMITTED FOR APPROVAL. PRODUCT SHALL BE SPECIFICALLY DESIGNED FOR THE USE AND PROCEDURES PROPOSED.
- 4. GROUT SHALL NOT CONTAIN METALLIC AGGREGATES AND SHALL BE FREE OF AGENTS THAT PRODUCE OR RELEASE GAS, BE FREE OF OXIDIZING CATALYSTS AND BE FREE OF INORGANIC ACCELERATORS.
- GROUT SHALL BE FORMED USING WATER-TIGHT FORMS.
- 6. USE GROUT UNDER EQUIPMENT SUPPORT PLATES (MAX THICKNESS = I") IF NEEDED PER MFR DISCRECTION/RECOMMENDATION.



PENASQUITOS PUMP STATION OXYGENATION SYSTEM

STRUCTURAL GENERAL NOTES



ALICE ALTES DESCRIPTION ORIGINAL A\ ADDENDUM A

WBS <u>B-21001</u> ENGINEERING AND CAPITAL PROJECTS
SHEET 9 OF 52 SHEETS 5/10/2022 ANTHONY VAN PROJECT MANAGER C68286 EYNALDO NOVENCIDO DATE FILMED APPROVED PROJECT ENGINEER BC 5/10/22 Thin Itter 282-1737 M&L 8/18/22 CCS27 COORDINATE Alin Itte 1922444-6298407 CCS83 COORDINATE NPT DATE 40933-09-D

CITY OF SAN DIEGO, CALIFORNIA

ADJUSTED DEFERRED SUBMITTAL EQUIPMENT COVER SIZE, ADDED "APPROVAL" TO CONCRETE NOTE II, AND DELETED DRILLED IN AHCORS AND BARS NOTE 3, CHANGE TOTAL NUMBER OF SHEETS.

ADDENDUM A

A. EQUIPMENT PADS.

- 2. STRUCTURAL OBSERVATION IS REQUIRED IN ADDITION TO CITY AND SPECIAL INSPECTIONS.
- 3. STRUCTURAL OBSERVATION MEANS THE VISUAL OBSERVATION OF THE STRUCTURAL SYSTEM BY THE S.E.O.R. OR ASSIGNED AGENT, FOR GENERAL CONFORMATION TO THE APPROVED PLANS AND SPECIFICATIONS, AT SIGNIFICANT CONSTRUCTION STAGES FOR THE ITEMS LISTED AND AT COMPLETION OF THE STRUCTURAL SYSTEM. STRUCTURAL OBSERVATION DOES NOT INCLUDE OR WAIVE THE RESPONSIBILITY FOR THE INSPECTIONS REQUIRED BY CHAPTER 17 OR OTHER SECTIONS OF THE CBC.
- 4. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO REQUEST STRUCTURAL OBSERVATION BY THE ENGINEER. THE ENGINEER SHALL BE GIVEN A MINIMUM OF 2 WORK DAYS NOTICE BY THE CONTRACTOR PRIOR TO PERFORMING STRUCTURAL OBSERVATION.

SPECIAL INSPECTIONS AND TESTS

- I. THE SPECIAL INSPECTIONS AND TESTS LISTED ARE IN ADDITION TO THE CALLED INSPECTIONS AND TESTS REQUIRED BY CHAPTER 17 OF THE CBC, AS AMENDED. SPECIAL INSPECTION IS NOT A SUBSTITUTE FOR INSPECTION BY A CITY INSPECTOR.
- 2. CONTINUOUS INSPECTION IS ALWAYS REQUIRED DURING THE PERFORMANCE OF THE WORK UNLESS OTHERWISE SPECIFIED. WHEN WORK IN MORE THAN ONE CATEGORY OF WORK REQUIRING SPECIAL INSPECTION IS TO BE PERFORMED SIMULTANEOUSLY, OR THE GEOGRAPHIC LOCATION OF THE WORK IS SUCH THAT IT CANNOT BE CONTINUOUSLY OBSERVED IN ACCORDANCE WITH THE PROVISIONS OF CBC CHAPTER 17, IT IS THE AGENT'S RESPONSIBILITY TO EMPLOY A SUFFICIENT NUMBER OF INSPECTORS TO ASSURE THAT ALL THE WORK IS INSPECTED IN ACCORDANCE WITH THOSE PROVISIONS.
- 3. THE SPECIAL INSPECTORS MUST BE CERTIFIED BY THE CITY OF SAN DIEGO TO PERFORM THE TYPE OF INSPECTION SPECIFIED. EXCEPTIONS:
 - A. SOILS INSPECTIONS BY THE SOILS ENGINEER OF RECORD.
 - B. WHEN WAIVED BY THE BUILDING OFFICIAL.
- 4. THE CONSTRUCTION MATERIALS TESTING LABORATORY MUST BE APPROVED BY THE CITY OF SAN DIEGO, DEVELOPMENT SERVICES, FOR TESTING OF MATERIALS, SYSTEMS. COMPONENTS AND EQUIPMENT.
- 5. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE SPECIAL INSPECTOR OR INSPECTION AGENCY AT LEAST TWO WORKING DAYS PRIOR TO PERFORMING ANY WORK THAT REQUIRES SPECIAL INSPECTION.
- 6. SPECIALLY INSPECTED WORK THAT IS INSTALLED OR COVERED WITHOUT THE APPROVAL OF THE CITY INSPECTOR IS SUBJECT TO REMOVAL OR EXPOSURE.
- 7. THE SPECIAL INSPECTOR SHALL SUBMIT IN WRITING A REPORT OF SPECIAL INSPECTIONS AND TESTS TO THE BUILDING OFFICIAL AND TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE.
- 8. THE INSPECTOR SHALL REPORT IN ADVANCE THEIR ASSIGNMENT TO THE CITY OF SAN DIEGO INSPECTION SERVICES DIVISION.

SPECIAL INSPECTIONS AND TESTS (CONTINUED)

- 9. A CERTIFICATE OF SATISFACTORY COMPLETION OF WORK REQUIRING SPECIAL INSPECTION MUST BE COMPLETED AND SUBMITTED TO THE INSPECTION SERVICES DIVISION.
- IO. AN APPLICATION FOR OFF-SITE FABRICATION MUST BE SUBMITTED TO THE INSPECTION SERVICES DIVISION FOR APPROVAL PRIOR TO FABRICATION.
- II. A CERTIFICATE OF COMPLIANCE FOR OFF-SITE FABRICATION MUST BE COMPLETED AND SUBMITTED TO THE INSPECTION SERVICES DIVISION PRIOR TO ERECTION OF PREFABRICATED COMPONENTS.
- 12. SPECIAL INSPECTOR SHALL BE HIRED BY THE OWNER (CBC SECTION 1704).
- 13. REQUIRED VERIFICATION, TESTING, QUALIFICATION AND/OR SPECIAL INSPECTION OF ELEMENTS AND NONSTRUCTURAL COMPONENTS OF BUILDINGS AND STRUCTURES SHALL BE IN ACCORDANCE WITH FOLLOWING:
 - A. CONCRETE CONSTRUCTION: CBC SECTION 1705.3 AND TABLE 1705.3.
 - I. MATERIAL TESTS: CBC SECTION 1705.3.2 AND ACI 318 CH 19 & 20.
 - 2. POST-INSTALLED ANCHORS: TABLE 1705.3. A A ADHESIVE ANCHORS
- 14. CONTRACTOR OR CONSTRUCTION MANAGER SHALL PROVIDE A WRITTEN STATEMENT ACKNOWLEDGING SPECIAL INSPECTIONS, STATING QUALITY CONTROL PROCEDURES INCLUDING METHOD, FREQUENCY & DISTRIBUTION OF REPORTS. THE STATEMENT SHALL ALSO IDENTIFY INDIVIDUALS EXERCISING CONTROL INCLUDING QUALIFICATIONS AND POSITION IN ORGANIZATION. THIS SHALL BE SUBMITTED PRIOR TO THE START OF WORK.

REQUIRED VERIFICATION, SPECIAL INSPECTIONS AND TESTS OF CONCRETE CONSTRUCTION (CDC TABLE 1705 3)

(CBC TABLE 1705.3)						
VERIFICATION AND INSPECTION TASK	CONTINUOUS	PERIODIC	REFERENCED STANDARD	IBC REFERENCE		
I. INSPECT REINFORCEMENT AND VERIFY PLACEMENT.	-	X	ACI 318 CH 20,25.2, 25.3, 26.5.1- 26.5.3	1908.4		
2. INSPECT ANCHORS CAST IN CONCRETE.	-	Х	ACI 318: 17.8.2	-		
3. INSPECT ANCHORS POST-INSTALLED IN HARDENED CONCRETE MEMBERS. ^Q Q. ADHESIVE ANCHORS INSTALLED IN HORIZONTALLY OR UPWARDLY INCLINED ORIENTATIONS TO RESIST SUSTAINED TENSION LOADS. b. MECHANICAL ANCHORS AND ADHESIVE ANCHORS NOT DEFINED IN 3.Q.	X	X	ACI 318: 17.8.2.4 ACI 318: 17.8.2	-		
4. VERIFYING USE OF REQUIRED DESIGN MIX.	-	X	ACI 318: CH 19, 26.4.3, 26.4.4	1904.1 1904.2 1908.2 1908.3		

SPECIAL INSPECTIONS AND TESTS (CONTINUED)

REQUIRED VERIFICATION. SPECIAL INSPECTIONS AND TESTS OF CONCRETE CONSTRUCTION (CBC TABLE 1705.3)

VERIFICATION AND INSPECTION TASK	CONTINUOUS	PERIODIC	REFERENCED STANDARD	IBC REFERENCE
5. PRIOR TO CONCRETE PLACEMENT, FABRICATE SPECIMENS FOR STRENGTH TESTS, PERFORM SLUMP AND AIR CONTENT TESTS, AND DETERMINE THE TEMPERATURE OF THE CONCRETE.	X	-	ASTM CI72 ASTM C3I ACI 318: 26.4.5, 26.12	1908.10
6. VERIFY MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES.	_	x	ACI 318: 26.4.7- 26.4.9	1908.9
7. INSPECT FORMWORK FOR SHAPE, LOCATION AND DIMENSIONS OF THE CONCRETE MEMBER BEING FORMED.	-	X	ACI 318: 26.10.1(b)	-

a. SPECIFIC REQUIREMENTS FOR SPECIAL INSPECTION SHALL BE INCLUDED IN THE RESEARCH REPORT FOR THE ANCHOR ISSUED BY AN APPROVED SOURCE IN ACCORDANCE WITH 17.8.2. IN ACI 318, OR OTHER QUALIFICATION PROCEDURES. WHERE SPECIFIC REQUIREMENTS ARE NOT PROVIDED, SPECIAL INSPECTION REQUIREMENTS SHALL BE SPECIFIED BY THE REGISTERED DESIGN PROFESSIONAL AND SHALL BE APPROVED BY THE BUILDING OFFICIAL PRIOR TO THE COMMENCEMENT OF THE WORK.

REQUIRED VERIFICATION, SPECIAL INSPECTIONS AND TESTS OF SOILS (CBC TABLE 1705.6)

VERIFICATION AND INSPECTION TASK	CONTINUOUS	PERIODIC
I. VERIFY MATERIALS BELOW SHALLOW FOUNDATIONS ARE ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY.	-	x
2. VERIFY EXCAVATIONS ARE EXTENDED TO PROPER DEPTH AND HAVE REACHED PROPER MATERIAL.	-	Х
3. PERFORM CLASSIFICATION AND TESTING OF COMPACTED FILL MATERIALS.	-	X
4. VERIFY USE OF PROPER MATERIALS, DENSITIES AND LIFT THICKNESSES DURING PLACEMENT AND COMPACTION OF COMPACTED FILL.	X	-
5. PRIOR TO PLACEMENT OF COMPACTED FILL, INSPECT SUBGRADE AND VERIFY THAT SITE HAS BEEN PREPARED PROPERLY.	-	Х

ABBREVIATIONS

EXT

EXTERIOR

^	ANID	EDN.	FOUND A TION	D.0	DIEGE
&	AND	FDN	FOUNDATION	PC	PIECE
@	ΑT	F.F.	FINISHED FLOOR	P.C.F.	POUNDS PER
A.B.	ANCHOR BOLT	FIN	FINISH(ED)		CUBIC FOOT
ABV	ABOVE	FLR	FLOOR	PL	PLATE
ADDL	ADDITIONAL	F.O.	FACE OF	P.L.F.	POUNDS PER
ALT	ALTERNATE	F.O.C.	FACE OF		LINEAR FOOT
APPROX	APPROXIMATE		CONCRETE	PNL	PANEL
ARCH	ARCHITECT	F.S.	FAR SIDE	P.S.F.	POUNDS PER
AITCII	(URAL)	FT	FOOT	1	SQUARE FOOT
A D T				D.C.I	
ART	ARTICLE	FTG	FOOTING	P.S.I.	POUNDS PER
A.T.R.	ALL-THREAD-	F.V.	FIELD VERIFY		SQUARE INCH
	ROD				
		GA	GAUGE (GAGE)	R	RADIUS
BLDG	BUILDING	GALV	GALVANIZE(D)	REF	REFERENCE
BLW	BELOW	GRD	GRADE	REINF	REINFORCE(ING)
ВМ	BEAM				(MENT)
BRG	BEARING	H.D.G.	HOT DIPPED	REQD	REQUIRED
BTM (B)	BOTTOM		GALVANIZED		
BTWN	BETWEEN	HDR	HEADER	SCHED	SCHEDULE(D)
DIWIN	DLIWLLIN				
CDC	CALIFORNIA	HGR	HANGER	SECT	SECTION
CBC	CALIFORNIA	HHCS	HEX HEAD CAP	S.E.O.R.	STRUCTURAL
	BUILDING CODE		SCREWS		ENGINEER OF
C.F.	CUBIC FEET	HORIZ (H)	HORIZONTAL		RECORD
C.I.P.	CAST IN PLACE	нТ	HEIGHT	SHT	SHEET
C.J.	CONSTRUCTION			SIM	SIMILAR
	JOINT	I.C.C.	INTERNATIONAL	S.O.G.	SLAB ON
C.L.	CENTER LINE		CODE COUNCIL		GRADE
CLR	CLEAR(ANCE)	IN	INCH(ES)	SPCG	SPACING
CNTR	CENTER(ED)	INT	INTERIOR	SPEC	SPECIFICATION
COL	COLUMN	·		SQ	SQUARE
CONC	CONCRETE	JT	JOINT	S.S.	STAINLESS
CONN	CONNECT(ION)	01	OONT	J.J.	STEEL
COMM		1	LONG (LENGTH)	CTD	
CONCT	(OR)	L	LONG (LENGTH)	STD	STANDARD
CONST	CONSTRUCT(ION)	LB	POUND	STGR	STAGGER(ED)
CONT	CONTINUOUS	Ld	DEVELOPMENT	STIFF	STIFFEN(ER)
C.Y.	CUBIC YARD(S)		LENGTH	STIR	STIRRUP
		L.L.H.	LONG LEG	STL	STEEL
DBL	DOUBLE		HORIZONTAL	STRUCT	STRUCTURAL
DEPT	DEPARTMENT	L.L.V.	LONG LEG	SYMM	SYMMETRICAL
DIA	DIAMETER		VERTICAL		
DIAG	DIAGONAL	LONGIT	LONGITUDINAL	T (T)	TOP
DWG	DRAWING	LTWT	LIGHTWEIGHT	T&B	TOP &
DWL	DOWEL				ВОТТОМ
2		MATL	MATERIAL	T.O.C.	TOP OF CURB
EA	EACH	MAX	MAXIMUM	THK	THICK(NESS)
E.F.	EACH FACE	MECH	MECHANICAL	THRD	THREAD(ED)
	EXPANSION	MFR	MANUFACTURER	T.O.	TOP OF
E.J.					
- .	JOINT	MIN	MINIMUM	T.O.C.	TOP OF
EL	ELEVATION	MISC	MISCELLANEOUS		CONCRETE
ELEC	ELECTRICAL	M.P.H.	MILES PER	T.O.F.	TOP OF
EMBED	EMBED(ED)		HOUR		FOOTING
	(MENT)	MTL	METAL	T.O.P.	TOP OF
EQ	EQUAL				PARAPET
EQUIP	EQUIPMENT	(N)	NEW	T.O.S.	TOP OF STEEL
E.S.	EACH SIDE	N.I.C.	NOT IN	TOT	TOTAL
E.W.	EACH WAY		CONTRACT	T.O.W.	TOP OF WALL
EXIST (E)	EXISTING	NLG	NAILING	TRANS	TRANSVERSE
EXP	EXPANSION	NO (#)	NUMBER	TYP	TYPICAL
	EXTERIOR	N. C	NEAD CIDE		- -

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

ULTIMATE

OTHERWISE

WIDTH (WIDE)

<

<

NOTED

WITH

YARD

WITHOUT WEIGHT

U.O.N. UNLESS

VERT (V) VERTICAL

W/0

YD

STRUCTURAL GENERAL NOTES

CITY OF SAN DIEGO, CALIFORNIA

Stantec Brown AND Caldwell MARTIN & LIBBY

STRUCTURAL ENGINEER:
4452 Glorier Avenue, San Diego, CA 92122
Ph (619) 280-9307 F (619) 284-3533

NEAR SIDE

ON CENTER

OUTSIDE

OPENING

OPPOSITE

DIAMETER

NOT TO SCALE

OPPOSITE HAND

N.T.S.

0.C.

0.D.

0.H.

CONSULTANT

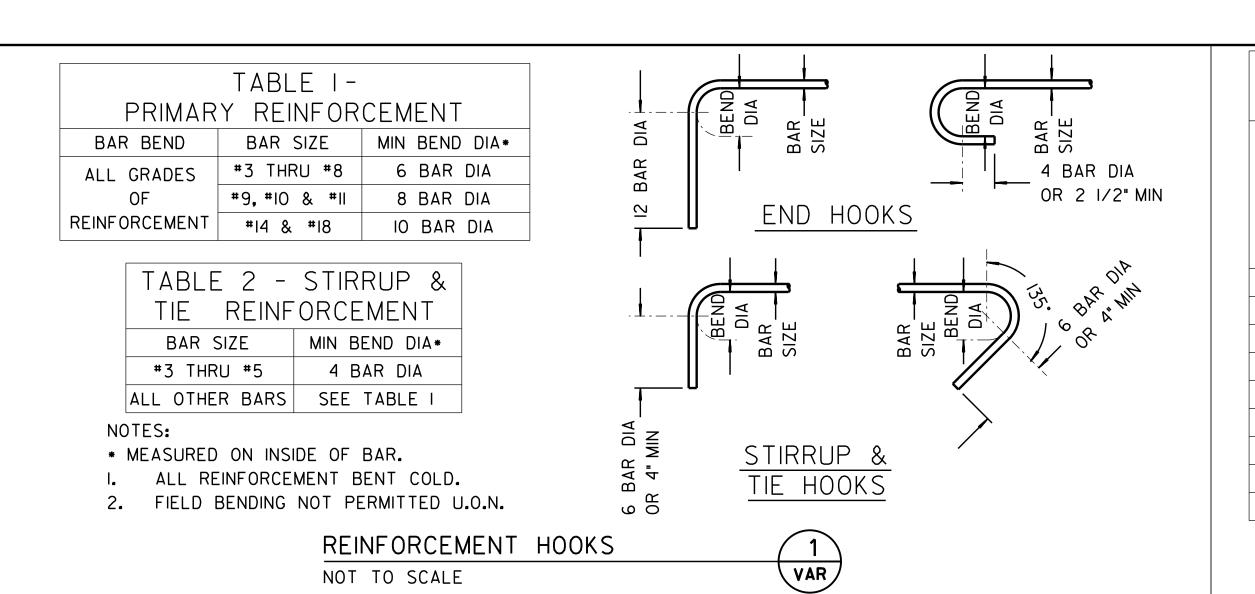
OPNG

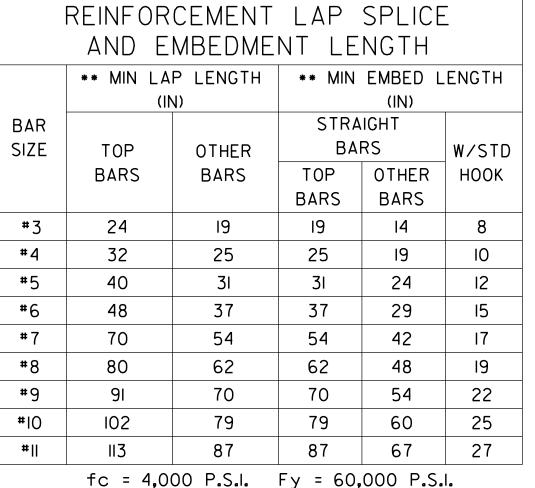
ENGINEERING AND CAPITAL PROJECTS
SHEET 10 OF 52 SHEETS ALICE ALTES DESCRIPTION ORIGINAL BC M&L A ADDENDUM A

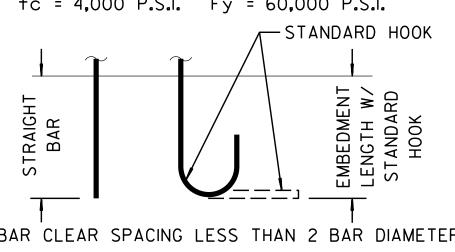
5/10/2022 ANTHONY VAN PROJECT MANAGER <u>C68286</u> EYNALDO NOVENCIDO DATE FILMED APPROVED PROJECT ENGINEER 5/10/22 Pein Ittes 282-1737 8/18/22 Hein Itte CCS27 COORDINATE 1922444-6298407 CCS83 COORDINATE NPT DATE 40933-10-D NOC DATE

WBS <u>B-21001</u>

S-3







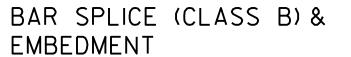
** FOR BAR CLEAR SPACING LESS THAN 2 BAR DIAMETER, ADD 50%.

NOTES:

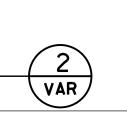
I. MIN LAP ALL BARS CLASS 'B' UNLESS OTHERWISE NOTED.

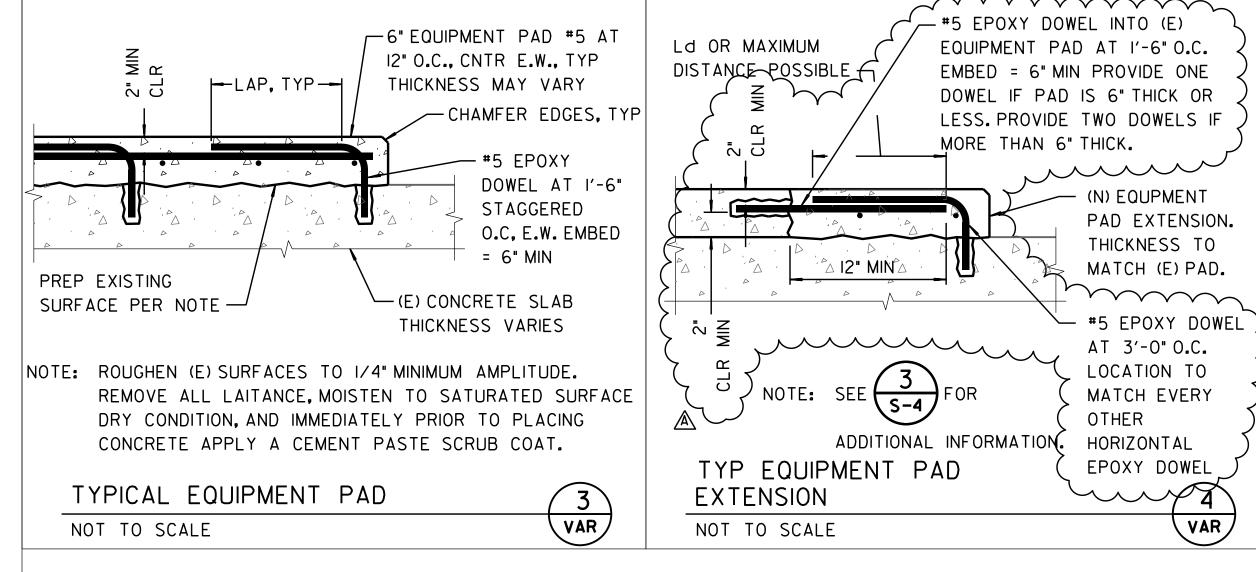
2. STAGGER LAP OF HORIZONTAL WALL BARS.

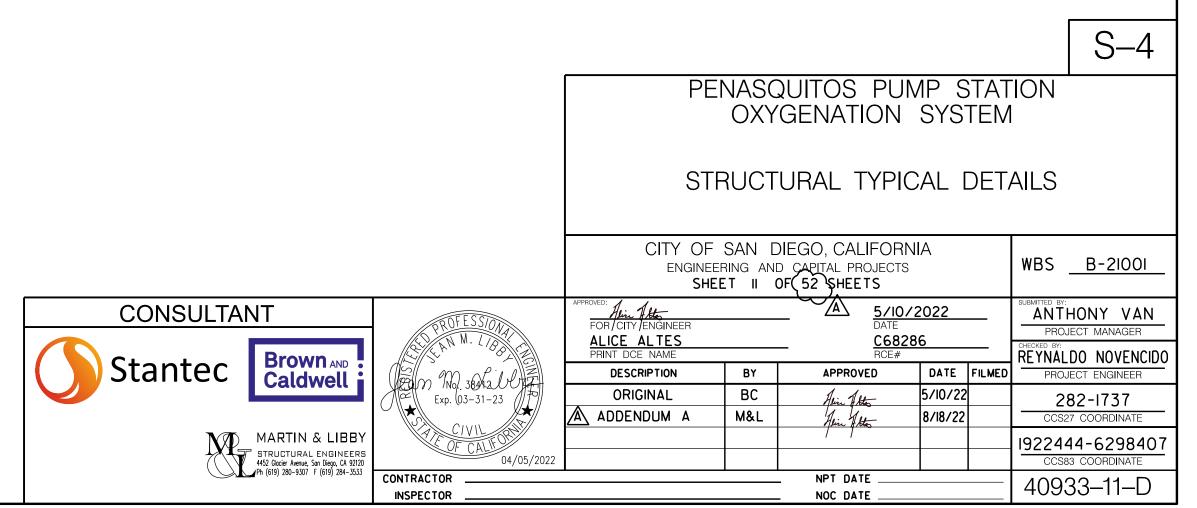
3. TOP BARS ARE HORIZONTAL BARS W/MORE THAN 12" DEPTH OF CONCRETE CAST BELOW THE REINFORCEMENT. MULTIPLE HORIZONTAL BARS IN A SINGLE VERTICAL PLAN SUCH AS COLUMN TIES OR HORIZONTAL BARS IN WALLS ARE NOT TOP BARS.



NOT TO SCALE



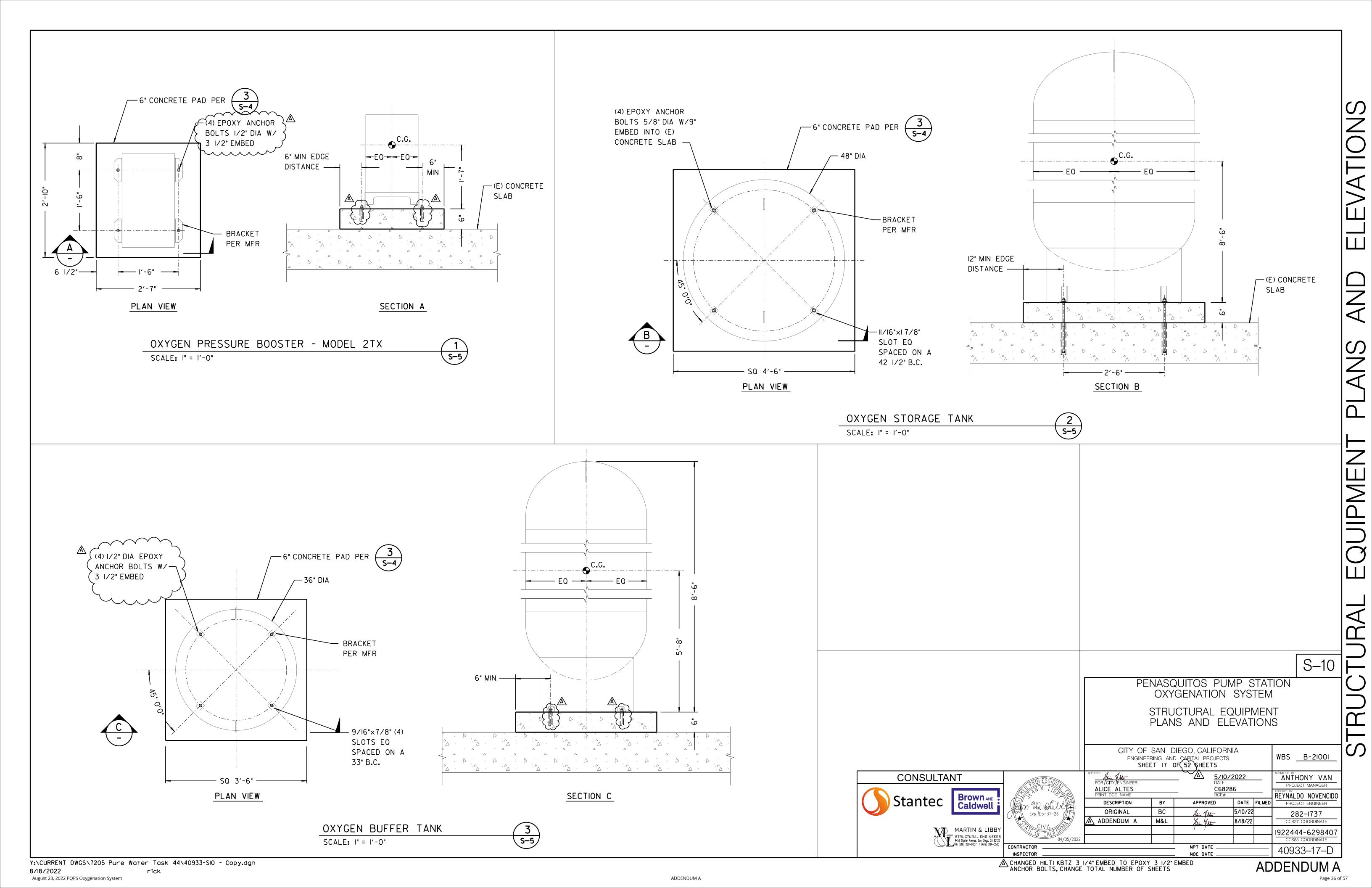


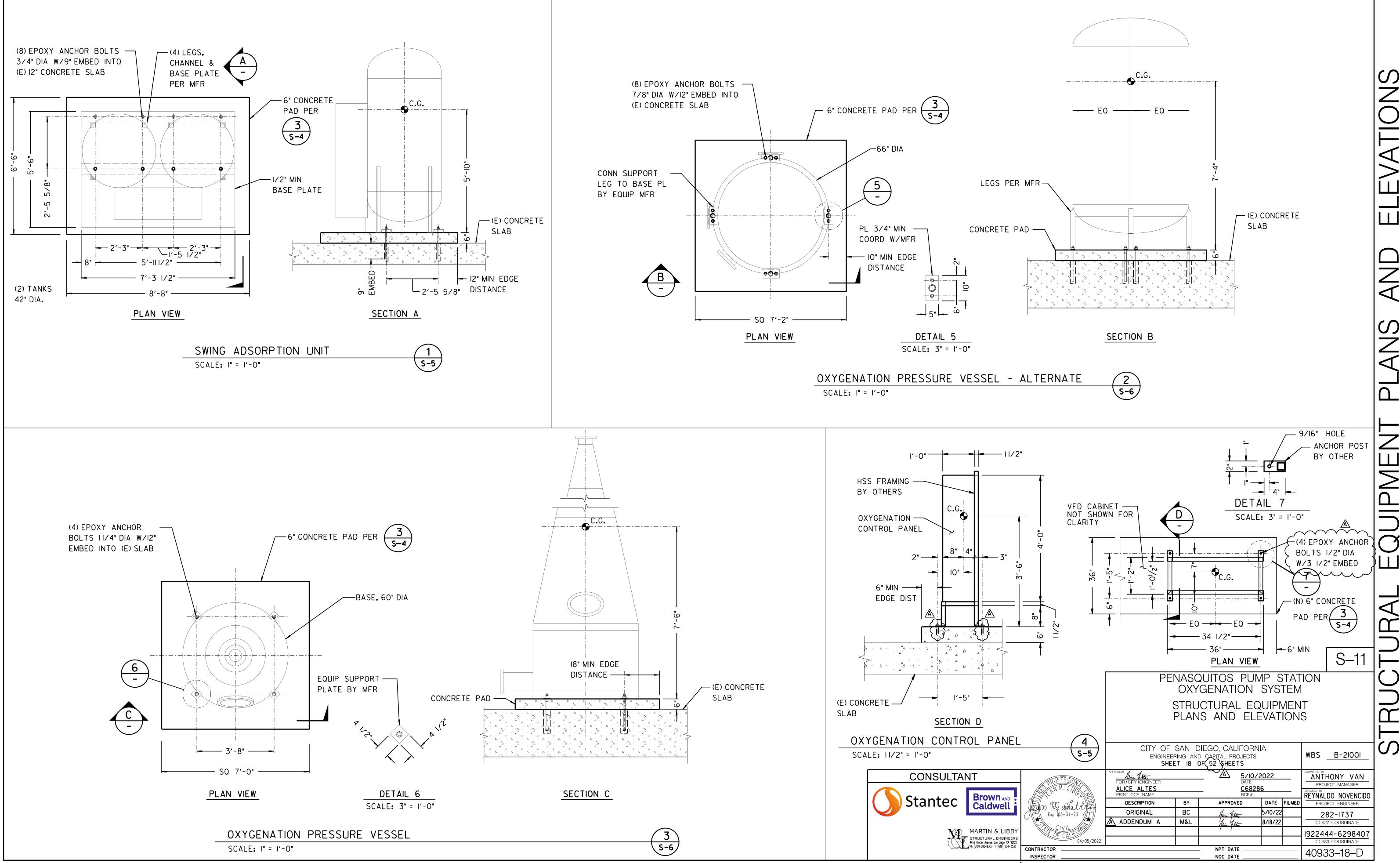


Y:\CURRENT DWGS\7205 Pure Water Task 44\40933-S04 - Copy.dgn 8/18/2022

August 23, 2022 PQPS Oxygenation System

A CLARIFIED DOWEL PLACEMENT IN DETAIL 4. CHANGE TOTAL NUMBER OF SHEETS





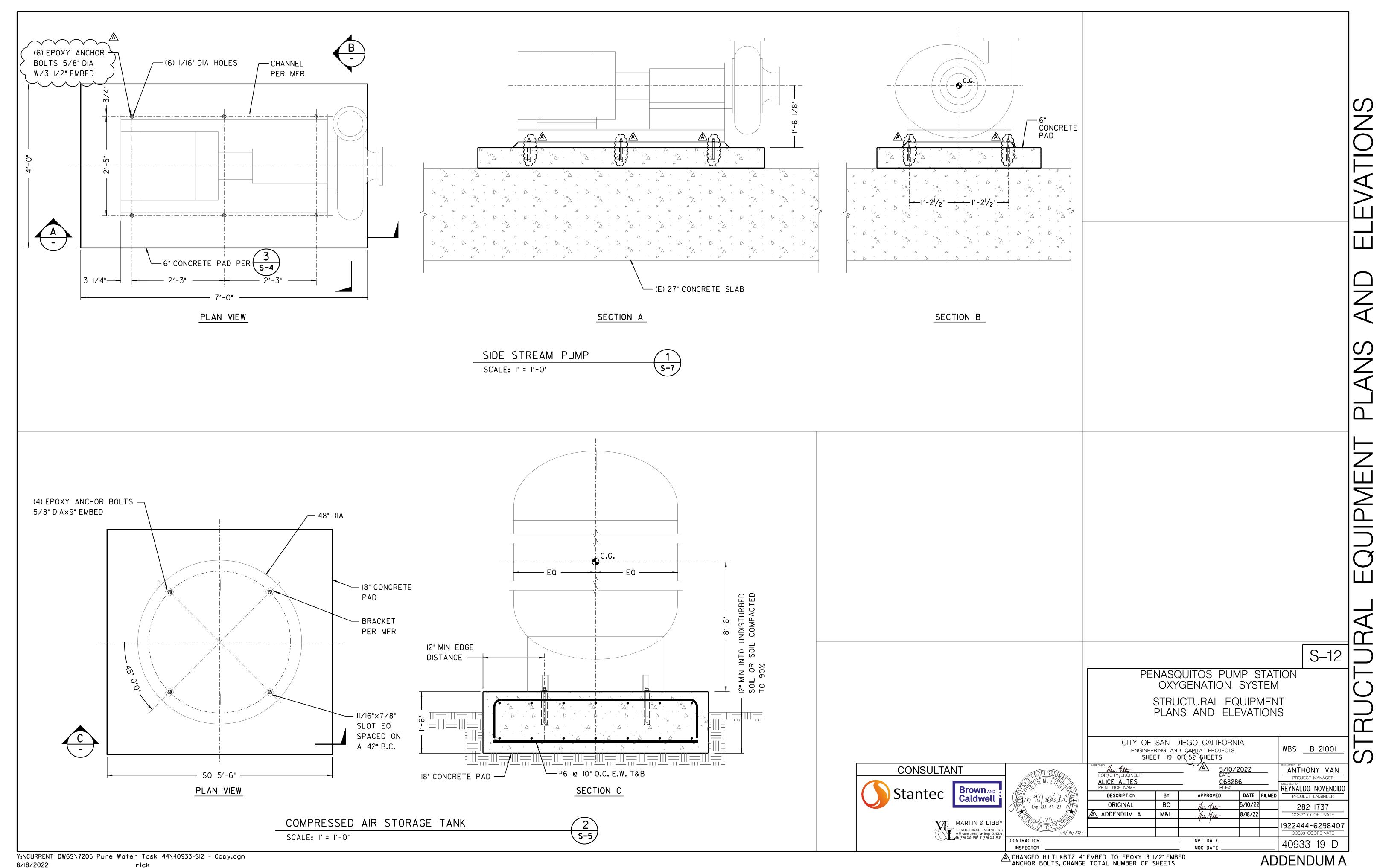
Y:\CURRENT DWGS\7205 Pure Water Task 44\40933-SII- Copy.dgn 8/18/2022 rick
August 23, 2022 PQPS Oxygenation System

ADDENDUM A

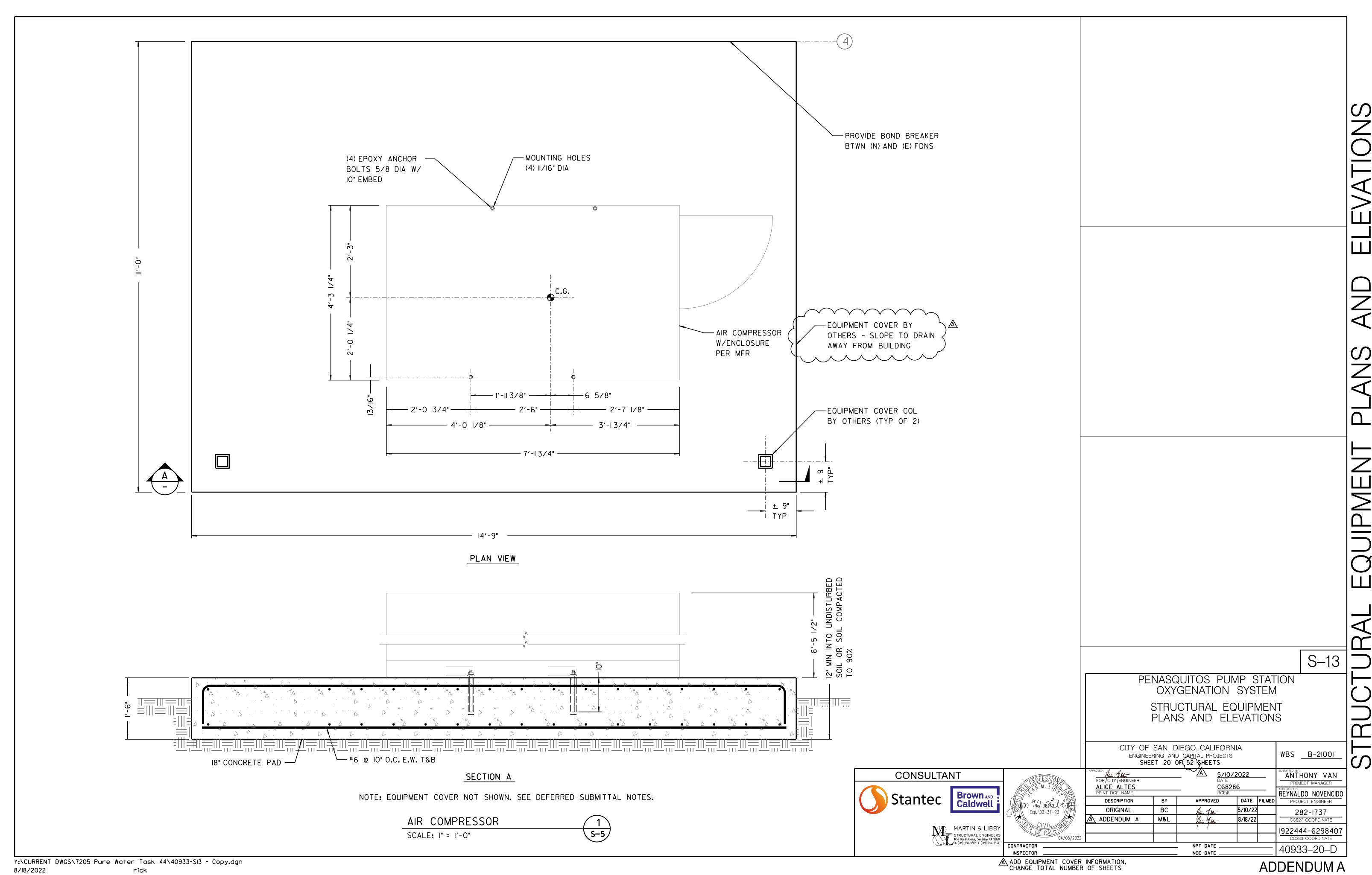
ANCHOR BOLTS, CHANGE TOTAL NUMBER OF SHEETS

ADDENDUM A

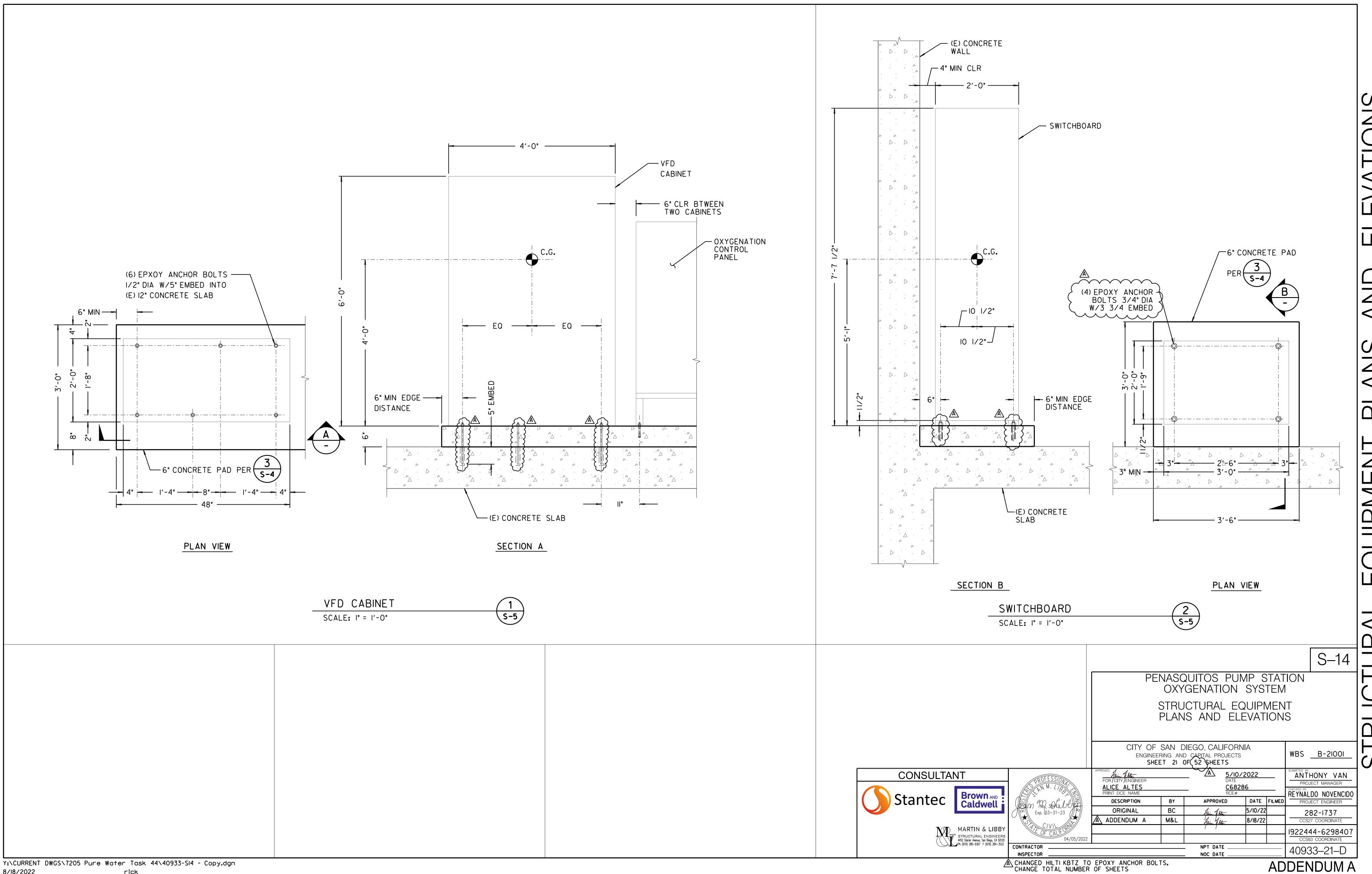
ADDENDUM A



8/18/2022 August 23, 2022 PQPS Oxygenation System

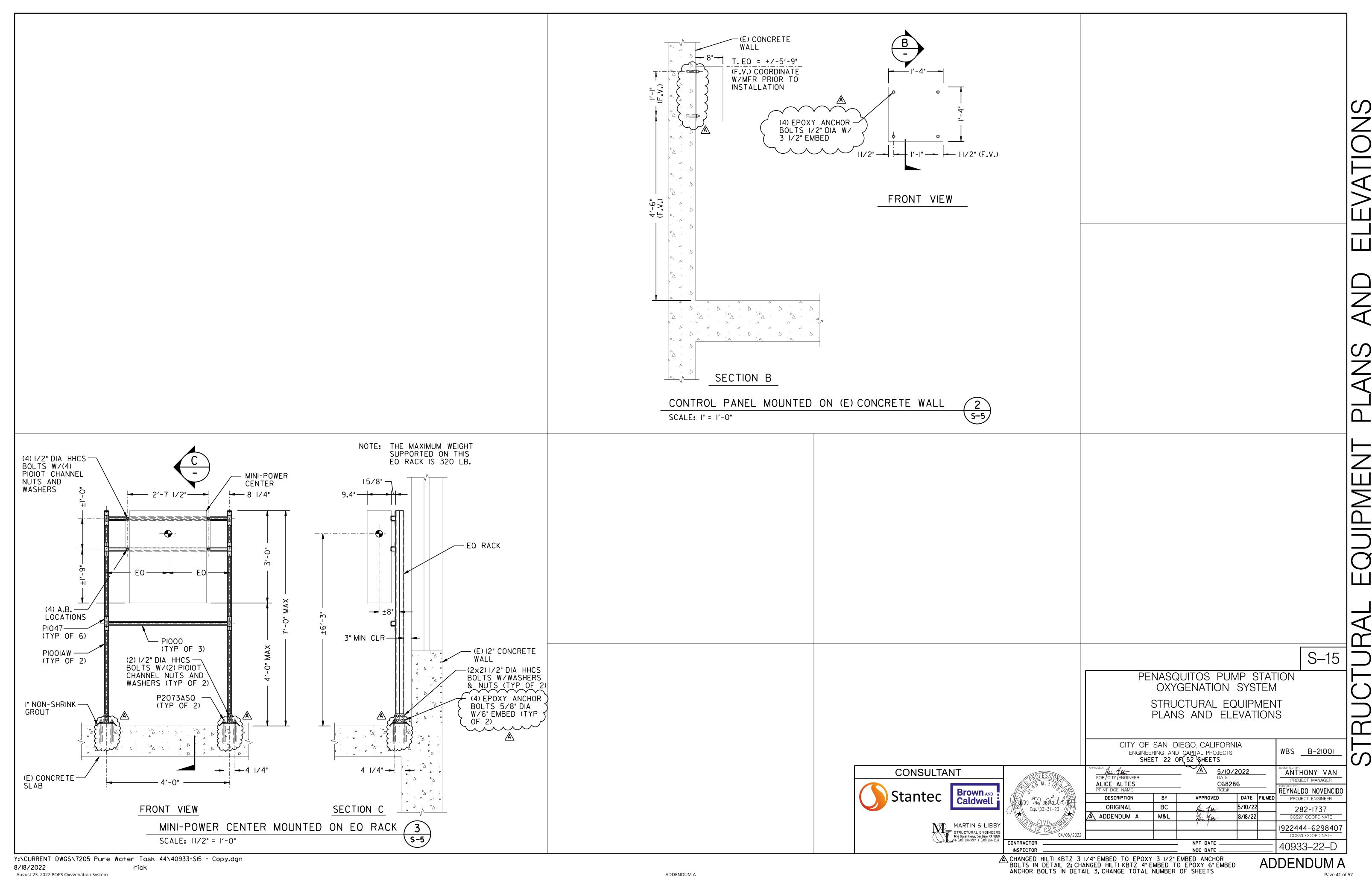


8/18/2022 August 23, 2022 PQPS Oxygenation System

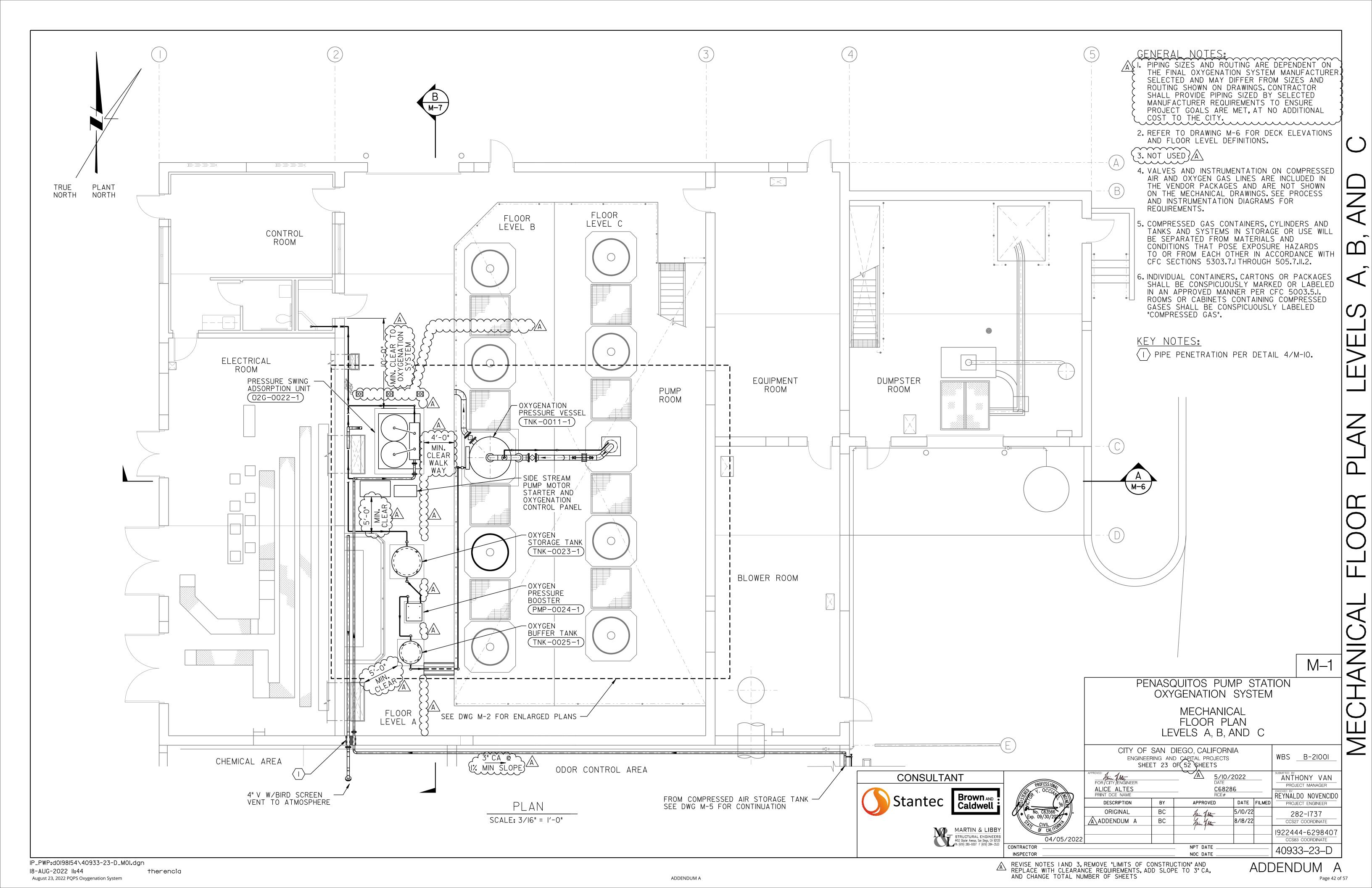


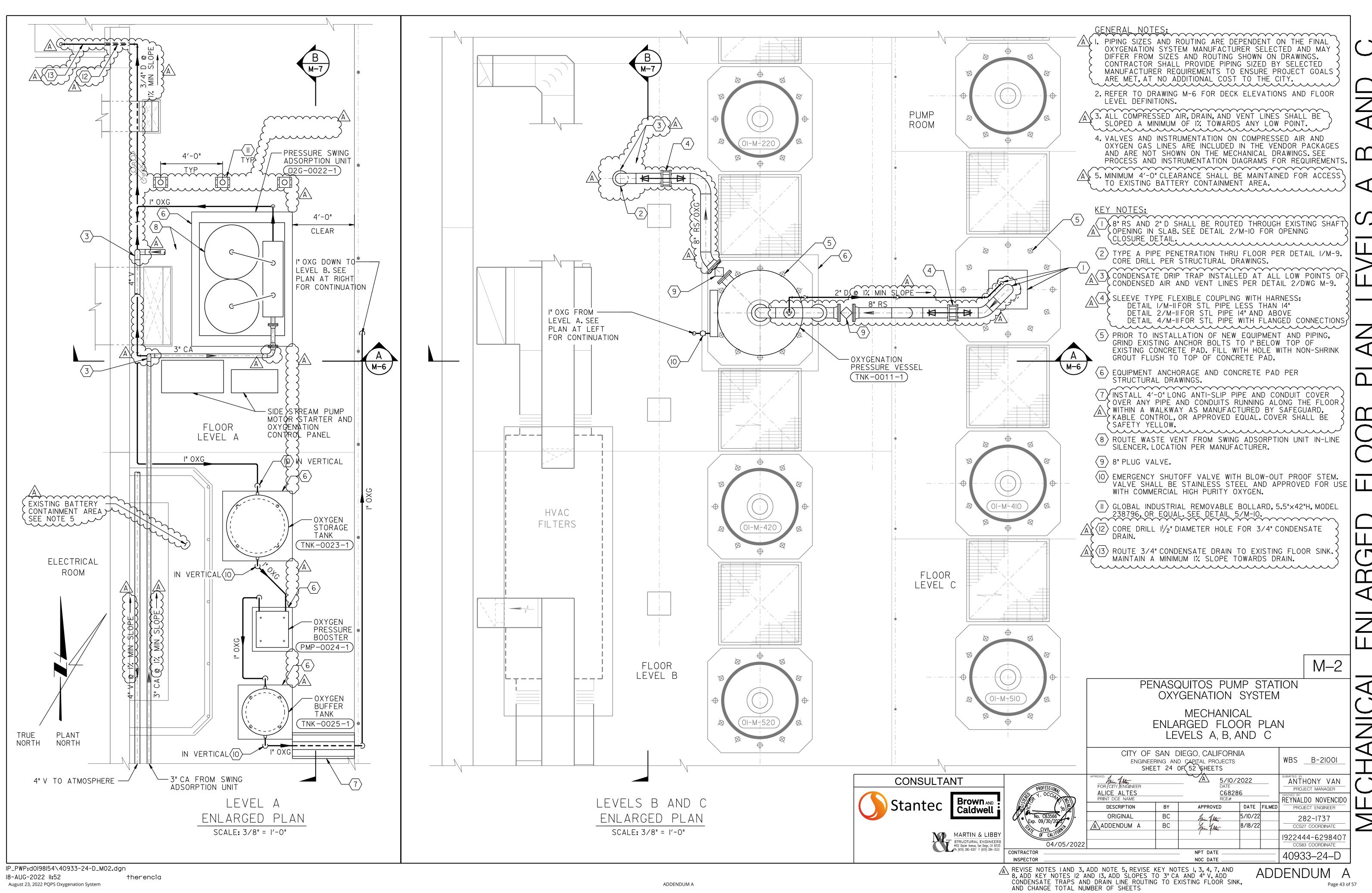
Y:\CURRENT DWGS\7205 Pure Water Task 44\40933-SI4 - Copy.dgn 8/18/2022 August 23, 2022 PQPS Oxygenation System

CHANGED HILTI KBTZ TO EPOXY ANCHOR BOLTS, CHANGE TOTAL NUMBER OF SHEETS



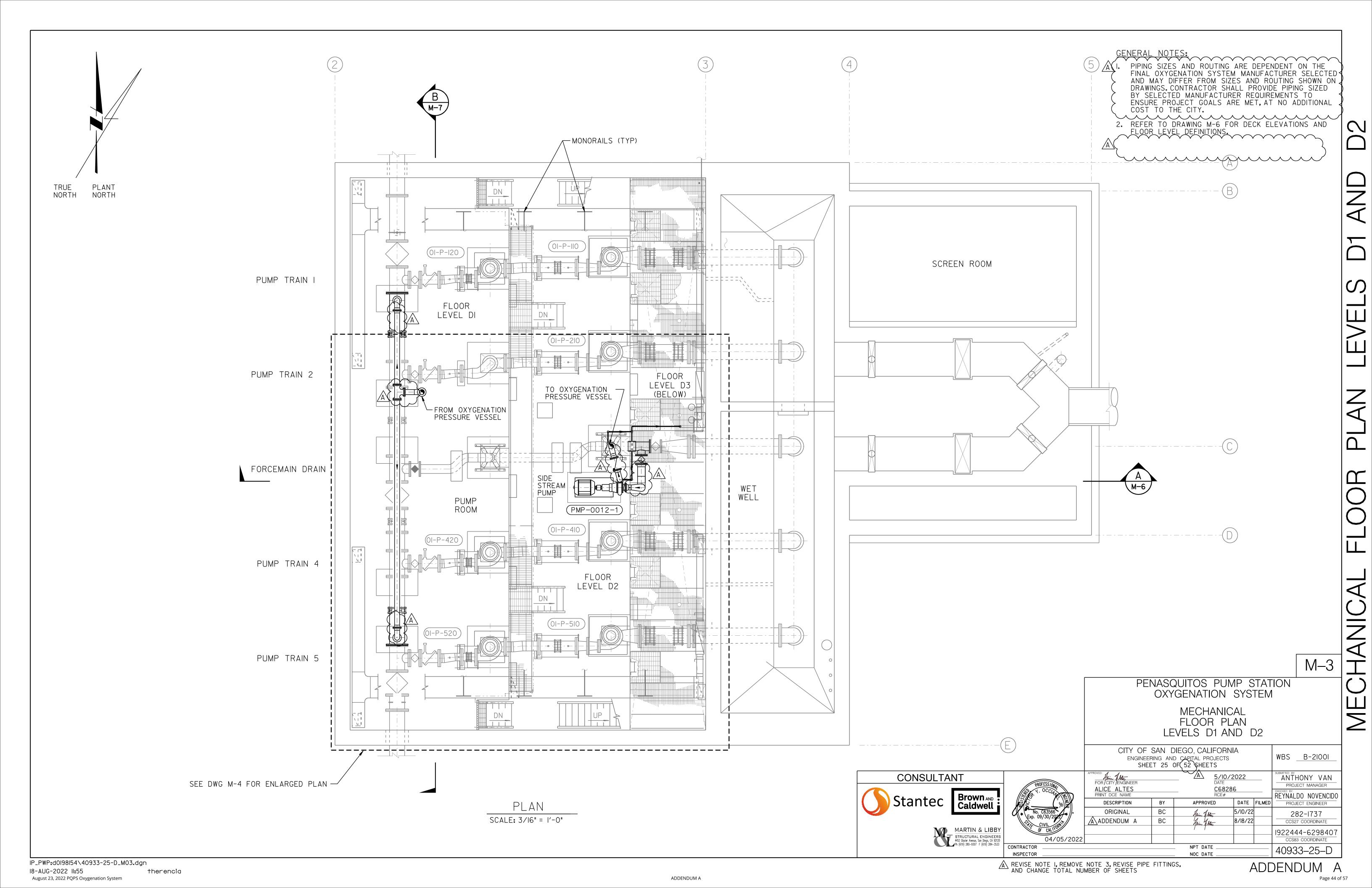
8/18/2022 August 23, 2022 PQPS Oxygenation System

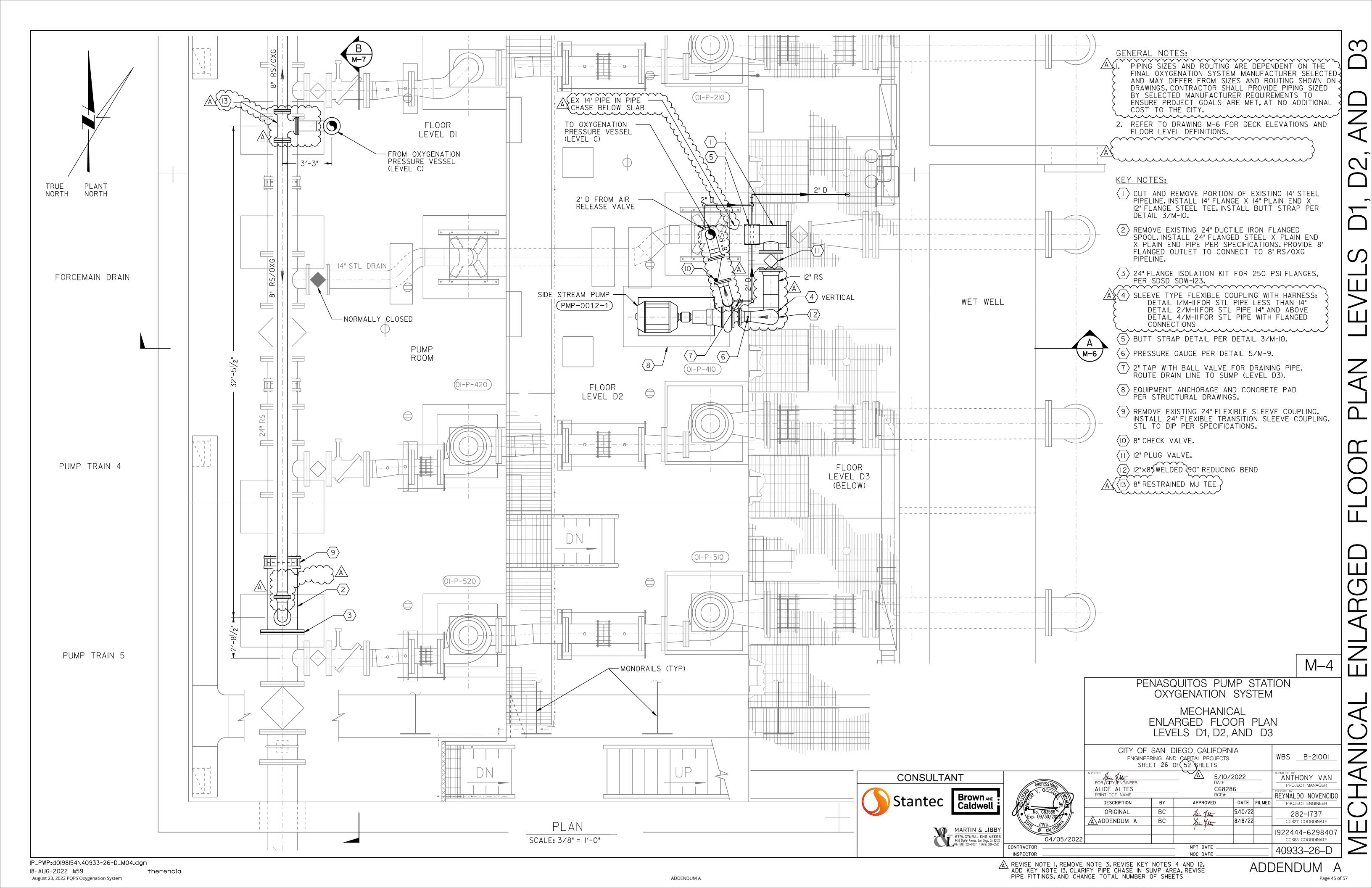


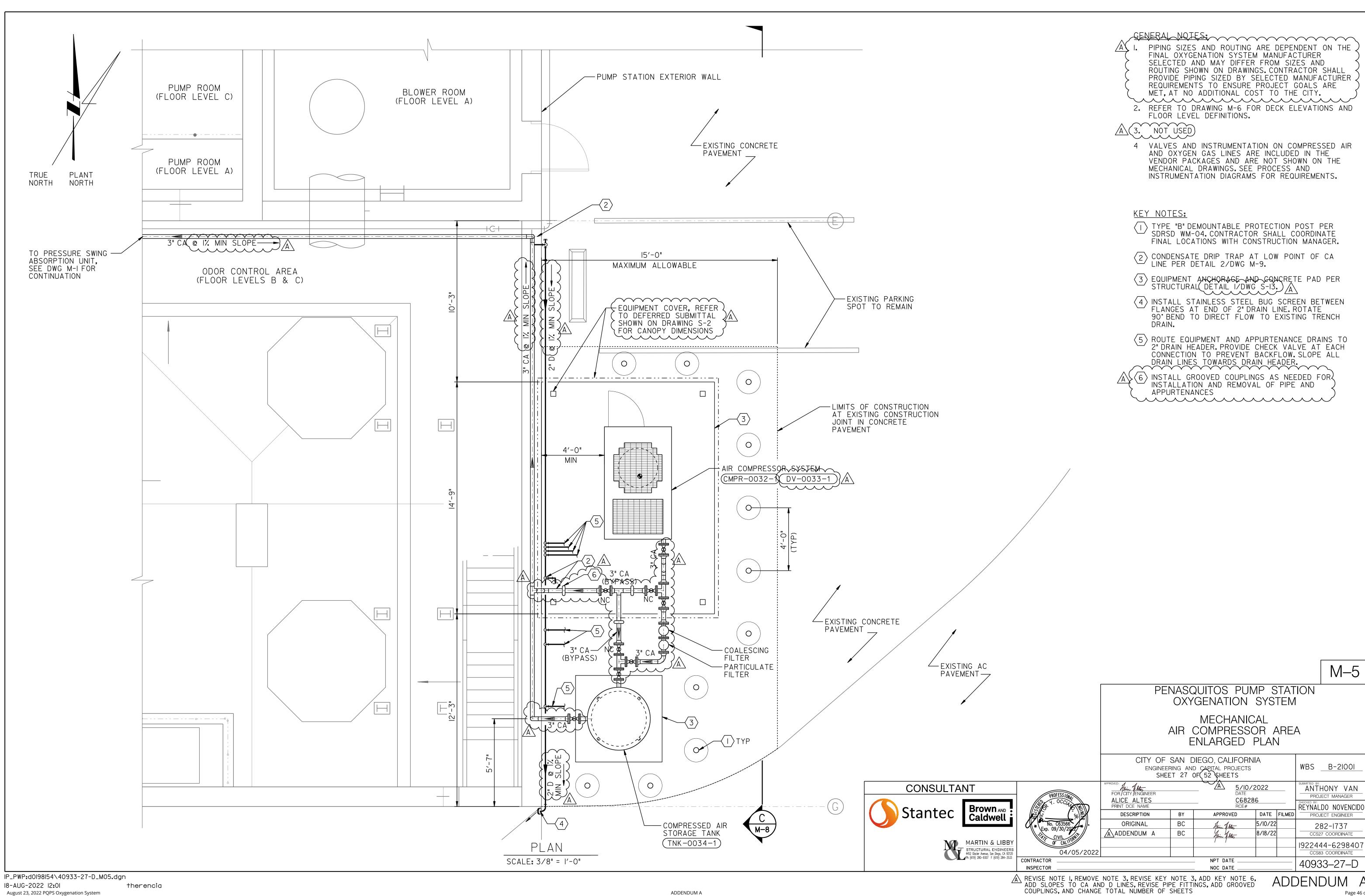


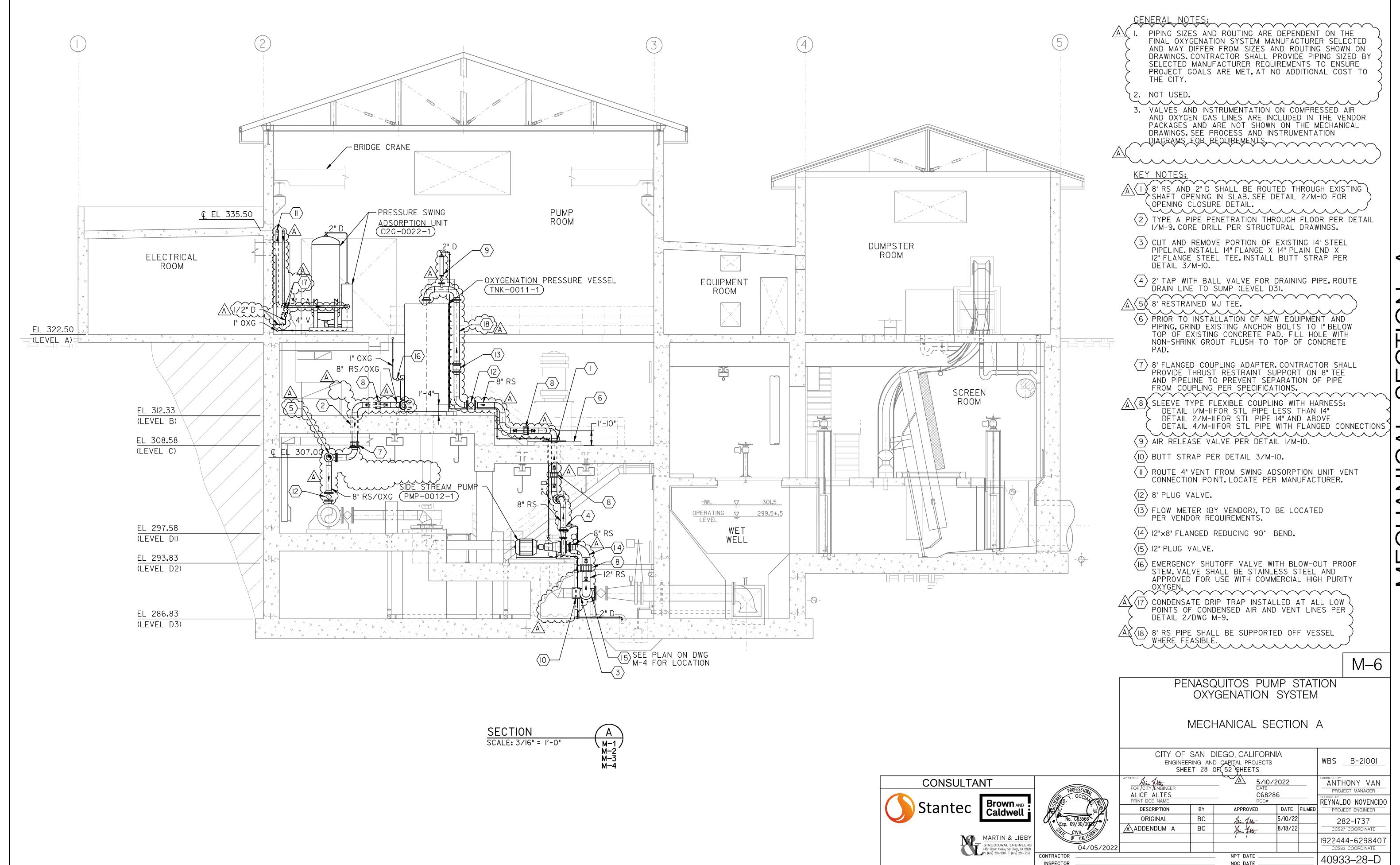
Page 43 of 57

August 23, 2022 PQPS Oxygenation System



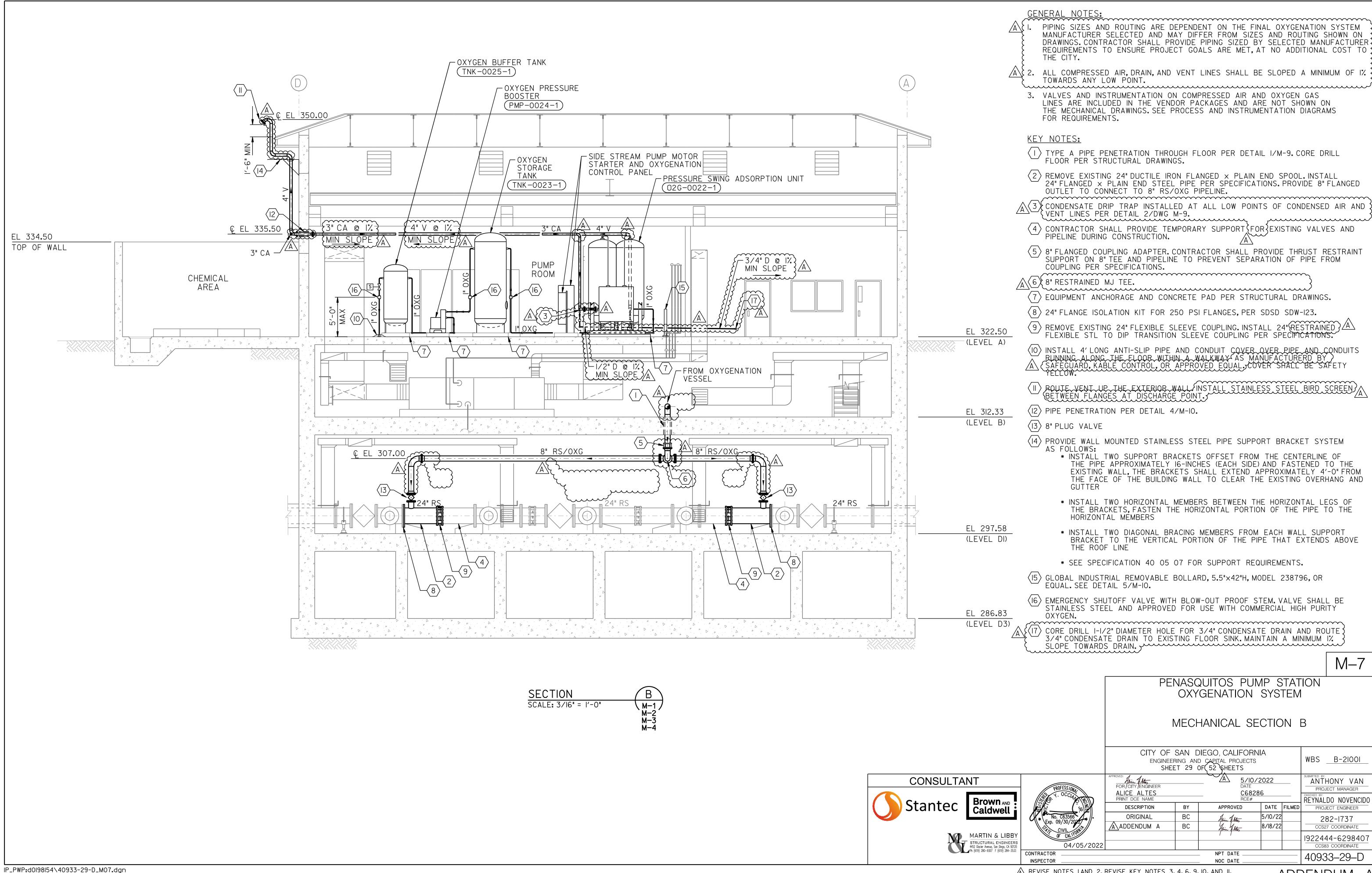






IP_PWP:d0I98I54\40933-28-D_M06.dgn 18-AUG-2022 12:04 therencia August 23, 2022 PQPS Oxygenation System

NOC DATE



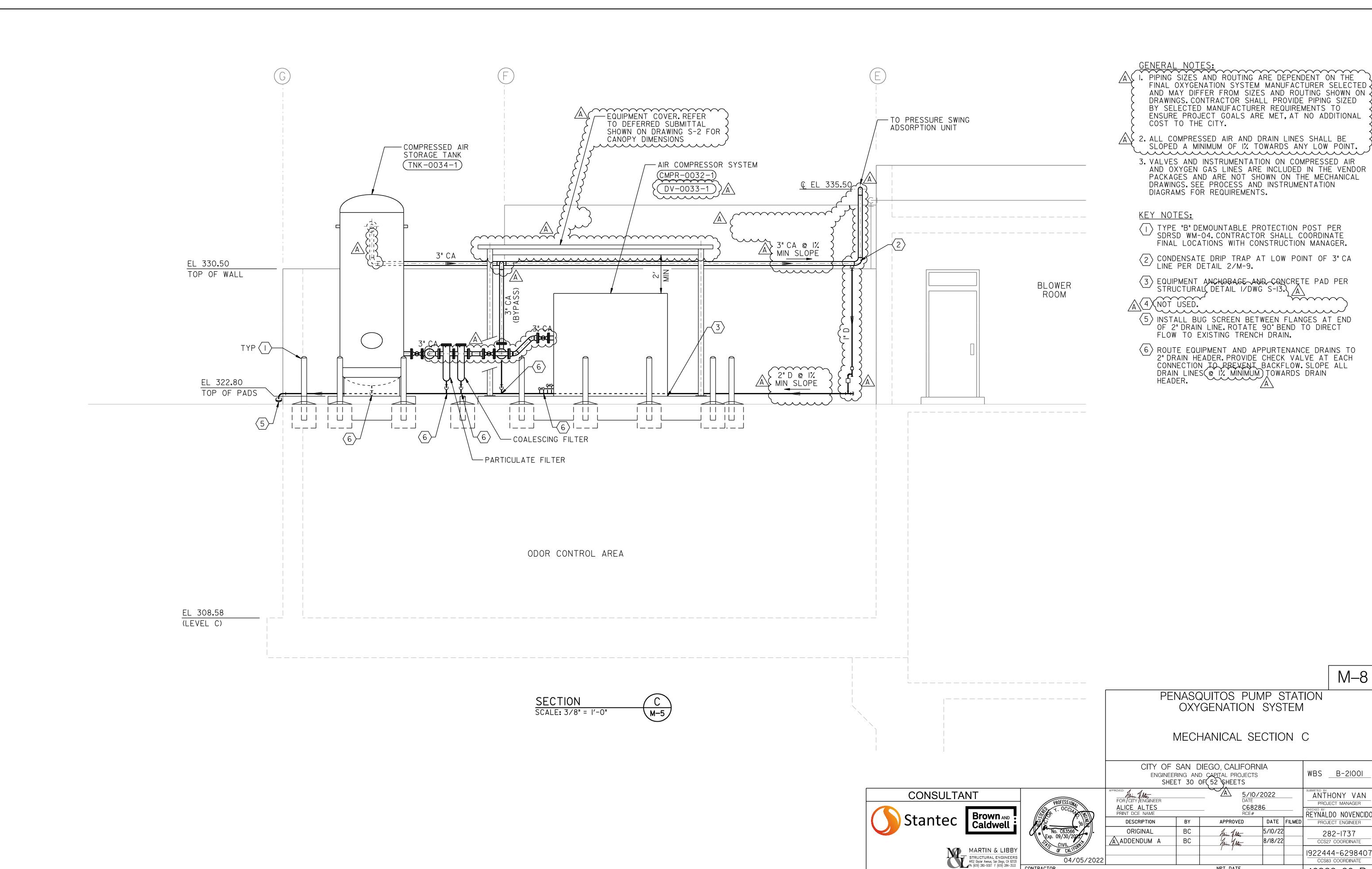
REVISE NOTES LAND 2, REVISE KEY NOTES 3, 4, 6, 9, 10, AND II, ADD KEY NOTE 17, ADD SLOPES TO 3" CA AND 4" V, REVISE PIPE FITTINGS, ADD CONDENSATE TRAPS AND DRAIN LINE ROUTING TO EXISTING FLOOR SINK, AND CHANGE TOTAL NUMBER OF SHEETS

18-AUG-2022 12:07

August 23, 2022 PQPS Oxygenation System

therencia

8–M



REVISE NOTES LAND 2, REVISE KEY NOTES 3, 4, AND 6, ADD SLOPES TO CA AND D LINES, REVISE PIPE FITTINGS, AND CHANGE TOTAL NUMBER OF SHEETS

CONTRACTOR

ADDENDUM Page 49 of 57

NPT DATE

NOC DATE

282-1737

40933-30-D

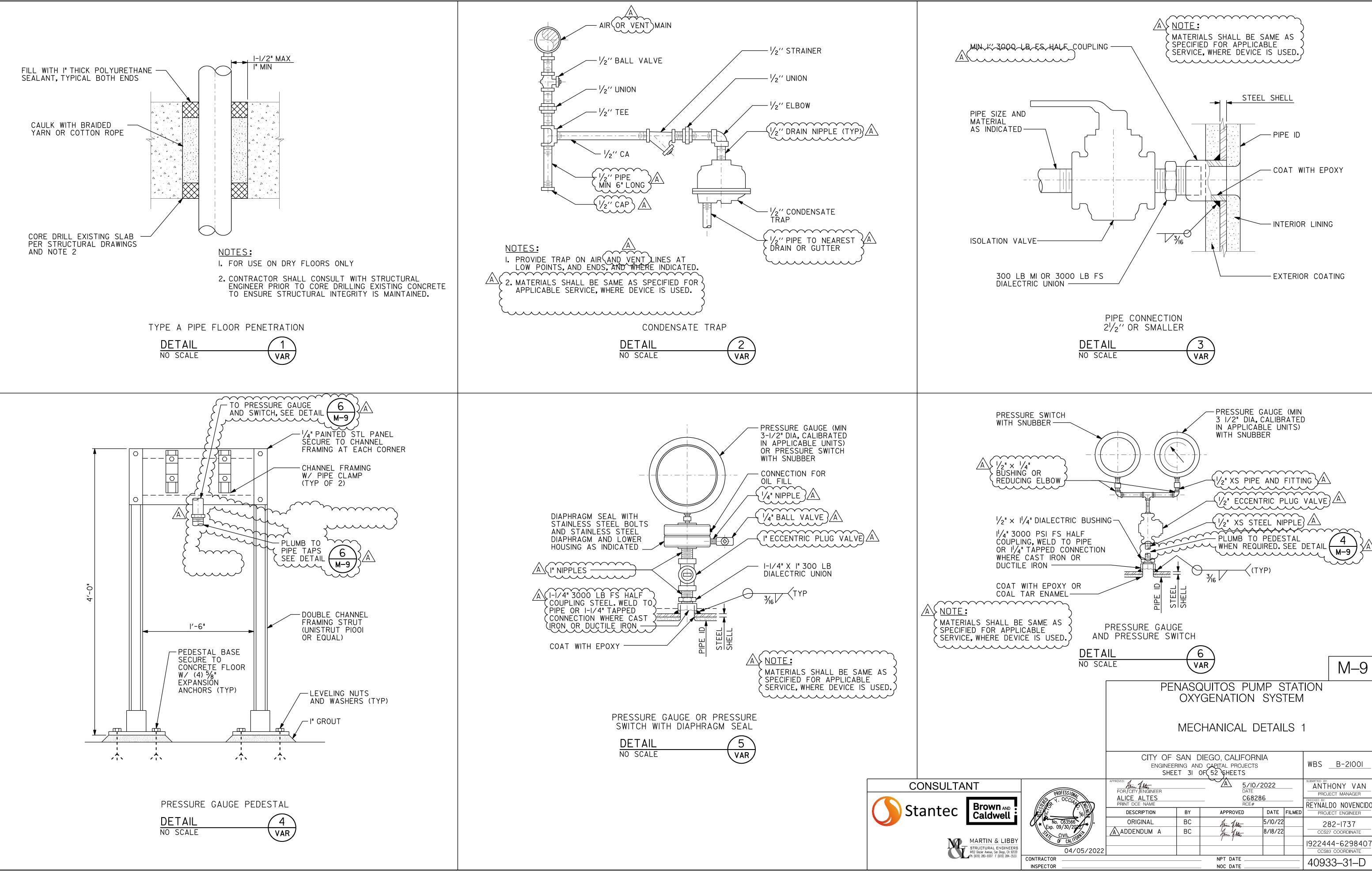
IP_PWP:d0I98I54\40933-30-D_M08.dgn

August 23, 2022 PQPS Oxygenation System

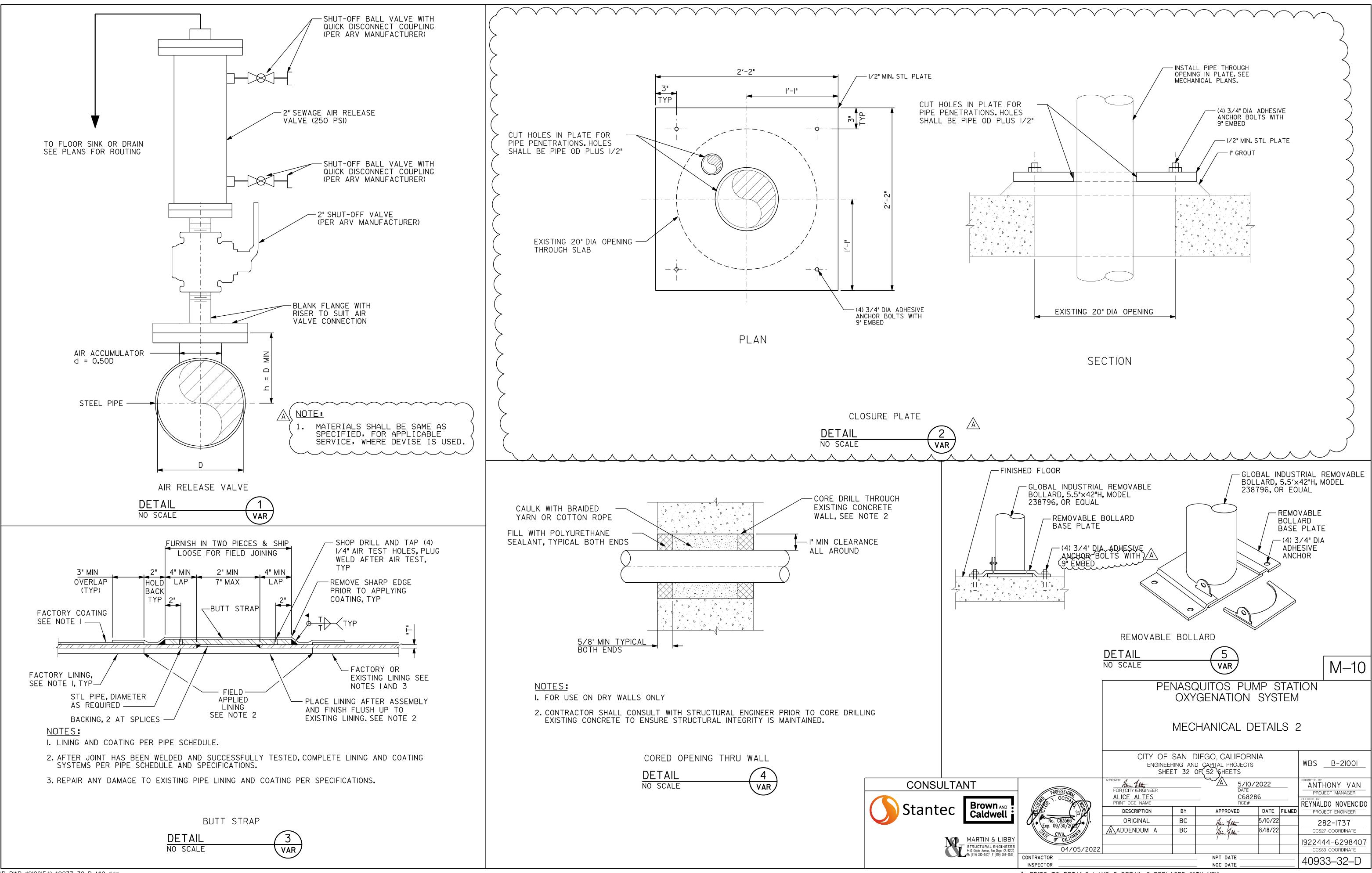
therencia

18-AUG-2022 12:10

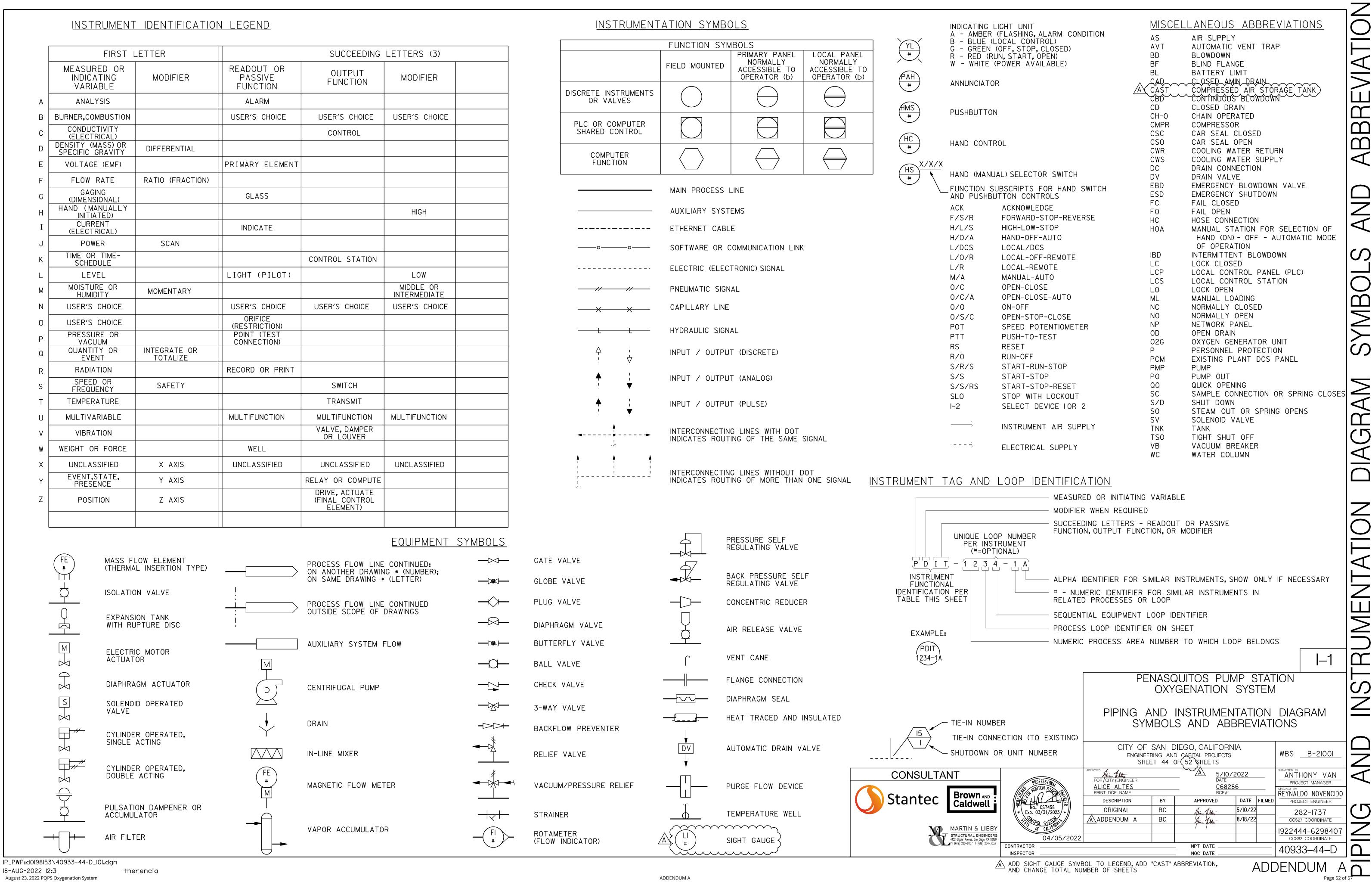


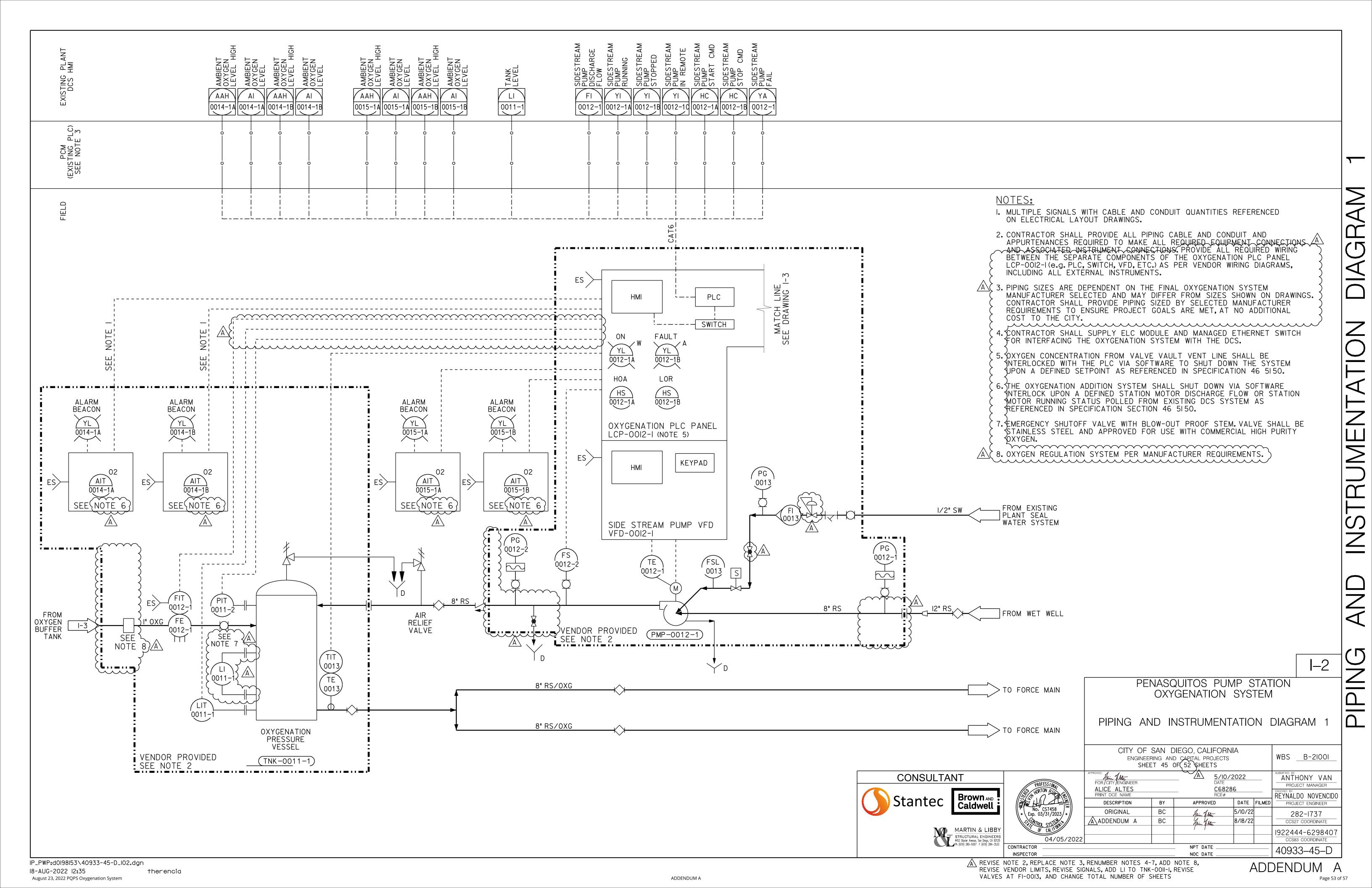


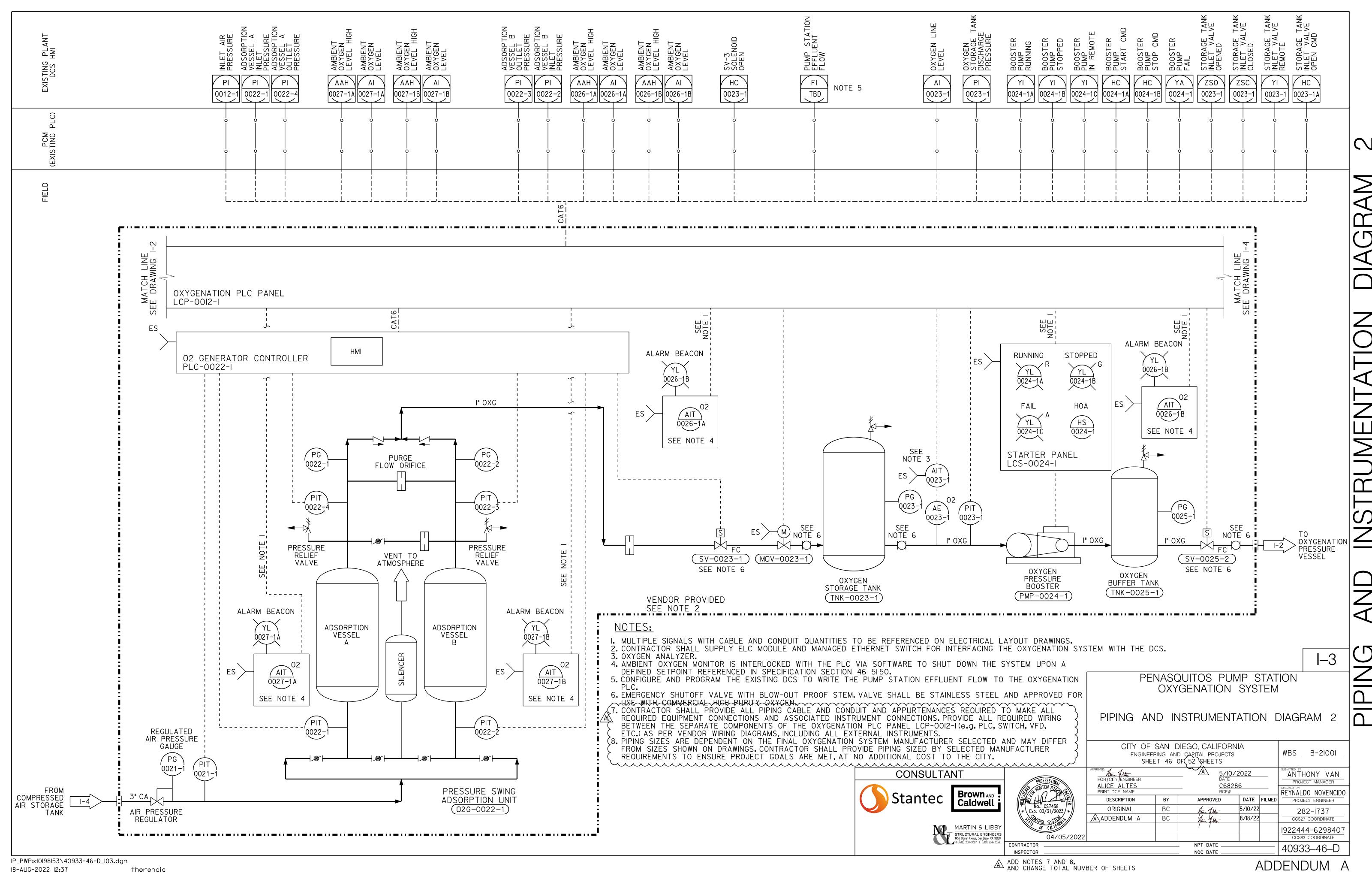
Page 50 of 57



Page 51 of 57



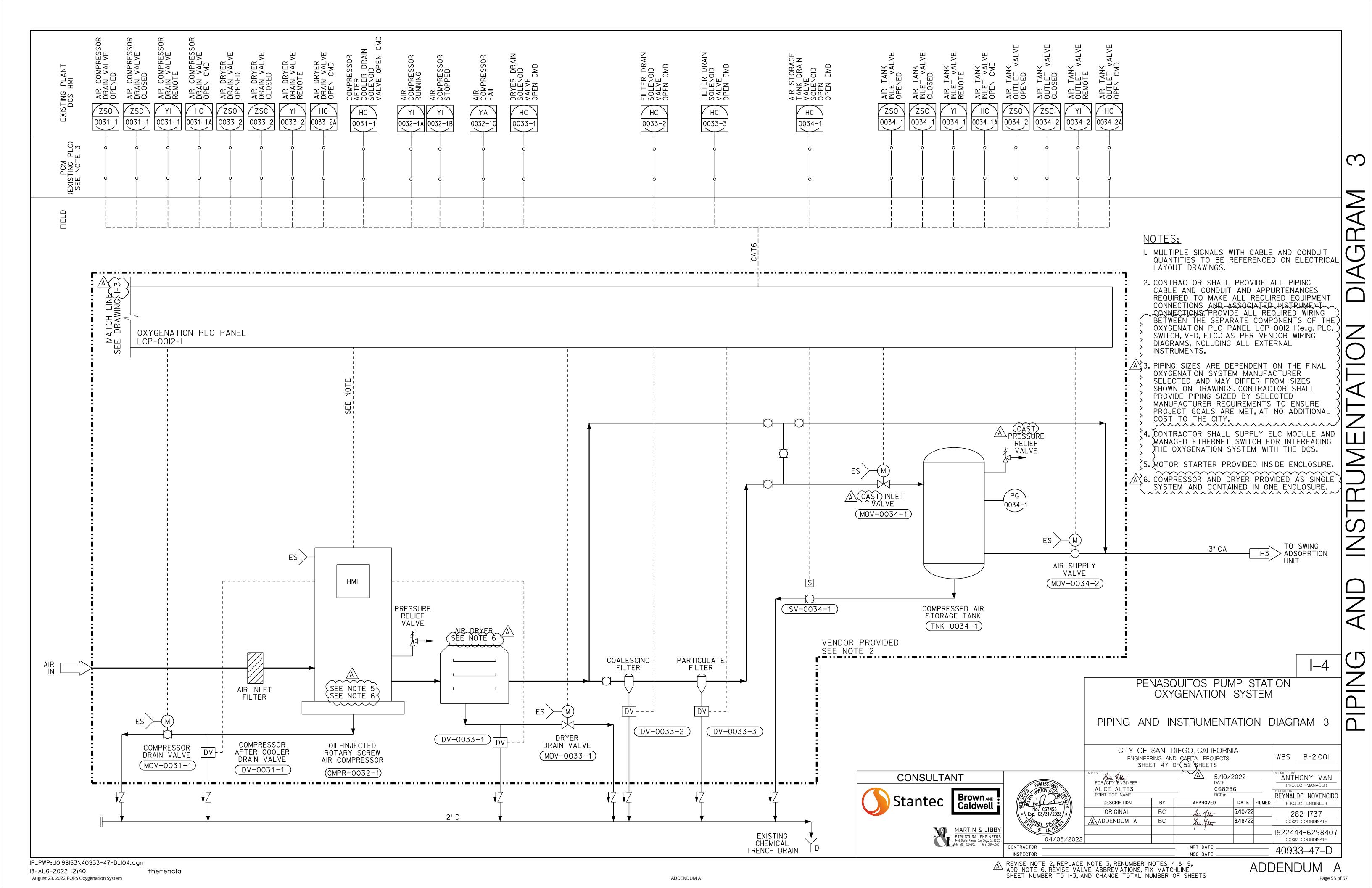


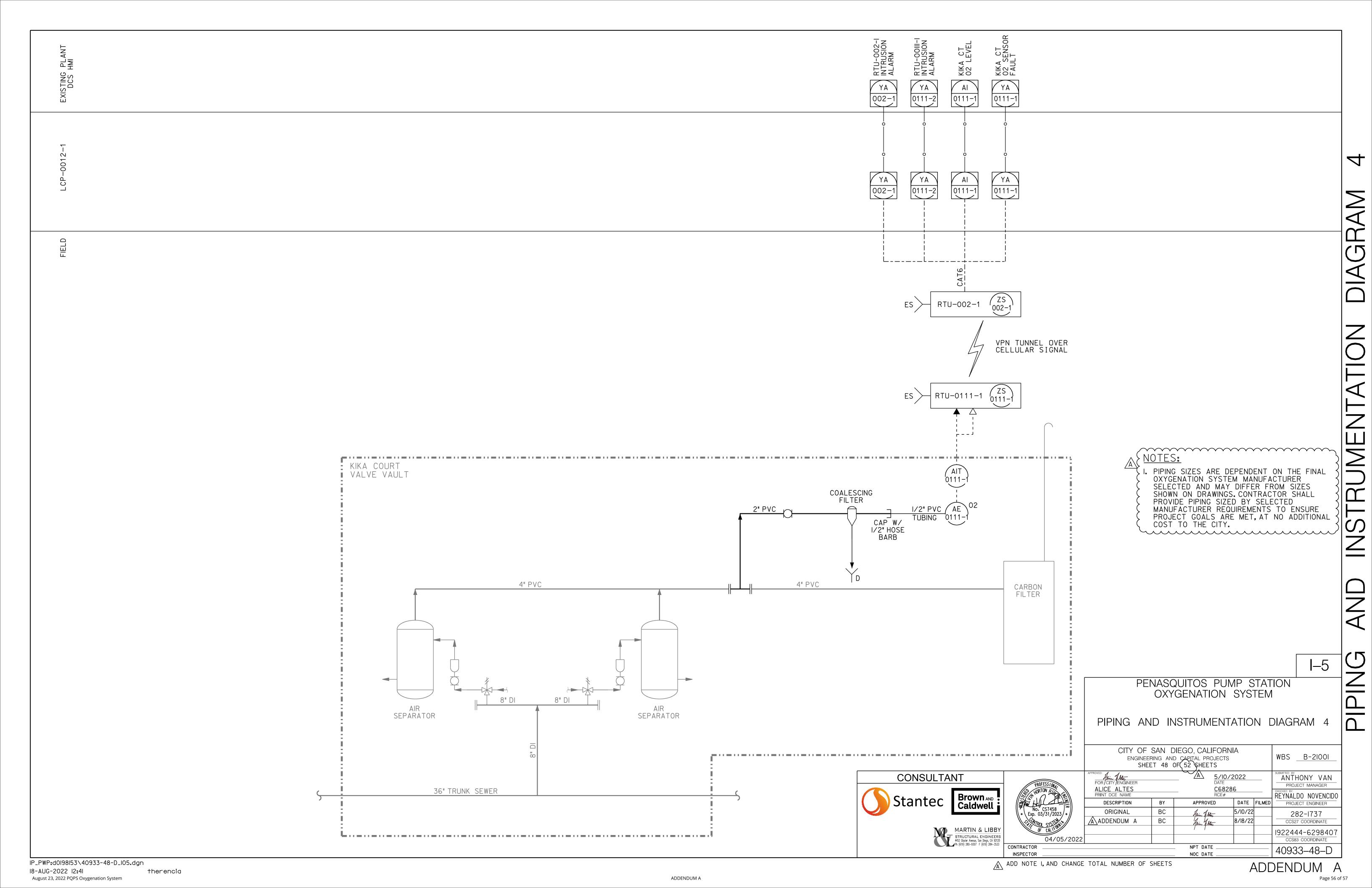


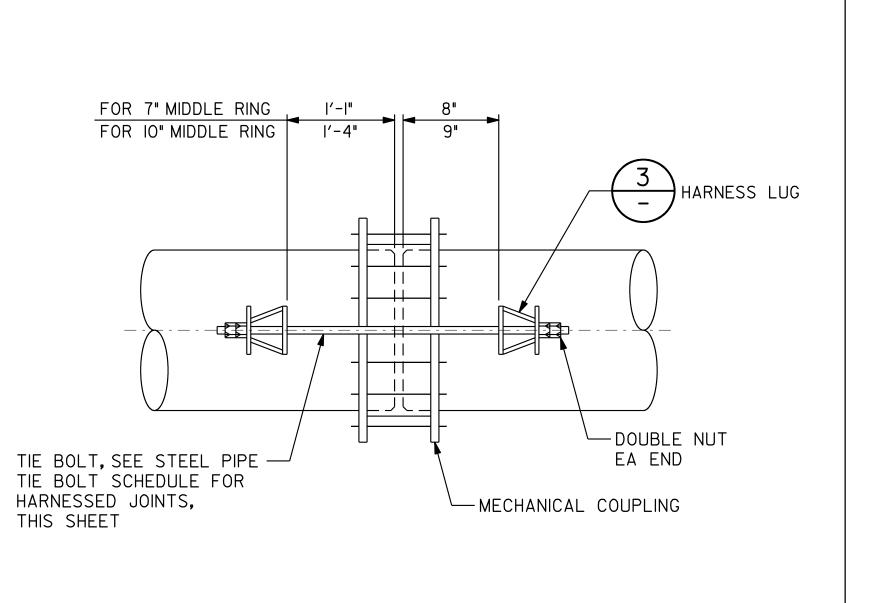
ADDENDUM

Page 54 of 57

August 23, 2022 PQPS Oxygenation System



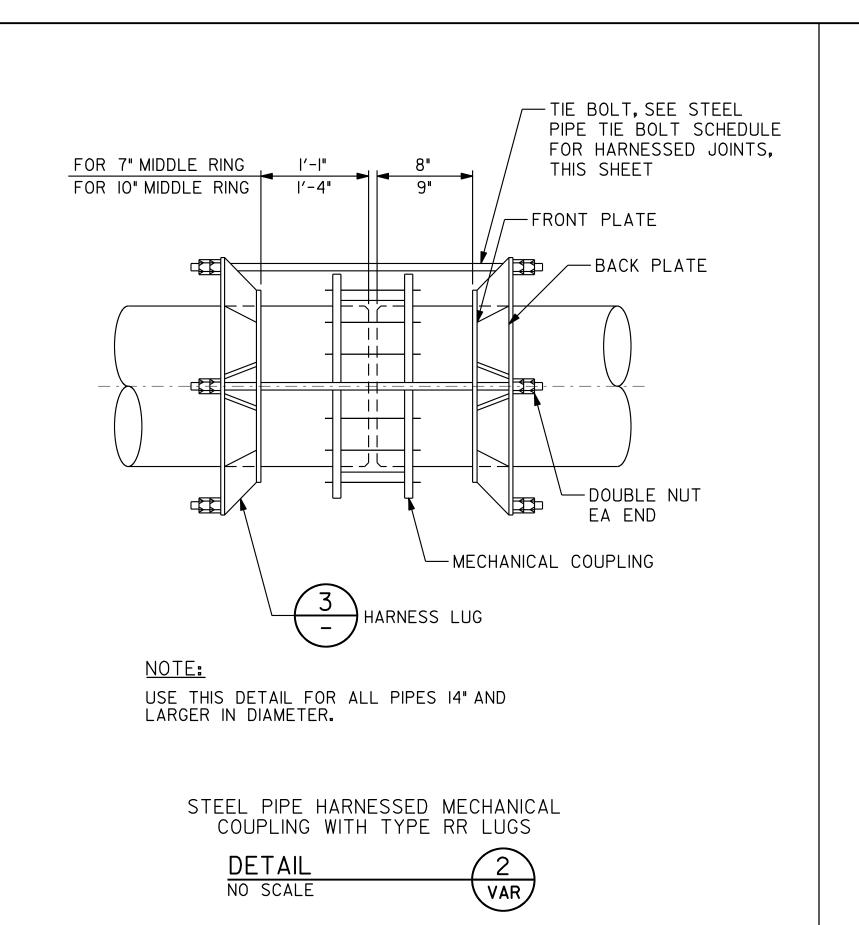


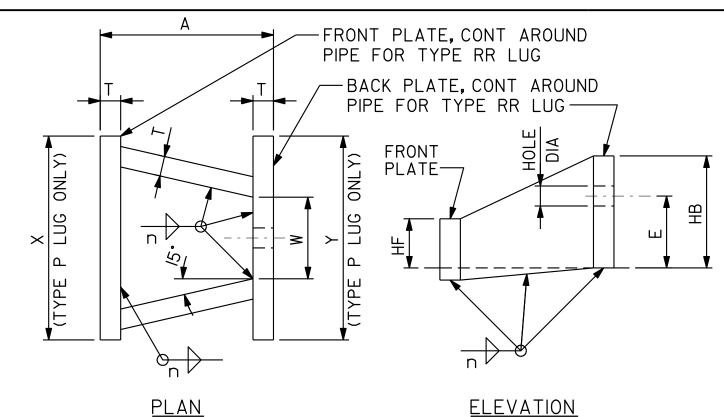


NOTE: TYPE P LUGS MAY BE USED FOR PIPE SIZES LESS THAN 14" IN DIAMETER AND PIPE WALL THICKNESS 0.25" AND GREATER.

STEEL PIPE HARNESSED MECHANICAL COUPLING WITH TYPE P LUGS

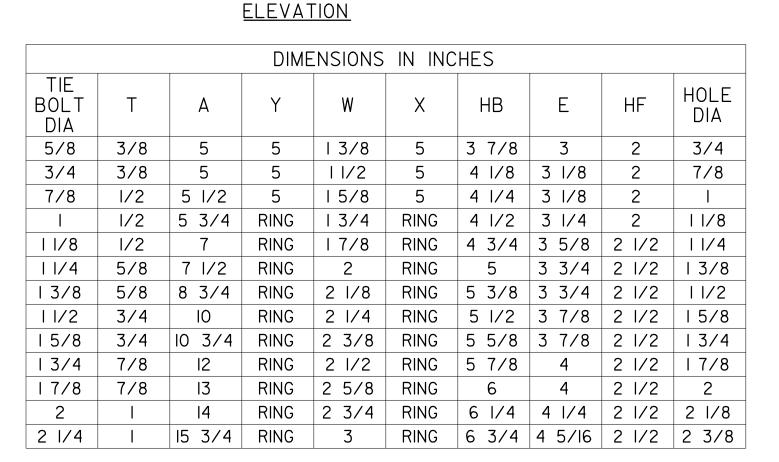
DETAIL NO SCALE **VAR**





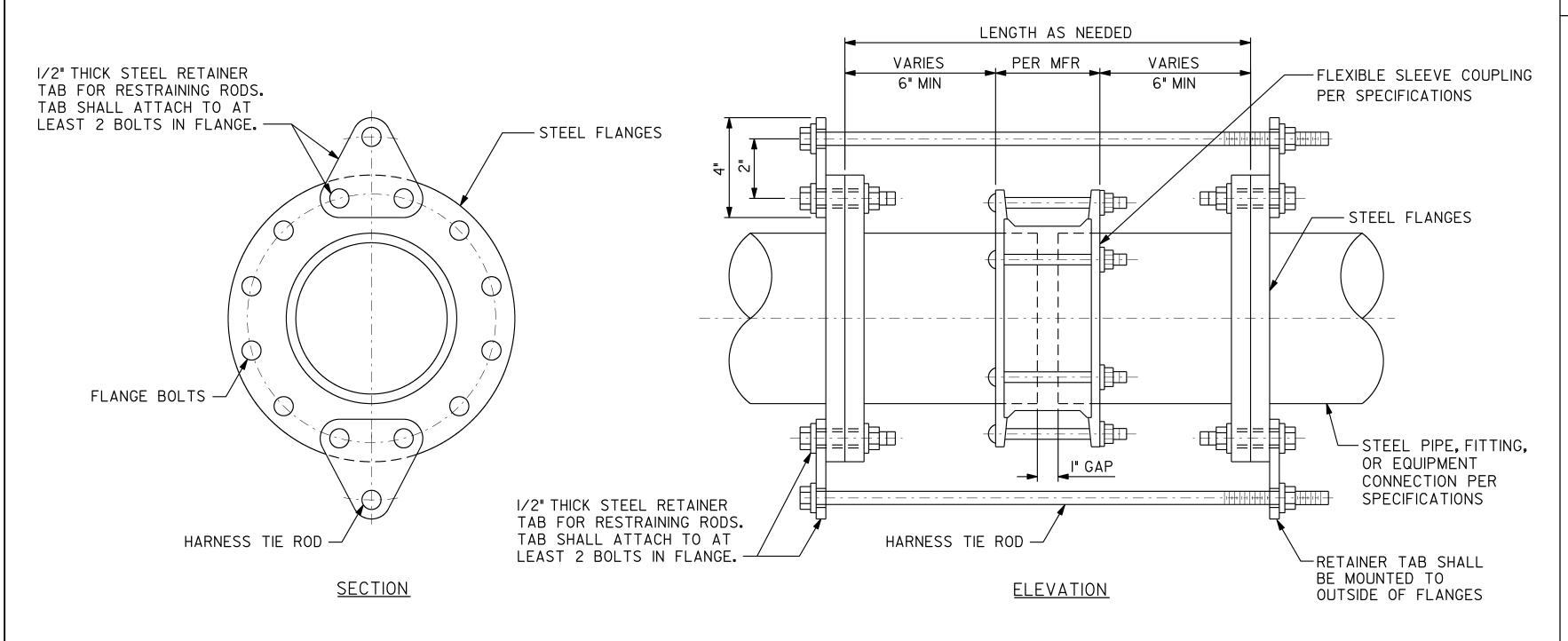
NOTES:

- I. n = PIPE WALL THICKNESS.
- 2. FOR HARNESS LUG TYPE RR, THE GUSSET PLATES BETWEEN THE FRONT PLATE AND THE BACK PLATE MAY BE PERPENDICULAR TO THE FRONT AND BACK PLATES WITH A MINIMUM CLEAR DISTANCE BETWEEN EACH PAIR OF GUSSET PLATES OF DIMENSION W.



STEEL PIPE HARNESS LUG TYPE P AND TYPE RR

DETAIL NO SCALE VAR /



VAR

DETAIL

NO SCALE

NOTES:

I. UTILIZE FOLLOWING DESIGN PRESSURE: 250 PSI

SLEEVE TYPE FLEXIBLE COUPLING W/HARNESS 2. FOR TIE ROD INFORMATION, SEE SPECIFICATIONS. BETWEEN FLANGED CONNECTIONS

STEEL PIPE	E TIE BOLT S	CHDULE FO	OR HARNESS	ED JOINTS
NOMINAL PIPE SIZE (INCHES)	PRESSURE (PSI) (NOTE I)	LUG TYPE	TIE BOLT DIAMETER (INCHES)	NO. BOLTS (NOTE 2)
6	250 OR LESS	Р	5/8	2
8	250 OR LESS	Р	5/8	2
10	50	Р	5/8	2
	100	Р	5/8	2
	150	Р	5/8	2
	200	Р	3/4	2
	250	Р	3/4	2
12	50	Р	5/8	2
	100	Р	5/8	2
	150	Р	3/4	2
	200	Р	3/4	2
	250	Р	7/8	2
24	50	RR	3/4	2
	100	RR	3/4	4
	150	RR	1	4
	200	RR	1 1/8	4
	250	RR	11/4	4

STEEL PIPE TIE BOLT SCHEDULE FOR HARNESSED JOINTS

DETAIL VAR NO SCALE

CONSULTANT

- I. PRESSURE SHALL BE THE PRESSURE AT WHICH THE PIPE IS HYDROSTATICALLY TESTED, OR IF THERE IS NO HYDROSTATIC FIELD TEST, IT SHALL BE THE SPECIFIED SHOP TEST PRESSURE.
- 2. NUMBER OF TIE BOLTS IS BASED ON TIE BOLTS WITH MINIMUM YIELD STRENGTH OF 100,000 PSI AND AN ALLOWABLE STRESS ON NET TENSION AREA OF 40,000 PSI.
- 3. UNLESS OTHERWISE INDICATED, TIE BOLTS SHALL BE SPACED UNIFORMLY AROUND THE PIPE, BEGINNING WITH THE FIRST TWO AT THE HORIZONTAL CENTERLINE OF THE PIPE, SUBJECT TO THE APPROVAL OF THE ENGINEER.
- 4. FOR HARNESS DETAILS SEE DETAIL I/M-II, DETAIL 2/M-II, DETAIL 3/M-II, DETAIL 4/M-II, STD MOIO, STD MOI2.

M-11

PENASQUITOS PUMP STATION OXYGENATION SYSTEM

MECHANICAL DETAILS 3

CITY OF SAN DIEGO, CALIFORNIA WBS <u>B-21001</u> ENGINEERING AND CAPITAL PROJECTS SHEET 52 OF 52 SHEETS





PROFESSIONAL T. OCCIA	
S S S S S S S S S S S S S S S S S S S	
No. C63566 Exp. 09/30/2022	L
OF CALIFORNIA	
08/18/2022	
CONTRACTOR	

	APPE
PROFESSIONAL T. OCCIANT	
A. OCCIANOSE	
No. C63566 Exp. 09/30/2022	
OF CALIFORNIA	A
OF CALL	
08/18/2022	
CONTRACTOR	

OFESSIONAL PROPERTY OF THE PRO	FOR/CITY/ENGINEER ALICE ALTES		ANTHONY VAN PROJECT MANAGER			
OCCIANO E	PRINT DCE NAME				REYNALDO NOVENCIDO	
(SE	DESCRIPTION	BY	APPROVED	DATE	FILMED	PROJECT ENGINEER
C63566 9/30/2022/*	ORIGINAL	ВС	Alin Alta	8/18/22		282-1737
/ / _ //	ADDENDUM A	ВС	, , ,	8/18/22		CCS27 COORDINATE
CIVIL FORMIT			7 1 5			1922444-6298407
08/18/2022						CCS83 COORDINATE
			NPT_DATE			40933-52-D
			NOC DATE			70000 -0Z-D

City of San Diego

CITY CONTACT: Brittany Friedenreich, Senior Contract Specialist, Email: BFriedenreic@sandiego.gov
Phone No. (619) 533-3104

ADDENDUM B





FOR

PQPS OXYGENATION SYSTEM

BID NO.:	K-23-2080-DBB-3
SAP NO. (WBS/IO/CC):	B-21001
CLIENT DEPARTMENT:	2000
COUNCIL DISTRICT:	5
PROJECT TYPE:	ВР

BID DUE DATE:

2:00 PM SEPTEMBER 2, 2022

CITY OF SAN DIEGO'S ELECTRONIC BIDDING SITE, PLANETBIDS

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

A. CHANGES TO CONTRACT DOCUMENTS

The following changes to the Contract Documents are hereby made effective as though originally issued with the bid package. Bidders are reminded that all previous requirements to this solicitation remain in full force and effect.

B. BIDDER'S QUESTIONS

- Q1. Can you confirm if we can you the existing hoist to pull and drop equipment during construction?
- A1. The hoist/overhead crane can be used to pull and/or lower equipment during construction. However, Contractor shall coordinate and provide 48 hours advance notice to City's Construction Manager prior to utilizing the hoist/overhead crane. For any reasons should the hoist/overhead crane require services or is out of commission, it shall be the contractor's responsibility to seek alternative solution to continue with the work progress without claiming delays to the City.

Rania Amen, Director Engineering & Capital Projects Department

Dated: August 30, 2022

San Diego, California

RA/AJ/ks

Bid Results

Bidder Details

Vendor Name Blue Pacific Engineering & Construction

Address 3750 Convoy Street, Suite 306

San Diego, California 92111

United States

Respondee Shahram Elihu Respondee Title President

Phone 858-956-1456

Email selihu@bluepacificeng.com Vendor Type PQUAL, CADIR, MALE, CAU

License # 824455 CADIR 1000929035

Bid Detail

Bid Format Electronic

Submitted 09/02/2022 1:54 PM (PDT)

Delivery Method Bid Responsive

Bid Status Submitted Confirmation # 303331

Respondee Comment

Buyer Comment

Attachments

File Title	File Name	File Type
debarment subs.pdf	debarment subs.pdf	DEBARMENT AND SUSPENSION CERTIFICATION FOR SUBCONTRACTORS, SUPPLIERS AND MANUFACTURERS
debar prime.pdf	debar prime.pdf	DEBARMENT AND SUSPENSION CERTIFICATION FOR PRIME CONTRACTOR
mand discl bus int.pdf	mand discl bus int.pdf	MANDATORY DISCLOSURE OF BUSINESS INTERESTS FORM
pending.pdf	pending.pdf	CONTRACTOR'S CERTIFICATION OF PENDING ACTIONS
Bid Bond.pdf	Bid Bond.pdf	Bid Bond

Subcontractors

Showing 4 Subcontractors

Name & Address	Desc	License Num	CADIR	Amount	Туре
A. B. Hashmi, Inc. 13066 Deer Canyon Court San Diego, California 92131	Site work and Mechanical (Partial)	798383	1000002125	\$425,220.00	ELBE, DBE, CADIR, PQUAL, Local
F.D. Thomas, Inc. 217 Bateman Dr. Central Point, Oregon 97502	Coatings	610403	1000000093	\$24,200.00	
Leed Electric Inc. 13138 Arctic Circle Santa Fe Springs, California 90670	Item12	379096	1000004633	\$657,897.00	CAU, MALE, CADIR, PQUAL
MTGL Inc. 6295 Ferris Square, Suite C San Diego, California 92121	Testing	00000	1000006646	\$117,000.00	DBE, HUBZ, MBE, CADIR, SDB, WBE, WOSB, FEM, LAT, Local

Line Items

Discount Terms No Discount

Item #	Item Code	Туре	Item Description	UOM	QTY	Unit Price	Line Total	Response	Comment
Main Bid									
1	524126		Bonds (Payment and Performance)	LS	1	\$40,000.00	\$40,000.00	Yes	
2	236220		Building Permits (EOC Type I) (Item G)	AL	1	\$15,576.00	\$15,576.00	Yes	
3	237110		Mobilization (Item B)	LS	1	\$120,000.00	\$120,000.00	Yes	
4			Field Orders (EOC Type II)	AL	1	\$117,191.00	\$117,191.00	Yes	
5	238910		Excavation and Base at 18" Thick Equipment Pad (Item C)	LS	1	\$100,000.00	\$100,000.00	Yes	
6	238190		Concrete Equipment Pads - 6" Thick (Item C)	LS	1	\$50,000.00	\$50,000.00	Yes	
7	238190		Concrete Equipment Pads - 18" Thick (Item C)	LS	1	\$80,000.00	\$80,000.00	Yes	
8	238190		Misc. Concrete Work (Item C)	LS	1	\$50,000.00	\$50,000.00	Yes	
9	238190		Misc. Structural Steel Work (Item C)	LS	1	\$100,000.00	\$100,000.00	Yes	
10	238110		Misc. Exterior Improvements (Item C)	LS	1	\$100,000.00	\$100,000.00	Yes	
11	237110		Misc. Equipment (Item C)	LS	1	\$100,000.00	\$100,000.00	Yes	
12	238210		Electrical and Instrumentation (Item C)	LS	1	\$825,000.00	\$825,000.00	Yes	
13	237110		Raw Sewage, Ductile Iron Pipe (Item C)	LS	1	\$250,000.00	\$250,000.00	Yes	
14	237110		Oxygen Gas Pipe, Blck Steel (Item C)	LS	1	\$500,000.00	\$500,000.00	Yes	
15	237110		Compressed Air Pipe, Black Steel (Item C)	LS	1	\$1,500,000.00	\$1,500,000.00	Yes	
16	237110		Vent Pipe, Blck Steel (Item C)	LS	1	\$50,000.00	\$50,000.00	Yes	
17	237110		Drain Pipe, PVC (Item C)	LS	1	\$40,000.00	\$40,000.00	Yes	
18	541330		WPCP Development (Item H)	LS	1	\$4,000.00	\$4,000.00	Yes	
19	237110		WPCP Implementation (Item I)	LS	1	\$100,000.00	\$100,000.00	Yes	
20	237110		Oxygen Monitoring System (Item E)	LS	1	\$200,000.00	\$200,000.00	Yes	
21	238990		Van Accessible Parking Modification (Item F)	LS	1	\$50,000.00	\$50,000.00	Yes	

Line Item Subtotals

Section Title	Line Total
Main Bid	\$4,391,767.00
Grand Total	\$4,391,767.00