

# PASSAIC VALLEY SEWERAGE COMMISSION



*“Protecting Public Health and the Environment”*

## REQUEST FOR PROPOSAL FOR GOODS AND SPECIAL SERVICES FOR PASSAIC VALLEY SEWERAGE COMMISSION

### CONTRACT B355 OXYGEN PRODUCTION FACILITY EQUIPMENT PROCUREMENT

NJEIT Project No. S340689-63

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*Commissioner*

Passaic Valley Sewerage Commission  
600 Wilson Avenue  
Newark, New Jersey 07105

December 2024

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Michael J. Hope, PE  
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**TABLE OF CONTENTS**

**SECTION 1: INTRODUCTION ..... 8**

**1.1 PROCUREMENT PROCEDURE ..... 8**

    1.2 Competitive Contracting ..... 8

    1.3 Purpose of Solicitation ..... 8

    1.4 Project Background ..... 8

    1.5 Attachments ..... 9

**SECTION 2: INSTRUCTION TO PROPOSERS ..... 9**

    2.1 Proposal Submission Requirements ..... 9

        2.1.1 Number of Copies ..... 10

        2.1.2 Proposal Format ..... 10

        2.1.3 Proposal Security ..... 10

    2.2 Addenda or Amendments to RFP ..... 10

    2.3 Sales Tax ..... 11

    2.4 Collusion 11

**SECTION 3: GENERAL INFORMATION ..... 11**

    3.1 Evaluation Committee ..... 11

    3.2 Procurement Schedule ..... 11

    3.3 Qualification Evaluation ..... 12

    3.4 Written Proposal ..... 13

    3.5 Softcopy version of RFP ..... 13

    3.6 Definitions ..... 13

**SECTION 4: GENERAL TERMS AND CONDITIONS ..... 13**

    4.1 Rights of PVSC ..... 13

    4.2 Disposition of RFP ..... 14

    4.3 Cost of Proposal Preparation ..... 14

    4.4 Build America, Buy America ..... 14

    4.5 Equal Employment Opportunity/Affirmative Action and Business Registration Certificate  
        Requirements ..... 14

        4.5.1 Equal Employment Opportunity/Affirmative Action Requirements ..... 15

        4.5.2 Business Registration Requirements ..... 15

    4.6 Public Law 2005, Chapter 51, and Executive Order No. 333 (2023) ..... 15

4.7 Notice To All State Vendors: Set-Off For State Tax .....	16
4.8 Authority to Audit or Review Contract Records .....	16
4.9 Meaning or Intent of RFP .....	16
4.10 Contract Form.....	16
4.10.1 Compliance with Contract Form and Technical Specifications .....	17
4.10.2 Contract Security .....	17
4.10.3 Contract to be Assigned .....	17
4.10.4 Requirements for Ineligible Telecommunication Equipment and Services Providers .....	17
4.10.5 Certification of Non-Involvement in Prohibited Activities in Russia and Belarus (P.L.2022, c.3) .....	18
<b>SECTION 5: WRITTEN PROPOSAL FORMAT .....</b>	<b>18</b>
5.1 Mandatory Content.....	18
<b>SECTION 6: SCOPE OF SERVICES .....</b>	<b>19</b>
<b>SECTION 7: PROPOSAL EVALUATION.....</b>	<b>20</b>
7.1 Evaluation Procedure .....	21
7.2 Written Response Evaluation .....	21
7.3 Response Weights .....	22
7.4 Oral Presentations.....	22
7.5 Final Evaluation and Report of Committee.....	22
<b>SECTION 8: CONTRACT AWARD AND EXECUTION OF THE CONTRACT .....</b>	<b>22</b>
8.1 Contract Award.....	22
8.2 Execution of the Contract .....	22
8.3 Failure to Execute Contract.....	23

**ATTACHMENTS**

- Attachment A – PVSC Mandatory Forms
- Attachment B – Technical Documents Required with Proposal
- Attachment C – Cost Proposal Form
- Attachment D – Qualification Form
- Attachment E – Contract Agreement
- Attachment F – General Conditions and Supplementary Conditions

## ANNEXES

### Annex A - Technical Specifications

- 01 10 00 – Technical Scope of Work and Performance Requirements
- 01 33 00 - Submittals
- 01 45 00 - Quality Control
- 01 66 00 - Product Storage and Handling Requirements
- 01 78 18 - Contract Closeout
- 01 78 23 - Operation and Maintenance Manuals
- 01 78 32 - Warranties and Bonds
- 01 79 00 - Demonstration and Training
- 09 90 00 - Paints and Coatings
- 11 55 10 - Vacuum Pressure Swing Adsorption Oxygen Generation System
- 11 55 20 - Liquid Oxygen Storage and Vaporization System
- 26 05 00 - Basic Electrical Materials and Methods
- 26 05 19 - Wires and Cables - 600V and Below
- 26 05 26 - Grounding
- 26 05 33 - Electrical Raceway Systems
- 26 05 53 - Electrical Identification
- 26 05 60 - Electrical Requirements for Shop-Assembled Equipment
- 26 05 80 - Electric Motors
- 26 14 00 - Medium Voltage Motor Control Centers
- 26 22 00 - General Purpose Dry Type Transformers
- 26 23 16 - Electrical Equipment Enclosures
- 26 24 16 - Panelboards
- 26 24 19 - Motor Control Centers
- 26 27 26 - Wiring Devices
- 26 28 16 - Disconnect Switches
- 26 29 53 - Control Components and Devices
- 40 90 00 - Instrumentation for Process Control - Basic Requirements
- 40 90 02 - Programmable Logic Controllers - Hardware and Software
- 40 90 03 - Operator Interface Terminals, Operator Workstations and Programming Workstations
- 40 90 04 - Primary Sensors and Field Instruments
- 40 90 05 - Control Panels and Enclosures
- 40 90 06 - Panel Instruments and Devices
- 40 90 07 - Input/Output List
- 40 90 08 - Control Strategies
- 40 90 09 - Process Control System Uninterruptible Power Supply (UPS)
- 40 90 10 - Process Control System Factory Acceptance Testing
- 40 90 11 - Process Control System Network Hardware and Software
- 40 90 12 - Process Control System Start-Up and Commissioning
- 40 90 13 - Process Control System Training
- 40 93 50 - Fiber Optic Cable and Accessories
- 40 96 52 - Configuration Requirements – Human Machine Interface (HMI) and Reports
- 40 99 00 - Surge Protection Devices (SPD) for Instrumentation and Control Equipment

## Annex B - Drawings

- G-00 COVER SHEET, VICINITY MAP AND LOCATION PLAN
- G-01 DRAWING INDEX - SHEET 1
- G-02 MASTER SITE PLAN - EXISTING
- G-03 OXYGEN GENERATION FLOW DIAGRAM 1
- C-01 SYMBOL LEGEND
- C-02 EXISTING YARD PIPING DEMOLITION PLAN
- C-03 EXISTING GRADING AND PAVING DEMOLITION PLAN
- C-04 SITE SPACE ALLOCATION PLAN
- CS-01 CONSTRUCTION SEQUENCING PHASE I AND PHASE II
- CS-02 CONSTRUCTION SEQUENCING PHASE III AND PHASE IV
- CS-03 CONSTRUCTION SEQUENCING PHASE V AND PHASE VI
- E-01 GENERAL NOTES AND SYMBOLS
- E-02 OVERALL ONE-LINE DIAGRAM
- N-01 PARTIAL NETWORK DIAGRAM

## NOTICE INVITING PROPOSALS

The Passaic Valley Sewerage Commission (PVSC) is soliciting proposals from qualified Proposers to provide Oxygen Production Facility Equipment. PVSC utilizes pure oxygen in its secondary wastewater treatment process. The oxygen is generated onsite by a cryogenic facility that has been in operation for approximately 40 years. The facility has reached the end of its useful life. The facility is also inefficient. In order to properly treat the wastewater, a new Vapor Pressure Swing Adsorption (VPSA) System needs to be constructed to provide a more reliable, energy efficient Oxygen Generation System as specified herein.

### **CONTRACT NO. B355** **OXYGEN PRODUCTION FACILITY EQUIPMENT PROCUREMENT**

Proposals are to be enclosed in opaque sealed envelopes, addressed to the **Passaic Valley Sewerage Commission, Purchasing Department, Public Meeting Room of the Administration Building, 600 Wilson Avenue, Newark, New Jersey 07105**, with name and address of Proposer, Contract Numbers, Contract Name and Proposal Submission Date plainly marked outside. Proposals will be accepted by mail. Proposals must be sealed and identified as indicated above, enclosed in a mailing envelope with proper postage, and received during the time set for receiving proposals.

Sealed Proposals shall be received by PVSC on **March 12, 2025 until 10:00 a.m.** in the morning, prevailing time. Proposals shall be opened publicly and read aloud on **March 12, 2025 at 10:00 a.m.** at PVSC's Public Meeting Room in PVSC's Administration Building.

All proposals shall be opened publicly (via Zoom), announced, read aloud (after the closing time, 10:00 a.m. in the PVSC Purchasing Department), and recorded via the Zoom Conferencing Application. At that time and place, the sealed proposals will be publicly opened, announced, and available in real time and recorded via the Zoom Conferencing Application at [<https://pvsc.zoom.us/j/2496333971>]. Bidders can also dial into the bid opening by phone at [+1 646 876 9923], access code [249 633 3971].

Proposals may be withdrawn or modified prior to the time for the opening of proposals or the authorized postponement thereof. No proposal may be withdrawn for a period of sixty (60) calendar days after the date of the opening of proposals.

**Point of Contact for RFP Inquiries:** Thomas Fuscaldo  
Purchasing Agent  
Email: [tfuscaldo@pvsc.com](mailto:tfuscaldo@pvsc.com)

The person listed above is the only point of contact for any inquiries regarding any aspect of this Request for Proposal (RFP).

In the event that a potential proposer obtains the RFP in any manner other than as specified herein, the PVSC will not have the contact information of the potential Proposer for purposes of issuing addenda, if any. The non-receipt of any addenda (in the event that any addenda are issued) and the failure of the Proposer to acknowledge the receipt of any and all addenda at the time of proposal submission shall be considered a fatal defect in such Proposer's submission and said proposal shall be immediately rejected. Therefore, if a potential proposer obtains the RFP in any manner other than as specified herein, said Proposers shall promptly provide written notice to PVSC accordingly.

Security Notice: All contractors, subcontractor's employees and/or representatives entering the plant must have and must present to PVSC Security, government issued identification such as a valid picture Driver's License or Passport. This applies to bid openings, pre-bid conferences and all on-premises contract work.

A pre-proposal meeting and tour of the project site at the PVSC Facility will be held on **January 31, 2025 at 10:00 a.m.** The meeting will take place at PVSC's Operations Engineering & Maintenance (OEM) Building Main Conference Room, second floor, 600 Wilson Avenue, Newark, New Jersey, 07105, with site visit to follow. Attendance to the pre-proposal meeting and site visit are strongly encouraged to all the interested proposers.

The Contract is expected to be funded in part with funds from the New Jersey Department of Environmental Protection (NJDEP) and the New Jersey Environmental Infrastructure Trust (NJEIT). Neither the United States nor the State of New Jersey, the NJEIT, nor any of their departments, agencies, or employees is, or will be, a party to the Contract or any lower tier contract or subcontract.

Passaic Valley Sewerage Commission  
Albert Lukin  
Clerk

## **SECTION 1: INTRODUCTION**

### **1.1 Procurement Procedure**

PVSC is not subject to the Local Public Contracts Law (N.J.S.A. 40A:11-1 et seq.). However, in keeping with longstanding PVSC policy, this contract will be awarded using the Competitive Contracting provisions of the Local Public Contracts Law ("LPCL") (N.J.S.A. 40A:11-4.1 et seq.) as a guide with the goal of procuring the required services and equipment by means of a competitive and transparent process.

Proposals will be evaluated in accordance with the criteria set forth in this Request for Proposals (RFP). At its sole discretion, PVSC's Board of Commissioners will approve a resolution awarding a contract to the successful Proposer for a sum not to exceed a specified amount.

### **1.2 Competitive Contracting**

As set forth in Section 3.1, this contract award will be guided by the Competitive Contracting provisions of the Local Public Contracts Law (N.J.S.A. 40A:11-4.1 et seq.).

PVSC has structured a procurement process that seeks to obtain the desired equipment and services, while establishing a competitive environment to assure that each person and/or firm is provided an equal opportunity to submit a proposal in response to the RFP. Proposals will be evaluated in accordance with the criteria set forth in Section 7 of this RFP, which will be applied in the same manner to each Proposal received.

### **1.3 Purpose of Solicitation**

The Passaic Valley Sewerage Commission (PVSC) is seeking proposals from qualified Firms (Proposers) for services of, but not limited to, engineering, design, manufacturing and field support services for a Oxygen Production System as described herein. All Proposers submitting proposals are responsible for examining the entire RFP. Failure to do so shall be at the Proposer's risk.

### **1.4 Project Background**

PVSC owns and operates a 330 million-gallon-per-day wastewater secondary treatment Facility located in Newark, New Jersey, one of the half-dozen largest modern wastewater facilities in the United States. The 140-acre site is generally located at the intersection of Wilson Avenue and Doremus Avenue in Newark, New Jersey. Doremus Avenue provides the separation between the eastern and western parts of the project site. Connecting the two sides is a 450-ft long bridge that goes over Doremus Avenue. Immediately adjacent to the PVSC site to the east is the Newark Bay.

In the early 1980's, PVSC underwent a major expansion at which time most of the facility's process treatment equipment was installed and placed in service. The PVSC wastewater facility is a pure oxygen activated sludge secondary treatment plant designed to achieve an average effluent carbonaceous biochemical oxygen demand (CBOD5) of 25 mg/L and an average effluent total suspended solids (TSS) of 30 mg/L.

The pure oxygen utilized as part of the secondary treatment process is currently generated using an onsite cryogenic oxygen production facility. The facility is approximately 40 years old and has reached the end of its useful life and will be replaced with more reliable, energy efficient equipment. In order to properly



treat the wastewater, a new Oxygen Production Facility will be constructed to replace the existing cryogenic facility.

The overall project has been divided into two contracts, this procurement contract; B-355 - Oxygen Production Facility Equipment Procurement, and a separate installation contract; B-356 - Oxygen Production Facility.

## **1.5 Attachments**

The following attachments are included with this Request for Proposals.

### Attachment A - PVSC Mandatory Forms

- PVSC Proposal Transmittal Letter
- New Jersey Business Registration Certificate
- 00 27 00 - Acknowledgement of Receipt of Changes to RFP Form
- 00 43 16 - Proposal Security
- 00 45 01 - Statement of Ownership
- 00 45 14 - Proposer's Affidavit
- 00 45 19 - Non-Collusion Affidavit
- 00 45 30 - Affirmative Action Affidavit
- 00 45 52 - Combined Certification: Prohibited Activities in Russia and Belarus and Investment Activities in Iran
- 00 62 76 - Consent of Surety
- 00 62 77 - Surety Disclosure Statement Certification
- 00 62 78 - Build America, Buy America (BABA) Act Form
- 00 62 79 - Byrd Anti-Lobbying Amendment Certification

### Attachment B - Technical Documents Required with Proposal (P-00350)

### Attachment C - Cost Proposal Forms

### Attachment D - Qualification Form (P-00400)

### Attachment E

- P-00500 - Contract Agreement
- P-00610 - Performance and Payment Bond
- 00 61 19 - Maintenance Bond

### Attachment F – Standard General Conditions for Procurement Contract (P-00700) and Supplementary Conditions (P-00800)

### Annex A - Technical Specifications and Performance Requirements

## **SECTION 2: INSTRUCTION TO PROPOSERS**

### **2.1 Proposal Submission Requirements**

To be responsive, Proposals must provide all requested information, and must be in strict conformance with the instructions set forth herein. Proposals and all related information must be bound and signed and acknowledged by the Respondent.

### 2.1.1 Number of Copies

Respondents must submit one signed original and ten (10) copies of their proposal and one (1) softcopy file in PDF format that is indexed and text searchable on a USB Drive.

### 2.1.2 Proposal Format

To facilitate a timely and comprehensive evaluation of all submitted Proposals, it is essential that all Respondents adhere to the required response format. PVSC requires a standard format for all Proposals submitted to ensure that clear, concise and complete statements are available from each Respondent in response to requirements. The required format is detailed in Section 5.

PVSC is not under any obligation to search for clarification through additional or unformatted information submitted as a supplement to the formatted response. Where a proposal contains conflicting information, PVSC at its option may either request clarification or may consider the information unresponsive.

### 2.1.3 Proposal Security

Each proposal shall be accompanied by a proposal security in one of the following forms:

- Cashier's check or certified check drawn on a solvent bank, payable to "Passaic Valley Sewerage Commission," for an amount equal to ten percent (10%) of the total maximum amount of the Proposer's Cost Proposal but not exceeding \$20,000; or
- A satisfactory corporate surety proposal bond or a Letter of Credit for an amount equal to ten percent (10%) of the total maximum amount of the Proposer's Cost Proposal, but not exceeding \$20,000, may accompany the proposal.

If Proposer elects to submit a Letter of Credit, it must be issued by the United States of America office of a commercial bank or trust company with assets of at least \$10 Billion and credit rating of at least A- by Standard & Poor's and at least A3 by Moody's.

Said security shall serve as a guarantee that the successful Proposer shall, within sixty (60) calendar days from the date established pursuant to Section 8.01 of the award of the contract, enter into a valid contract with PVSC for said Work in accordance with the Contract Documents, at which time the Proposal Security will be returned to all Proposers.

## 2.2 Addenda or Amendments to RFP

During the period provided for the preparation of responses to the RFP, PVSC may issue, clarifications, addenda, amendments or answers to written inquiries. Notice of revisions and addenda or amendments to RFP shall, in accordance with Local Public Contracts Law (LPCL) 40A:11-23(c), be provided no later than seven days, Saturdays, Sundays, or holidays excepted, prior to the date for receipt of proposals. Those addenda will be noticed by PVSC and will constitute a part of the RFP. All responses to the RFP shall be prepared with full consideration of the addenda issued prior to the proposal submission date.

All communications concerning this RFP or the RFP process shall be directed to PVSC's **Point of Contact**, in writing, via fax or e-mail. Responses to all questions will be forwarded as addenda to all

prospective respondents who have provided accurate and current contact information (mailing address, fax number, e-mail address) to PVSC.

Subsequent to issuance of this RFP, PVSC (through the issuance of addenda to all persons and/or firms that have received a copy of the RFP) may modify, supplement or amend the provisions of this RFP in order to respond to inquiries received from prospective Respondents or as otherwise deemed necessary or appropriate by (and in the sole judgment of) PVSC.

### **2.3 Sales Tax**

Proposers shall be aware PVSC is exempt from payment of sales tax on all goods and services to be provided under the project. Proposers shall follow requirements as described in Article 5 of the Procurement Supplementary Conditions (Attachment F) regarding sales tax.

### **2.4 Collusion**

The proposal of any Proposer or Proposers who engage in collusion shall be rejected. Any Proposer who submits more than one proposal in such manner as to make it appear that the proposals submitted are on a competitive basis from different parties shall be considered a collusive Proposer. PVSC may reject the proposals of any collusive Proposer upon proposal opening. However, nothing in this section shall prevent a Proposer from superseding a proposal by a subsequent proposal delivered prior to proposal opening which expressly revokes the previous proposal.

## **SECTION 3: GENERAL INFORMATION**

### **3.1 Evaluation Committee**

Proposals will be reviewed and evaluated by a committee appointed by PVSC's Executive Director. The proposals will be reviewed to determine if the Respondent has met the qualifications, professional, administrative and subject area requirements described in this RFP. Pursuant to N.J.A.C. 5:34-4.3, "the names of the individuals who serve as committee members shall not be publicly disclosed until the evaluation report is presented to the governing body."

### **3.2 Procurement Schedule**

The steps involved in the process and the anticipated completion dates are set forth in the Procurement Schedule below. PVSC reserves the right to, among other things, amend, modify or alter the Procurement Schedule upon notice to all potential Respondents.

Commissioner Approval of Resolution .....	February 9, 2023
Issuance of Request for Proposal .....	January 6, 2025
Pre-Proposal Meeting .....	January 31, 2025
Deadline for Questions .....	February 17, 2025
Issuance of Clarification/Addenda .....	February 28, 2025
Receipt of Proposals .....	March 12, 2025
Meeting with Proposers .....	March 28, 2025
Completion of Evaluation of Proposals .....	April 11, 2025
Anticipated Notice of Intent to Award .....	May 15, 2025

Executed Contract .....	June 13, 2025
Notice to Proceed .....	June 20, 2025

### 3.3 Qualification Evaluation

Proposals will be evaluated initially on the basis of the Qualifications Criteria listed below. Proposals which do not meet the Qualification Criteria will be deemed non-responsive and their Proposals will not be considered. Proposals that meet the Qualification Criteria will be evaluated initially on the basis of the evaluation criteria contained in the written response to the RFP. Proposers may be invited to make an oral presentation to the Evaluation Committee.

- The Proposer is required to be experienced and an expert in the supply of Oxygen Production Facility Equipment. The Proposer shall be an Oxygen Production Facility Original Equipment Manufacturer (OEM) and shall be the sole entity responsible for providing all equipment and all services specified herein, with no exceptions.
- Proposer’s equipment that comprises the Oxygen Production Facility shall provide 500 tons per day of gaseous oxygen per the equipment type, quantity, quality and configuration described in the Technical Specifications (Annex A).
- Proposer’s equipment shall meet the Oxygen Production Facility performance guarantees per the Technical Specification (Annex A).
- Proposer’s equipment shall fit within the allotted spaces as presented in the Technical Specifications and Drawings (Annex A).
- Proposer’s shall submit a Vacuum Pressure Swing Adsorption (VPSA) qualification experience list with at least 50 VPSA installations and demonstrating 20 years of experience. Proposers shall also submit a separate VPSA reference experience list with at least 10 reference installations of a similar size but not less than 100 TPD.
- To demonstrate Proposer’s qualifications to provide the Goods and Special Services, each Proposer must submit with Proposal fully completed Qualification and Reference Forms. Failure to submit completed Proposer's Qualification and Reference Forms may lead to the Proposer being deemed as non-responsive. The information supplied by the Proposer on the Proposer's Qualification Form will be used to ascertain the Proposer's history, reputation, organization, and capacity for satisfactory and faithful performance of their work and work of a similar character and will not otherwise be made public, except as provided by law.
- PVSC may make such additional investigation as it deems necessary to determine the qualifications of Proposer to perform the Work and Proposer shall furnish to PVSC all such information and data for this purpose as PVSC may request. PVSC reserves the right to reject any proposal if the evidence submitted by, or investigation of, such Proposer fails to satisfy PVSC that such Proposer is properly qualified to carry out the obligations of the Agreement, and to complete the Work contemplated therein.
- An initial review will be performed of all proposals confirming the Proposer and Proposer’s Oxygen Production Facility meets the qualifications as stated in the RFP. Any proposal deemed to not have met the qualification will not be considered further.

### **3.4 Written Proposal**

Prospective Firms must submit a written proposal in a format specified by PVSC. The required format is detailed in Section 5.

### **3.5 Softcopy version of RFP**

Prospective respondents who have obtained printed copies of this RFP and who have provided accurate and current contact information (mailing address, fax number, e-mail address) to the Division of Purchasing, may request a softcopy version of this RFP. Softcopy versions will be provided as a PDF file only.

### **3.6 Definitions**

The following definitions shall apply to and are used in this Request for Proposal (RFP):

"PVSC" - Passaic Valley Sewerage Commission.

“VPSA” – Vacuum Pressure Swing Adsorption

“LOX” – Liquid Oxygen Storage and Vaporization System

"RFP" - refers to this Request for Proposals, including any amendments thereof or supplements thereto.

“Competitive Contracting” - refers to the process being utilized as a guide by PVSC in evaluating proposals and awarding the subject Contract.

“Proposers” or “Respondents” - refers to the interested persons and/or firm(s) that submit a Proposal.

“Contractor” or “Seller” - refers to the Proposer to which the contract is awarded.

“Owner” – refers to PVSC

## **SECTION 4: GENERAL TERMS AND CONDITIONS**

### **4.1 Rights of PVSC**

PVSC reserves, holds and may exercise, at its sole discretion, the following rights and options with regard to this RFP and the procurement process in accordance with the provisions of Local Public Contracts Law.

- a. To conduct investigations of any or all of the Respondents, as PVSC deems necessary or convenient, to clarify the information provided as part of the Proposal and to request additional information to support the information included in any Proposal.

- b. To suspend or terminate the procurement process described in this RFP at any time (at its sole discretion). If terminated, PVSC may determine to commence a new procurement process or exercise any other rights provided under Local Public Contracts Law without any obligation to the Respondents.
- c. To reject all Proposals pursuant to Local Public Contracts Law.

## **4.2 Disposition of RFP**

Upon submission of a Proposal in response to this RFP, the Respondent acknowledges and consents to the following conditions relative to the submission and review and consideration of its Proposal:

All Proposals shall become the property of PVSC and will not be returned.

All Proposals will become public information at the appropriate time, as determined by PVSC (in the exercise of its sole discretion) in accordance with law.

## **4.3 Cost of Proposal Preparation**

Each Proposal and all information required to be submitted pursuant to the RFP shall be prepared at the sole cost and expense of the Respondent. There shall be no claims whatsoever against PVSC, its officers, officials, or employees for reimbursement for the payment of costs or expenses incurred in the preparation of the Proposal or other information required by the RFP.

## **4.4 Build America, Buy America**

Infrastructure Investment and Jobs Act (IIJA) recognized the Nation’s critical need for infrastructure investment. In Title IX of the IIJA, Congress passed the Build America, Buy America (BABA) Act, which establishes strong and permanent domestic sourcing requirements across all Federal financial assistance programs for infrastructure. Therefore, Federal financial infrastructure investments obligated on or after May 14, 2022, must comply with the BABA requirements. Absent a waiver, all iron, steel, manufactured products, and construction materials permanently incorporated into an infrastructure project subject to the BABA requirements must be produced in the United States.

While N.J.S.A. 40A:11-18 provides that only manufactured and farm products of the United States, whenever available, must be used in such work, PVSC may, in its reasonable discretion consider foreign products based on cost quality and other factors, as compared to American-made products. *Delta Chemical Corp. vs. Ocean County Utilities Authority, et al*, 231 N.J. Super. 180, 196 (Law Div. 1988), rev’d in part, aff’d in part, 250 N.J. Super. 395 (App. Div. 1991).

## **4.5 Equal Employment Opportunity/Affirmative Action and Business Registration Certificate Requirements**

The Contractor is required to comply with requirements of N.J.S.A. 10:5-31 et seq. (equal opportunity), N.J.S.A. 10:5-1 et seq. (the New Jersey Law Against Discrimination), and N.J.A.C. 17:27-1.1 et seq. (affirmative action rules).

A party responding to this RFP must indicate what type of business organization it is e.g., corporation, partnership, sole proprietorship, or non-profit organization. If a party is a subsidiary or direct or indirect

affiliate of any other organization, it must indicate in its proposal the name of the related organization and the relationship. If a party responding to this RFP is a corporation it shall list the names of those stockholders holding 10% or more of the outstanding stock.

#### **4.5.1 Equal Employment Opportunity/Affirmative Action Requirements**

Firms are required to comply with the provisions of N.J.S.A. 10:5-31 and N.J.A.C. 17:27 et seq. No firm may be issued a contract unless it complies with these affirmative action provisions. The Mandatory Equal Employment Opportunity/Affirmative Action Language for Goods, Professional Services and General Service Contracts, Attachment F Section 00800, Exhibit Nos. 5, 6, 7 and 8 summarizes the full required regulatory text.

Goods and Services (including professional services) Firms/contractors shall submit to the public agency, after notification of award but prior to execution of a goods and services contract, one of the following three documents:

- a. A photocopy of a valid letter that the contractor is operating under an existing Federally approved or sanctioned affirmative action programs (good for one year from the date of the letter); or
- b. A photocopy of a Certificate of Employee Information Report approval, issued in accordance with N.J.A.C. 17:27-4; or
- c. A photocopy of an Employee Information Report (Form AA302) provided by the Division and distributed to the public agency through the Division's website at: [https://www.state.nj.us/treasury/contract\\_compliance](https://www.state.nj.us/treasury/contract_compliance) to be completed by the contractor, in accordance with N.J.A.C. 17:27-4.

The Firm's attention is also called to Section 5.1 of this document which contains the required information and forms. For information on EEO/AA requirements and forms only, please contact RFP Point of Contact identified in the Notice of Inviting Proposals section.

#### **4.5.2 Business Registration Requirements**

All bid submissions must meet all requirements set forth under N.J.S.A. 40A:11-23.2, as amended, and N.J.S.A. 52:32-44, as amended.

#### **4.6 Public Law 2005, Chapter 51, and Executive Order No. 333 (2023).**

##### For Contracts Awarded Pursuant to a Fair and Open Process

Per N.J.S.A. 19:44A-20.13 to 20.25 and Executive Order No. 333 (Murphy), contracts awarded pursuant to a fair and open process do **not** require a certification or disclosure of any solicitation or contribution of money, or pledge of contribution, including in-kind contributions.

The form is not necessary as the competitive contracting process is considered a fair and open process.

#### **4.7 Notice To All State Vendors: Set-Off For State Tax**

Per N.J.S.A. 54:49-19 and N.J.S.A. 54:49-20, and notwithstanding any provision of the law to the contrary, whenever any taxpayer, partnership or S corporation under contract to provide goods or services or construction projects to the State of New Jersey or its agencies or instrumentalities, including the legislative and judicial branches of State government, is entitled to payment for those goods and services or construction projects, at the same time a taxpayer, partner or shareholder of that entity is indebted for any State tax, the Director of the Division of Taxation shall seek to set off that taxpayer's, partner's or shareholder's share of the payment of that indebtedness. The amount set off shall not allow for the deduction of any expenses or other deductions which might be attributable to the taxpayer, partner or shareholder subject to set off.

The Division of Taxation may initiate procedures to set off the tax debt of a specific vendor upon the expiration of ninety (90) days after either the issuance by the Division of a notice and demand for payment of any state tax owed by the taxpayer or the issuance by the Division of a final determination on any protest filed by the taxpayer against an assessment or final audit determination. A set-off reduces the contract payment due to a vendor by the amount of that vendor's state tax indebtedness or, in the case of a vendor-partnership or vendor S-corporation, by the amount of state tax indebtedness of any member-partner or shareholder of the partnership or S corporation, respectively N.J.A.C. 18:2-8.3.

The Director of the Division of Taxation shall give notice of the set-off to the taxpayer, partner or shareholder and shall provide an opportunity for a hearing within thirty (30) days of such notice under the procedures for protests established under N.J.S.A. 54:49-18. No requests for conference, protest or subsequent appeal to the Tax Court from a protest permitted under N.J.S.A. 54:49-19 shall stay the collection of the indebtedness. Interest that may be payable by the State to the taxpayer, pursuant to L. 1987, c 184 (N.J.S.A. 52:32-32) shall be stayed.

#### **4.8 Authority to Audit or Review Contract Records**

Per N.J.S.A. 52:15C-14(d) et seq., the Engineer shall maintain all documentation related to products, transactions or services under this contract for a period of five (5) years from the date of final payment. Such records shall be made available to the New Jersey Office of the State Comptroller upon request.

#### **4.9 Meaning or Intent of RFP**

Should any difference arise as to the meaning or intent of this RFP, Proposer shall request clarification from PVSC. PVSC's decision shall be final and conclusive.

#### **4.10 Contract Form**

If selected to provide equipment and services, it is agreed and understood that the successful Respondent shall be bound by the requirements and terms contained in this RFP and the final contract and the forms as presented in Attachments E and F with regard to services performed, equipment supplied, payments, indemnification, insurance, termination, provisions governing assignment of the Contract and any applicable licensing provisions.

It is also agreed and understood that the acceptance of the final payment by Contractor shall be considered a release in full of all claims against the PVSC arising out of, or by reason of, the work done and materials furnished under this Contract.



#### **4.10.1 Compliance with Contract Form and Technical Specifications**

The Proposer shall state that the submitted proposal agrees and complies with the terms and conditions and all technical requirements of this RFP or list such Proposer exceptions. If exceptions are taken, it is required the Proposer first propose modifications to the contract terms and specifications and then provide itemized exceptions with applicable cost pricing for evaluation purposes. A blank statement that Proposer's commercial terms and conditions shall apply in lieu of the Contract Form will not be acceptable. Failure to comply with this requirement may be cause for elimination of the Proposer's proposal from consideration.

#### **4.10.2 Contract Security**

Article 5 of Section P-00700 Standard General Conditions for Procurement Contracts and in the Supplementary General Conditions set forth PVSC's requirements as to Performance and Payment Bonds (Specification Section P-00600). When the successful Proposer delivers the executed Contract to PVSC, it must be accompanied by the required Maintenance, Performance, and Payment Bonds and Insurance.

#### **4.10.3 Contract to be Assigned**

Proposer's attention is directed to the provisions of Paragraph 10.2 of Section P-00500 Contract Agreement, which provide for the future assignment of this Contract for furnishing Goods and Special Services covered by RFP to an Installation Contractor to be selected by PVSC after the date of execution of this Contract. Timing of the assignment is set forth in the Agreement. Forms documenting the assignment of the Contract and for the agreement of the Proposer's surety to such assignment are included as attachments to the Agreement.

#### **4.10.4 Requirements for Ineligible Telecommunication Equipment and Services Providers**

The United States Government passed Public Law 115-232 in August of 2020. Among other things, this law prohibits the use of SRF funds for goods and services supplied by specific companies and corporations.

As described in section 889 of Public Law 115-232, covered telecommunications equipment or services includes:

- Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).
- For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).
- Telecommunications or video surveillance services provided by such entities or using such equipment.
- Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

There is no exhaustive list of components and services that fall under the prohibition. Project Sponsors should exercise due diligence and be particularly mindful of project components with internet or cellular connections. For example, Sponsors should be mindful of automatic meter reading (AMR) technology and advanced metering infrastructure (AMI), instrumentation control systems (e.g. process control systems, distributed control systems and programmable logic controls), and security cameras and other electronic security measures to ensure that those items are procured from a non-excluded entity. Items included in the prohibition are not eligible State Revolving Funds (SRF) costs, and the SRF programs cannot reimburse borrowers for these costs.

#### **4.10.5 Certification of Non-Involvement in Prohibited Activities in Russia and Belarus (P.L.2022, c.3)**

In accordance with P.L.2022, c.3, Bidder shall certify and submit prior to award as set forth therein on a form of Certification promulgated by the Senate and General Assembly of the State of New Jersey entitled "Certification of Non-Involvement in Prohibited Activities in Russia and Belarus". The form of Certification dated March 25, 2022 can be found in **Attachment A - Required Forms - Section 00 45 53** of the design documents.

### **SECTION 5: WRITTEN PROPOSAL FORMAT**

Proposals must address all information requested in this RFP. Proposals which in the judgment of the PVSC fail to meet the requirements of the RFP or which are in any way conditional, incomplete, obscure, contain additions or deletions from requested information, or contain errors may be rejected.

#### **5.1 Mandatory Content**

Each proposal submitted must contain the following sections:

- Proposal Transmittal Letter
- Cover Sheet
- Table of Contents
- Qualification Forms (P-00400)
- Executive Summary
- Organization chart demonstrating the Proposer's understanding as the sole entity responsible to furnish the equipment comprised of the Oxygen Production System. Organization chart shall illustrate the project organization that the Proposer would put in place to execute the project with an illustration of the relationship between and amongst the Proposer and equipment suppliers.
- Project Approach
  - Proposer's approach/plan to meet the requirements and objectives of the RFP
  - Proposer's manufacturing and delivery schedule of required submittals and equipment
- Oxygen Production Facility Equipment
  - Vacuum Pressure Swing Adsorption System Description
  - Liquid Oxygen Storage System Description
  - Liquid Oxygen Vaporization System Description
  - Cooling System Description
  - Sound Mitigation System Description
  - Electrical & Instrumentation Controls Description
- Technical Documentation

- Technical Documents Required with Proposal (P-00350)
- Contract Form and Technical Specifications
  - Commercial Comments and Clarifications
  - Technical Comments and Clarifications
- Pricing
  - Cost Proposal Form
  - Itemized Exceptions Cost Pricing (Add/Deduct)
- Mandatory Forms
  - Two-Year Chapter 51/Executive Order 117 Vendor Certification and Disclosure of Political Contributions
  - Build America, Buy America (BABA) Act Form
  - 00 27 00 - Acknowledgement of Receipt of Changes to RFP Form
  - 00 43 16 - Proposal Security
  - 00 45 01 - Statement of Ownership
  - 00 45 14 - Proposer's Affidavit
  - 00 45 19 - Non-Collusion Affidavit
  - 00 45 30 - Affirmative Action Affidavit
  - 00 62 76 - Consent of Surety
  - 00 62 77 - Surety Disclosure Statement Certification
  - 00 62 79 - Byrd Anti-Lobbying Amendment Certification
- Additional Forms Due Prior to Contract Award
  - New Jersey Business Registration Certificate
  - 00 45 52 - Disclosure of Investment in Iran Form
  - 00 45 53 - Certification of Non-Involvement in Prohibited Activities in Russia and Belarus

All proposals submitted in response to the RFP shall utilize the form of correspondence (Proposal Transmittal Letter, appended to Attachment A) hereof as the transmittal letter of such proposal. There shall be attached to said transmittal letter succeeding pages setting forth the remainder of the proposal.

To meet the requirements of the RFP, the form of attachments or certifications set forth herein shall be fully completed and executed.

## **SECTION 6: SCOPE OF SERVICES**

PVSC utilizes pure oxygen as part of the secondary treatment process. The oxygen is currently generated using an onsite cryogenic oxygen production facility. The facility is approximately 40 years old and has reached the end of its useful life and needs to be replaced with more reliable, energy efficient equipment.

The overall project has been divided into two contracts, this procurement contract; B-355 - Oxygen Production Facility Equipment Procurement, and a separate installation contract; B-356 - Oxygen Production Facility to be awarded at a later date. As such, the successful respondent of this procurement contract shall furnish and deliver Oxygen Production Facility Equipment in accordance with the Technical Specifications as presented in Annex A, consisting of, but not limited to:

- Vacuum Pressure Swing Adsorption System
- Liquid Oxygen Storage System
- Liquid Oxygen Vaporization System
- Related Electrical & Power Distribution Systems

- Related Instrumentation and Controls System

As part of this work the successful Proposer shall provide:

- Design engineering, submittals, manufacturing, storage and shipping services for the VPSA, LOX Storage and vaporization systems, related electrical and power distribution system, and for the related instrument and control systems
- Performance guarantees, shop drawings, layout drawings, network diagrams, wiring diagrams, installation drawings and details, and installation instructions
- Rigging and transportation instructions
- Preservation and storage instructions
- Spare parts
- Operations and maintenance manuals
- Factory, Shop, and Field testing procedures and results for VPSA, LOX System, Electrical, Instrumentation and Process Equipment
- Four year VPSA service contract
- Training for PVSC Operations Staff
- PE Stamped Design

Additionally, the successful proposer shall perform and provide the following post manufacturing services during installation and commissioning of the oxygen production facility systems:

- **Manufacturers Office and Field Services During Installation and Testing:**
  - Installation instructions, oversight, supervision, and certification services
  - Field Testing support services
  - Startup and Commissioning support services
  - Performance and acceptance testing support services
  - Equipment and operational training of PVSC staff
- **Manufacturers Office and Field Services After Systems Acceptance By The Owner:**
  - Operational support services
  - System Optimization Services

## SECTION 7: PROPOSAL EVALUATION

PVSC's objective in soliciting Proposals is to enable it to select a Respondent that will provide high quality and cost-effective services to PVSC. PVSC will consider Proposals only from Respondents that, in PVSC's sole judgment, have demonstrated the capability and willingness to provide high quality services to PVSC in the manner described in this RFP.

An initial review will be performed on all proposals submitted to determine responsiveness to the following requirements:

1. Minimum qualifications that must be met as required by the RFP,
2. Functional technical requirements of the project, and
3. Any technical and commercial exceptions proposed that PVSC may consider unacceptable.

## 7.1 Evaluation Procedure

Proposals will be evaluated initially on the basis of the written response to the RFP. The top three proposals may be invited to make an oral presentation in person to the Evaluation Committee. If oral presentations are made, and after such presentations, the Evaluation Committee will rank the top three proposals and submit an evaluation to the Commissioners for consideration.

## 7.2 Written Response Evaluation

There will be seven (7) criteria by which proposals will be evaluated. Each criterion will bear a certain weight, and the extent to which the criterion is met or exceeded will be determined by the committee.

1. Cost – The Oxygen Production Facility Equipment will be evaluated on the total cost written on the Cost Proposal Forms submitted with the Proposal. Cost may be adjusted based on Add/Deduct(s) for exceptions within proposal.
2. Adherence to the Terms and Conditions of the Contract - The nature and extent of the clarifications and exceptions stated in the Proposer’s proposal shall be considered in the evaluation of the proposal. At PVSC’s discretion, contract terms and conditions may be adjusted to a mutual acceptable revision of the terms and conditions in the final executed contract. Clarifications that are unacceptable to PVSC, may cause for the proposal to be rejected.
3. Adherence to Technical Specifications - The nature and extent of the clarifications and exceptions stated in the Proposer’s proposal shall be considered in the evaluation of the proposal. Exceptions or clarifications that could prevent the Oxygen Production Facility Equipment from achieving its performance requirements will be cause for rejection of proposal as determined by PVSC.
4. Delivery Schedule - The ability to deliver the Oxygen Production Facility Equipment to the Site in accordance with the overall project schedule as described in Section P-00500 Contract Agreement and as coordinated by PVSC. The delivery of submittals, the cost for equipment long term storage and the ability to meet schedule milestones will be factored into evaluation.
5. Project Execution - The ability to demonstrate Single Source Responsibility for the entire Oxygen Production Facility Equipment will be compared against the project approach to ensure the Oxygen Production Facility Equipment components are delivered on time, coordinate with each other and are properly integrated with the scope of the project as required by the specifications. The ability to demonstrate project management and engineering capabilities and quality assurance programs required to coordinate and deliver all project components will be factored into the evaluation.
6. Quality of Service - The capability of the Proposer’s support systems will be evaluated and will consider the number of Service Representatives and their locations relative to Newark, New Jersey as well as locations of part and equipment warehouses and any other factors that affect overall service response time. Equipment historical availability will also be evaluated.
7. Installation Requirements - Since space is a premium at the Facility, installed cost will be factored into the evaluation including size, foundation, other structural costs and required system auxiliary equipment; as well as the physical arrangement of equipment as to ease of installation, maintenance procedures and operational requirements will be evaluated.

### 7.3 Response Weights

For each of the above written response criteria, the committee will determine the extent to which the requirements are fulfilled. The maximum possible Evaluated Score of 800 Points is weighted for each evaluation criteria as follows:

- Cost: 70 Points
- Adherence to the Terms and Conditions of the Contract: 20 Points
- Adherence to the Technical Specifications: 40 Points
- Delivery Schedule: 10 Points
- Project Execution: 10 Points
- Quality of Service: 5 Points
- Installation Requirements: 5 Points

Each criterion will be weighted by the extent to which the requirements are met. Each criterion will be scaled by the Evaluation Committee between 1 to 5 with 5 being the highest. The scale rating will then be multiplied by the weight to produce a Weighted Score for each criterion. The Weighted Score of all criterion will then be summed to provide a total Evaluated Score. The Evaluation Committee will then rank the Respondent by total Evaluated Score and the top three respondents with the highest score will be identified.

### 7.4 Oral Presentations

The oral presentations can include presentation aids such as PowerPoint. The presentations will be held in a conference room at PVSC 600 Wilson Avenue Newark, NJ 07105 and will be scheduled during the month after receipt of the proposals.

### 7.5 Final Evaluation and Report of Committee

The Committee will prepare a report listing the names of all Respondents who submitted proposals and ranking these Firms in order of evaluation. The Evaluation Committee will rank the top three proposals and submit an evaluation to the Commissioners for consideration.

## SECTION 8: CONTRACT AWARD AND EXECUTION OF THE CONTRACT

### 8.1 Contract Award

The Passaic Valley Sewerage Commissioners will vote to accept the proposal of a Respondent within sixty (60) days of the receipt of proposals, except that the proposals of any Firms who consent thereto, may, at the request of PVSC, be held for consideration for such longer period as may be agreed. **All Proposers must state in their Proposal that Proposer will consent to an extension of the time period to award the Contract, except that the proposals of any firms who consent thereto, may, at the request of PVSC, be held for consideration for such, same longer period as may be agreed.**

### 8.2 Execution of the Contract

When PVSC gives a Notice of Award to the Successful Proposer, it will be accompanied by the required number of unsigned counterparts of the Agreement with all other written Contract Documents attached.

Within ten (10) business days thereafter Proposer (Successful Proposer) shall sign and deliver the required number of counterparts of the Agreement and attached documents to PVSC with the required Bonds. Thereafter, PVSC shall deliver one (1) fully signed counterpart to Proposer.

### **8.3 Failure to Execute Contract**

If Successful Proposer shall fail or neglect to sign and execute the Agreement and bonds with ten (10) business days after Notice of Award, such failure or neglect may be deemed to be an abandonment and breach of Contract by the Proposer and shall be just cause for an annulment of the award and action for breach of contract. Upon such abandonment, PVSC shall have the authority to make an award to another Proposer or re-advertise the RFP. In addition, PVSC may exclude Proposer from submitting on subsequent PVSC projects for such a period, as the PVSC may deem appropriate.

It is understood and agreed by said Proposer that, upon notice of said failure, the surety shall pay the PVSC the amount provided for the Proposal Guarantee in accordance with the provisions of the RFP and PVSC shall be entitled to collect on any certified checks, or Performance and Payment Bonds posted as security for execution.

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**ATTACHMENT A**  
**PVSC MANDATORY FORMS**



Date:

Mr. Gregory A. Tramontozzi  
Executive Director  
Passaic Valley Sewerage Commission  
600 Wilson Avenue  
Newark, New Jersey 07105  
Dear Mr. Tramontozzi:

The undersigned hereby submits the enclosed proposal for the position of **PVSC OXYGEN PRODUCTION FACILITY EQUIPMENT PROCUREMENT – CONTRACT B355**.

The undersigned hereby undertakes and promises to provide services for **PVSC OXYGEN PRODUCTION FACILITY EQUIPMENT PROCUREMENT - CONTRACT B355** and to do all work requested as appropriate and required herein as well as the contract documents concerning the same, including all written amendments and changes thereto, if any, which are incorporated herein by reference and made a part of this proposal.

\_\_\_\_\_  
SIGNATURE

\_\_\_\_\_  
BUSINESS NAME

\_\_\_\_\_  
Type or Print Full Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Date

\_\_\_\_\_  
Telephone Number

\_\_\_\_\_  
Fax-Telephone Number

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# **INSERT PROPOSER NEW JERSEY BUSINESS REGISTRATION CERTIFICATE**

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SECTION 00 27 00 (P-00307)

ACKNOWLEDGEMENT OF RECEIPT OF CHANGES TO RFP FORM

PASSAIC VALLEY SEWERAGE COMMISSION

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PVSC Oxygen Production Facility Equipment Procurement (Name of Construction Project)	B355 (Contract No.)
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The undersigned Proposer hereby acknowledges receipt of the following notices, revisions, or addenda to the Request for Proposal (RFP). By indicating date of receipt, Proposer acknowledges the submitted Proposal takes into account the provisions of the notices, revision or addendum. Note that the PVSC's record of notice to proposers shall take precedence and that failure to include provisions of changes in a bid proposal may be reason for rejection of the bid.

Addendum No.	How Received (mail, fax, Pick-up, etc)	Date Received

\_\_\_\_\_<= Indicate "NONE" in the space provided (to the left) if there were no notices, revisions, or addenda to the bid advertisement, specifications or bid documents.

Acknowledgement by proposer:

Name of Proposer:

\_\_\_\_\_

By Authorized Representative:

Signature: \_\_\_\_\_

Printed Name and Title: \_\_\_\_\_

Date: \_\_\_\_\_

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SECTION 00 43 16 (P-00301)

PROPOSAL SECURITY

KNOW ALL MEN BY THESE PRESENTS that we, the undersigned, \_\_\_\_\_, as Principal; and \_\_\_\_\_ Surety, are hereby held and firmly bound unto the Passaic Valley Sewerage Commission in the penal sum of \_\_\_\_\_ for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_.

The condition of the above obligation is such that whereas the Principal has submitted to the Passaic Valley Sewerage Commission a certain Bid, attached hereto, and hereby made a part hereof, to enter into a contract in writing, to:

CONTRACT NO. B355 - PVSC OXYGEN PRODUCTION FACILITY  
EQUIPMENT PROCUREMENT

NOW THEREFORE,

- A. If said Proposal shall be rejected, or, in the alternate,
- B. If said Proposal shall be accepted and the Principal shall execute and deliver a contract in the form of Contract attached hereto (properly completed) and shall furnish a bond for his faithful performance of said Contract and shall in all other respects perform the agreement created by the acceptance of said Proposal.

Then, this obligation shall be void, otherwise the same shall remain in force, and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of time within which the Principal may accept such Proposal and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have set their hands and seals, and such of them as are corporations having caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

Principal: \_\_\_\_\_

Surety: \_\_\_\_\_ by: \_\_\_\_\_

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SECTION 00 45 01 (P-00305)

STATEMENT OF OWNERSHIP  
(OWNERSHIP DISCLOSURE CERTIFICATION)

N.J.S.A. 52:25-24.2 (P.L. 1977, c.33, as amended by P.L. 2016, c.43)

**This Statement Shall Be Included with  
All Bid and Proposal Submissions**

**Name of Business:** \_\_\_\_\_

**Address of Business:** \_\_\_\_\_

**Name of person completing this form:** \_\_\_\_\_

**N.J.S.A. 52:25-24.2:**

"No corporation, partnership, or limited liability company shall be awarded any contract nor shall any agreement be entered into for the performance of any work or the furnishing of any materials or supplies, unless prior to the receipt of the bid or proposal, or accompanying the bid or proposal of said corporation, said partnership, or said limited liability company there is submitted a statement setting forth the names and addresses of all stockholders in the corporation who own 10 percent or more of its stock, of any class, or of all individual partners in the partnership who own a 10 percent or greater interest therein, or of all members in the limited liability company who own a 10 percent or greater interest therein, as the case may be.

If one or more such stockholder or partner or member is itself a corporation or partnership or limited liability company, the stockholders holding 10 percent or more of that corporation's stock, or the individual partners owning 10 percent or greater interest in that partnership, or the members owning 10 percent or greater interest in that limited liability company, as the case may be, shall also be listed. The disclosure shall be continued until names and addresses of every noncorporate stockholder, and individual partner, and member, exceeding the 10 percent ownership criteria established in this act, has been listed.

To comply with this section, a bidder with any direct or indirect parent entity which is publicly traded may submit the name and address of each publicly traded entity and the name and address of each person that holds a 10 percent or greater beneficial interest in the publicly traded entity as of the last annual filing with the federal Securities and Exchange Commission or the foreign equivalent, and, if there is any person that holds a 10 percent or greater beneficial interest, also shall submit links to the websites containing the last annual filings with the federal Securities and Exchange Commission or the foreign equivalent and the relevant page numbers of the filings that contain the information on each person that holds a 10 percent or greater beneficial interest."

This Ownership Disclosure Certification form shall be completed, signed and notarized.

**Failure of the bidder/proposer to submit the required information is cause for automatic rejection of the bid or proposal**

**Part I**

**Check the box that represents the type of business organization:**

- Sole Proprietorship
- Non-Profit Corporation (skip Parts II and III, sign and notarize at the end)
- Partnership    Limited Partnership    Limited Liability Partnership
- Limited Liability Company
- For-profit Corporation (including Subchapters C and S or Professional Corporation)
- Other (be specific): \_\_\_\_\_

**Part II**

- I certify that the list below contains the names and addresses of all stockholders in the corporation who own 10 percent or more of its stock, of any class, or of all individual partners in the partnership who own a 10 percent or greater interest therein, or of all members in the limited liability company who own a 10 percent or greater interest therein, as the case may be.

**OR**

- I certify that no one stockholder in the corporation owns 10 percent or more of its stock, of any class, or no individual partner in the partnership owns a 10 percent or greater interest therein, or that no member in the limited liability company owns a 10 percent or greater interest therein, as the case may be.

**The disclosure shall be continued until names and addresses of every noncorporate stockholder, and individual partner, and member exceeding the 10 percent ownership criteria established pursuant to N.J.S.A. 52:25-24.2 has been listed.**

**Sign and notarize the form below, and, if necessary, complete the list below. (Please attach additional sheets if more space is needed):**

Name: \_\_\_\_\_ Name: \_\_\_\_\_

Address: \_\_\_\_\_ Address: \_\_\_\_\_

\_\_\_\_\_

Name: \_\_\_\_\_ Name: \_\_\_\_\_

Address: \_\_\_\_\_ Address: \_\_\_\_\_

\_\_\_\_\_

Name: \_\_\_\_\_ Name: \_\_\_\_\_

Address: \_\_\_\_\_ Address: \_\_\_\_\_

\_\_\_\_\_

Name: \_\_\_\_\_ Name: \_\_\_\_\_

Address: \_\_\_\_\_ Address: \_\_\_\_\_

\_\_\_\_\_

Name: \_\_\_\_\_ Name: \_\_\_\_\_

Address: \_\_\_\_\_ Address: \_\_\_\_\_

\_\_\_\_\_

Name: \_\_\_\_\_ Name: \_\_\_\_\_

Address: \_\_\_\_\_ Address: \_\_\_\_\_

\_\_\_\_\_

Name: \_\_\_\_\_ Name: \_\_\_\_\_

Address: \_\_\_\_\_ Address: \_\_\_\_\_

\_\_\_\_\_

**Part III - Any Direct or Indirect Parent Entity Which is Publicly Traded:**

“To comply with this section, a bidder with any direct or indirect parent entity which is publicly traded may submit the name and address of each publicly traded entity and the name and address of each person that holds a 10 percent or greater beneficial interest in the publicly traded entity as of the last annual filing with the federal Securities and Exchange Commission or the foreign equivalent, and, if there is any person that holds a 10 percent or greater beneficial interest, also shall submit links to the websites containing the last annual filings with the federal Securities and Exchange Commission or the foreign equivalent and the relevant page numbers of the filings that contain the information on each person that holds a 10 percent or greater beneficial interest.”

- Pages attached with name and address of each publicly traded entity as well as the name and address of each person that holds a 10 percent or greater beneficial interest.
- OR**
- Submit here the links to the Websites (URLs) containing the last annual filings with the federal Securities and Exchange Commission or the foreign equivalent.

\_\_\_\_\_  
\_\_\_\_\_

**AND**

- Submit here the relevant page numbers of the filings containing the information on each person holding a 10 percent or greater beneficial interest.

\_\_\_\_\_

Subscribed and sworn before me this \_\_\_ day of

\_\_\_\_\_  
(Affiant)

\_\_\_\_\_, 20\_\_.

(Notary Public)

\_\_\_\_\_  
(Print name of affiant and title if applicable)

My Commission expires:

(Corporate Seal if a Corporation)

SECTION 00 45 14 (P-00303)

PROPOSER'S AFFIDAVIT

State of \_\_\_\_\_ )

ss:

County of \_\_\_\_\_ )

\_\_\_\_\_ being duly sworn, deposes and says that he resides at  
\_\_\_\_\_ that he is the \_\_\_\_\_ (Title)  
of \_\_\_\_\_  
(Name of Proposer)

who signed the above Proposal, that he was duly authorized to sign, and that the Proposal is a true offer of the Proposer, and the seal attached is the seal of the Proposer and that all the declarations and statements contained in the Proposal are true to the best of his knowledge and belief.

\_\_\_\_\_  
(Affiant)

Sworn to and subscribed before me

this \_\_\_\_ day of \_\_\_\_\_, 20\_\_

\_\_\_\_\_  
Notary Public in and for

\_\_\_\_\_ County, \_\_\_\_\_

My Commission Expires

\_\_\_\_\_, 20\_\_

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SECTION 00 45 19 (P-00304)

NON-COLLUSION AFFIDAVIT

STATE OF NEW JERSEY, COUNTY OF \_\_\_\_\_ ss.:

I, \_\_\_\_\_, of the City of \_\_\_\_\_ in the County of \_\_\_\_\_ and the State of \_\_\_\_\_ of full age, being duly sworn according to law on my oath depose and say that:

I am \_\_\_\_\_ of the firm of \_\_\_\_\_ the bidder making the Bid for the above-named contract, and that I executed the said Bid with full authority so to do; that said bidder has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free, competitive bidding in connection with the within Contract; and that all statements contained in said Bid and in this Affidavit are true and correct, and made with full knowledge that the **Passaic Valley Sewerage Commission** relies upon the truth of the statements contained in said Bid and in the statements contained in this Affidavit in awarding the Contract.

I further warrant that no person or selling agency has been employed or retained to solicit or secure such Contract upon an agreement or understanding for a commission, percentage, brokerage or contingent fee, except bona fide employees or bona fide established commercial or selling agencies maintained by the bidder for the purpose of securing business.

For breach or violation of this warranty the Owner shall have the right to annul the Contract without liability or in its discretion to deduct from the Contract price or consideration the full amount of such commission, percentage, brokerage or contingent fee.

\_\_\_\_\_  
(Affiant)

Sworn to and subscribed before me

this \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_

\_\_\_\_\_  
Notary Public in and for  
\_\_\_\_\_ County, \_\_\_\_\_

My Commission Expires  
\_\_\_\_\_, 20\_\_\_\_

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SECTION 00 45 30 (P-00306)

AFFIRMATIVE ACTION AFFIDAVIT

(to be completed by firms with more than 50 employees)

\_\_\_\_\_ of the firm of \_\_\_\_\_  
(name)

being sworn according to law on his oath deposes and says that:

1. I am authorized to make this affidavit on behalf of:

\_\_\_\_\_  
(name of firm)

2. In addition, an agreement to comply with an Affirmative Action Program for equal employment opportunity heretofore submitted as part of any pre-qualification statement, or under other conditions of this contract for a similar program, I/we do hereby further affirm that I/we will comply with the rules and regulations which will be promulgated by the State Treasurer as of the effective date therefor pursuant to the Affirmative Action Law (N.J.S.A. 10:5-31 et seq. (N.J.A.C. 17:27)), as amended.

\_\_\_\_\_  
Name and Title

\_\_\_\_\_  
Signature of Authorized Representative

Subscribed and sworn to  
before me this \_\_\_\_\_

day of \_\_\_\_\_ 20\_\_.

\_\_\_\_\_  
Seal Notary Public of New Jersey

AFFIRMATIVE ACTION AFFIDAVIT

(to be completed by firms with fewer than 50 employees)

I \_\_\_\_\_, of the (City, Town, Borough) of \_\_\_\_\_ in the County of \_\_\_\_\_, State of \_\_\_\_\_, of full age, being duly sworn according to law on my oath depose and say that:

1. I am \_\_\_\_\_, of the firm of \_\_\_\_\_, a bidder making a proposal upon

**CONTRACT B355 - PVSC OXYGEN PRODUCTION FACILITY  
EQUIPMENT PROCUREMENT**

2. \_\_\_\_\_ does not have 50 employees or more inclusive of all officers and employees of every type.

3. I am familiar with the affirmative action requirements of P.L. 1975, c. 127 and rules and regulations issued by the Treasurer, State of New Jersey, pursuant thereto.

4. \_\_\_\_\_ has complied with all the affirmative action requirements of the State of New Jersey, including those required by the P.L. 1975. c. 127 and rules and regulations issued by the Treasurer, State of New Jersey, pursuant thereto.

5. I am aware that if \_\_\_\_\_ does not comply with P.L. 1975, c. 127 and rules and regulations issued pursuant thereto, that no monies will be paid by the State of New Jersey, County of \_\_\_\_\_, (City, Town, Borough) of \_\_\_\_\_ until an affirmative action plan is approved. I am also aware that the contract may be terminated and the \_\_\_\_\_, may be debarred from all public contracts, for a period of up to five (5) years.

6. In the event my workforce increases to 50 employees, I must contact the State Affirmative Action Office and complete an Employee Information Report.

\_\_\_\_\_  
Name and Title

\_\_\_\_\_  
Signature of Authorized Representative

Subscribed and sworn to  
before me this \_\_\_\_\_

day of \_\_\_\_\_, 20\_\_.

\_\_\_\_\_  
Seal Notary Public of New Jersey

## Prohibited Russia-Belarus Activities & Iran Investment Activities

**Person or Entity**

### Part 1: Certification

#### COMPLETE PART 1 BY CHECKING ONE OF THE THREE BOXES BELOW

Pursuant to law, any person or entity that is a successful bidder or proposer, or otherwise proposes to enter into or renew a contract, for goods or services must complete the certification below prior to contract award to attest, under penalty of perjury, that neither the person or entity, nor any parent entity, subsidiary, or affiliate, is identified on the Department of Treasury's Russia-Belarus list or Chapter 25 list as a person or entity engaging in prohibited activities in Russia, Belarus or Iran. Before a contract for goods or services can be amended or extended, a person or entity must certify that neither the person or entity, nor any parent entity, subsidiary, or affiliate, is identified on the Department of Treasury's Russia-Belarus list. Both lists are found on Treasury's website at the following web addresses:

<https://www.nj.gov/treasury/administration/pdf/RussiaBelarusEntityList.pdf>  
[www.state.nj.us/treasury/purchase/pdf/Chapter25List.pdf](http://www.state.nj.us/treasury/purchase/pdf/Chapter25List.pdf).

As applicable to the type of contract, the above-referenced lists must be reviewed prior to completing the below certification.

A person or entity unable to make the certification must provide a detailed, accurate, and precise description of the activities of the person or entity, or of a parent entity, subsidiary, or affiliate, engaging in prohibited activities in Russia or Belarus and/or investment activities in Iran. The person or entity must cease engaging in any prohibited activities and provide an updated certification before the contract can be entered into.

If a vendor or contractor is found to be in violation of law, action may be taken as appropriate and as may be provided by law, rule, or contract, including but not limited to imposing sanctions, seeking compliance, recovering damages, declaring the party in default, and seeking debarment or suspension of the party.

### CONTRACT AWARDS AND RENEWALS



*I certify, pursuant to law, that neither the person or entity listed above, nor any parent entity, subsidiary, or affiliate appears on the N.J. Department of Treasury's lists of entities engaged in prohibited activities in Russia or Belarus pursuant to P.L. 2022, c. 3 or in investment activities in Iran pursuant to P.L. 2012, c. 25 ("Chapter 25 List"). I further certify that I am the person listed above, or I am an officer or representative of the entity listed above and am authorized to make this certification on its behalf. (Skip Part 2 and sign and complete the Certification below.)*

**CONTRACT AMENDMENTS AND EXTENSIONS**



*I certify, pursuant to law, that neither the person or entity listed above, nor any parent entity, subsidiary, or affiliate is listed on the N.J. Department of the Treasury's lists of entities determined to be engaged in prohibited activities in Russia or Belarus pursuant to P.L. 2022, c. 3. I further certify that I am the person listed above, or I am an officer or representative of the entity listed above and am authorized to make this certification on its behalf. (Skip Part 2 and sign and complete the Certification below.)*

**IF UNABLE TO CERTIFY**



*I am unable to certify as above because the person or entity and/or a parent entity, subsidiary, or affiliate is listed on the Department's Russia-Belarus list and/or Chapter 25 Iran list. I will provide a detailed, accurate, and precise description of the activities as directed in Part 2 below, and sign and complete the Certification below. Failure to provide such will prevent the award of the contract to the person or entity, and appropriate penalties, fines, and/or sanctions will be assessed as provided by law.*

**Part 2: Additional Information**

**PLEASE PROVIDE FURTHER INFORMATION RELATED TO PROHIBITED ACTIVITIES IN RUSSIA OR BELARUS AND/OR INVESTMENT ACTIVITIES IN IRAN.**

You must provide a detailed, accurate, and precise description of the activities of the person or entity, or of a parent entity, subsidiary, or affiliate, engaging in prohibited activities in Russia or Belarus and/or investment activities in Iran in the space below and, if needed, on additional sheets provided by you.

### Part 3: Certification of True and Complete Information

*I, being duly sworn upon my oath, hereby represent and state that the foregoing information and any attachments there, to the best of my knowledge, are true and complete. I attest that I am authorized to execute this certification on behalf of the above-referenced person or entity.*

*I acknowledge that the Contracting Unit is relying on the information contained herein and hereby acknowledge that I am under a continuing obligation from the date of this certification through the completion of any contracts with the Contracting Unit to notify the Contracting Unit in writing of any changes to the answers of information contained herein.*

*I acknowledge that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification. If I do so, I recognize that I am subject to criminal prosecution under the law and that it will also constitute a material breach of my agreement(s) with the Contracting Unit and that the Contracting Unit at its option may declare any contract(s) resulting from this certification void and unenforceable.*

<b>Full Name (Print)</b>		<b>Title</b>	
<b>Signature</b>		<b>Date</b>	

NO TEXT ON THIS PAGE



SECTION 00 62 76 (P-00302)

CONSENT OF SURETY

KNOW ALL MEN BY THESE PRESENTS, that for and in consideration of the sum of \$1.00, lawful money of the United States, the receipt whereof is hereby acknowledged, paid the undersigned corporation, and for other valuable consideration, the \_\_\_\_\_  
\_\_\_\_\_(Name of Surety) corporation organized and existing under the laws of the State of \_\_\_\_\_ and licensed to do business in the State of New Jersey, certifies and agrees, that if CONTRACT NO. B355 - PVSC OXYGEN PRODUCTION FACILITY EQUIPMENT PROCUREMENT is awarded to \_\_\_\_\_ undersigned corporation will execute the Bond or Bonds as required by the Contract Documents and will become surety in the full amount of the Contract price for the faithful performance of the contract and for payment of all persons supplying labor or furnishing materials in connection hence with.

Signature of Surety by: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(To be accompanied by the usual proof of authority of officers of surety company to execute the same.)

NO TEXT ON THIS PAGE

SECTION 00 62 77

**SURETY DISCLOSURE STATEMENT AND CERTIFICATION**

Surety(ies) on the attached bond, hereby certifies(y) the following:

(1) The surety meets the applicable capital and surplus requirements of R.S. 17:17-6 or R.S. 17:17-7 as of the surety's most current annual filing with the New Jersey Department of Insurance.

(2) The capital (where applicable) and surplus, as determined in accordance with the applicable laws of this State, of the surety(ies) participating in the issuance of the attached bond is (are) in the following amount(s) as of the calendar year ended December 31, \_\_\_\_\_ (most recent calendar year for which capital and surplus amounts are available), which amounts have been certified as indicated by certified public accountants (indicating separately for each surety that surety's capital and surplus amounts, together with the name and address of the firm of certified public accounts that shall have certified those amounts):

(3) (a) With respect to each surety participating in the issuance of the attached bond that has received from the United States Secretary of the Treasury a certificate of authority pursuant to 31 U.S.C. § 9305, the underwriting limitation established therein and the date as of which that limitation was effective is as follows (indicating for each such surety that surety's underwriting limitation and the effective date thereof):

(b) With respect to each surety participating in the issuance of the attached bond that has not received such a certificate of authority from the United States Secretary of the Treasury, the underwriting limitation of that surety as established pursuant to R.S. 17:18-9 as of (date on which such limitation was so established) is as follows (indicating for each such surety that surety's underwriting limitation and the date on which that limitation was established):

(4) The amount of the bond to which this statement and certification is attached is:  
\$ \_\_\_\_\_

**SURETY DISCLOSURE STATEMENT AND CERTIFICATION (continued)**

(5) If, by virtue of one or more contracts of reinsurance, the amount of the bond indicated under item (4) above exceeds the total underwriting limitation of all sureties on the bond as set forth in items (3)(a) or (3)(b) above, or both, then for each such contract of reinsurance:

(a) The name and address of each such reinsurer under that contract and the amount of that reinsurer's participation in the contract is as follows:

;and

(b) Each surety that is party to any such contract of reinsurance certifies that each reinsurer listed under item (5)(a) satisfies the credit for reinsurance requirement established under P.L.1993, c.243 (C. 17:51B-1 et seq.) and any applicable regulations in effect as of the date on which the bond to which this statement and certification is attached shall have been filed with the appropriate public agency.

**CERTIFICATE**

(to be completed by an authorized certifying agent  
for each surety on the bond)

I \_\_\_\_\_ (Name of Agent), as \_\_\_\_\_ (Title of Agent) for  
\_\_\_\_\_ (Name of Surety), a corporation/mutual insurance company/other  
(circle one) domiciled in \_\_\_\_\_ (state of domicile), DO  
HEREBY CERTIFY that, to the best of my knowledge, the foregoing statements made by me  
are true, and ACKNOWLEDGE that, if any of those statements are false, this bond is  
VOIDABLE.

\_\_\_\_\_  
(Signature of certifying agent)

\_\_\_\_\_  
(Printed name of certifying agent)

\_\_\_\_\_  
(Title of certifying agent)

**SECTION 00 62 78**

**BUILD AMERICA, BUY AMERICA (BABA) ACT CON**

The **SELLER** acknowledges to and for the benefit of the **Passaic Valley Sewerage Commission** (“**OWNER**”) and the **New Jersey Infrastructure Bank** (the “Funding Authority”) that it understands the goods and services under this Agreement are being funded with federal monies and have statutory requirements commonly known as “Build America, Buy America;” that requires all of the iron and steel, manufactured products, and construction materials used in the project to be produced in the United States (“Build America, Buy America Requirements”) including iron and steel, manufactured products, and construction materials provided by the Contactor pursuant to this Agreement. The Seller hereby represents and warrants to and for the benefit of the Owner and Funding Authority (a) the Seller has reviewed and understands the Build America, Buy America Requirements, (b) all of the iron and steel, manufactured products, and construction materials used in the project will be and/or have been produced in the United States in a manner that complies with the Build America, Buy America Requirements, unless a waiver of the requirements is approved, and (c) the Seller will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the Build America, Buy America Requirements, as may be requested by the Owner or the Funding Authority. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Seller shall permit the Owner or Funding Authority to recover as damages against the Seller any loss, expense, or cost (including without limitation attorney’s fees) incurred by the Owner or Funding Authority resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the Funding Authority or any damages owed to the Funding Authority by the Owner). If the Seller has no direct contractual privity with the Funding Authority, as a lender or awardee to the Owner for the funding of its project, the Owner and the Seller agree that the Funding Authority is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the Funding Authority.

Seller: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

OFFICE OF WATER

November 3, 2022

**MEMORANDUM**

**SUBJECT:** Build America, Buy America Act Implementation Procedures for EPA Office of Water Federal Financial Assistance Programs

**FROM:** Radhika Fox  
Assistant Administrator 

**TO:** EPA Regional Water Division Directors, Regions I – X  
EPA Office of Water Office Directors

**OVERVIEW**

The Biden-Harris Administration recognized the Nation's critical need for infrastructure investment, championing the Bipartisan Infrastructure Law (BIL), which Congress passed on November 15, 2021 (also known as the Infrastructure Investment and Jobs Act (IIJA)). The BIL will provide an unprecedented level of federal investment in water and wastewater infrastructure in communities across America.

In Title IX of the IIJA, Congress passed the Build America, Buy America (BABA) Act, which establishes strong and permanent domestic sourcing requirements across all Federal financial assistance programs for infrastructure. The U.S. Environmental Protection Agency (EPA) Office of Water is honored to help lead the implementation of these provisions and is proud of its near decade of successful implementation of the American Iron and Steel (AIS) provisions for its flagship water infrastructure programs.

This is a transformational opportunity to build a resilient supply chain and manufacturing base for critical products here in the United States that will spur investment in good-paying American manufacturing jobs and businesses. EPA's efforts to implement BABA will help cultivate the domestic manufacturing base for a wide range of products commonly used across the water sector but not currently made domestically. This will take time, and flexibility will be important to ensure that EPA can leverage critical water investments on time and on budget to protect public health and improve water quality.

## IMPLEMENTATION

Recognizing the opportunity and need for BABA implementation guidance, the Made in America Office (MIAO) of the Office of Management and Budget (OMB) published [Initial Implementation Guidance on Application of Buy America Preference in Federal Financial Assistance Programs for Infrastructure](#) (OMB Guidance M-22-11) on April 18, 2022. The guidance provides government-wide implementation direction for all Federal financial assistance programs for infrastructure. Despite the extensive guidance developed by MIAO, EPA's Office of Water infrastructure investment programs have received many questions that were not addressed in OMB Guidance M-22-11 or that require further clarification for EPA water infrastructure programs. The following questions and answers serve to supplement OMB Guidance M-22-11 with implementation procedures specific to EPA's relevant water infrastructure programs.

Section 70914(a) of the IIJA states when a Buy America preference under BABA applies: "Not later than... [May 14, 2022], the head of each Federal agency shall ensure that none of the funds made available for a Federal financial assistance program for infrastructure...may be obligated for a project unless all of the iron, steel, manufactured products, and construction materials used in the project are produced in the United States." Therefore, Federal financial infrastructure investments obligated on or after May 14, 2022, must comply with the BABA requirements. Absent a waiver, all iron, steel, manufactured products, and construction materials permanently incorporated into an infrastructure project subject to the BABA requirements must be produced in the United States. For many of EPA's Office of Water infrastructure investment programs, the vast majority of products permanently incorporated into construction, maintenance, or repair projects must comply with the BABA requirements, with the exception of select construction materials (cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives), which are specifically excepted by the BABA statute.

EPA's Office of Water implements many infrastructure investment programs subject to BABA requirements, including the following:

- Alaska Native Villages and Rural Communities Water Grant Program (ANV) (and any associated Interagency Agreements with the Indian Health Service)
- Clean Water and Drinking Water State Revolving Fund Programs (CW and DWSRF)
- Clean Water and Drinking Water Grants to U.S. Territories and the District of Columbia
- Clean Water Indian and Drinking Water Tribal Infrastructure Grant Set-aside (and any associated Interagency Agreements with the Indian Health Service)
- Coastal Wetlands Planning, Protection and Restoration Act, (CWPPRA) Programs
- Congressionally Directed Spending/Community Project Funding (also known as Community Grants)
- Geographic Programs<sup>1</sup>
- Gulf Hypoxia Program
- National Estuaries Program (CWA Section 320)

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<sup>1</sup> Geographic Programs include: Great Lakes Restoration Initiative, Chesapeake Bay, San Francisco Bay, Puget Sound, Long Island Sound, Gulf of Mexico, South Florida, Lake Champlain, Lake Pontchartrain, Southern New England Estuaries, Columbia River Basin, Pacific Northwest





## QUESTIONS AND ANSWERS

### SECTION 1: GENERAL

- Q1.1: Will EPA provide documentation for BABA for bid solicitations and suggested contract language? Will EPA provide suggested language for Assistance Agreements?
  - A1.1: See Appendix 1, which includes suggested language for construction contracts which addresses the BABA requirements. In addition to the language suggested in Appendix 1, EPA also recommends that assistance recipients prepare contract bid solicitation documents with a statement for the consulting engineers and construction firms as follows: “By signing payment application and recommending payment, Contractor certifies they have reviewed documentation for all products and materials submitted for payment, and the certifications are sufficient to demonstrate compliance with Build America, Buy America Act requirements.” In most cases, the assistance recipient’s representatives assume the responsibility for their clients to conduct due diligence on compliance with applicable domestic preference requirements.

All Federal Financial infrastructure assistance agreements subject to BABA must have a clause requiring compliance with the requirements. See Appendix 2 for example assistance agreement language.

- Q1.2: Would federally-financed infrastructure projects outside of the United States need to comply with the BABA requirements?
  - A1.2: No. According to the OMB Guidance (M-22-11), a “project” is defined as “...any activity related to the construction, alteration, maintenance, or repair of infrastructure in the United States.” Therefore, the BABA requirements are not implicated for infrastructure projects occurring outside of the United States, such as projects funded through the United States-Mexico-Canada Agreement with infrastructure activities occurring in Mexico or Canada (that is, outside the United States).

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- Q1.3: If most of the project is BABA compliant, and a small portion is not, can an assistance recipient self-fund (i.e., paying with non-federal dollars) the non-compliant products?
  - A1.3: Any project that is funded in whole or in part with federal assistance must comply with the BABA requirements, unless the requirements are otherwise waived. All iron, steel, manufactured products, and construction materials used in a project must meet the BABA requirements unless waived. Absent a waiver, there is no “small portion” or product that does not need to satisfy the BABA requirements unless the requirements are waived (or specifically excluded as is the case for cement and cementitious materials; aggregates such as stone, sand, or gravel; aggregate binding agents or additives; or non-permanent products). An assistance recipient may request a waiver or inquire as to whether a broad waiver, such as a *de minimis* waiver, might apply.

- Q1.4: How do international trade agreements affect the implementation of the BABA requirements?
  - A1.4: The BABA requirements apply in a manner consistent with United States obligations under international trade agreements. Typically, these obligations only apply to direct procurement by the entities that are signatories to these trade agreements. In general, assistance recipients are not signatories to such agreements, so these trade agreements have no impact on BABA implementation. In the few instances where such an agreement applies to a municipality, that municipality is responsible for determining its applicability and requirements and communicating with the funding authority (such as EPA and/or a state) on the actions taken to comply with BABA.

SECTION 2: PRODUCT COVERAGE

- Q2.1: For products made of iron and steel, what is the difference between predominantly and primarily iron and steel?
  - A2.1: EPA considers the terms “predominantly” and “primarily” to be interchangeable, such that a product is considered predominantly (or primarily) iron and steel if it contains greater than 50 percent iron and steel by material cost.
- Q2.2: What is the definition of construction materials (with examples)?
  - A2.2: From OMB Guidance M-22-11: “construction materials” include an article, material, or supply (other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; aggregate binding agents or additives; or non-permanent products) that is or consists primarily of:
    - non-ferrous metals,
    - plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables), (including optic glass),
    - lumber, and
    - drywall.

For example, a plate of glass would be a construction material under BABA, but a framed window that incorporates the glass into a frame would be a manufactured product. Another common construction material for water infrastructure projects would be polyvinyl chloride (PVC) pipe and fittings. However, if PVC components are incorporated into a more complex product such as instrumentation and control equipment or a water treatment unit, those items would be manufactured products.

- Q2.3: What are manufactured products (with examples)?
  - A2.3: From OMB Guidance M-22-11: “...all manufactured products used in the project are produced in the United States—this means the manufactured product was manufactured in the United States; and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total

cost of all components of the manufactured product, unless another standard for determining the minimum amount of domestic content of the manufactured product has been established under applicable law or regulation...”

The manufactured products category would cover the majority of potential water infrastructure products, including complex products made up of a variety of material types and components. For water infrastructure projects, common manufactured products would include, but not be limited to, pumps, motors, blowers, aerators, generators, instrumentation and control systems, gauges, meters, measurement equipment, treatment equipment, dewatering equipment, actuators, and many other mechanical and electrical items.

- Q2.4: Which category will valves fall under for BABA? Will it differ from the American Iron and Steel (AIS) requirements?
  - A2.4: For programs that are subject to BABA and AIS (SRF, WIFIA, and Community Project Funding), projects using valves should classify them as iron and steel products under BABA as long as their material cost is made up of more than 50 percent iron and/or steel. Valves with 50 percent or less iron and/or steel by material cost would be considered manufactured products under the BABA requirements.

In accordance with OMB Guidance M-22-11, an article, material, or supply should be classified into only one of the three categories: iron and steel, manufactured products, or construction materials. Under the AIS requirements, all valves made primarily of iron and steel (that is, those with iron and/or steel material cost greater than 50 percent) must comply with the AIS requirements. For BABA, EPA interprets Section IV of OMB Guidance M-22-11 to mean that iron and steel products are those items that are primarily iron and steel, the same as for the AIS requirements.

- Q2.5: Does EPA have a list of products to be classified as “Iron and Steel” under BABA?
  - A2.5: Although this list is not comprehensive, the following products were classified as AIS products if made primarily (more than 50 percent) of iron and/or steel by materials cost (for programs subject to both AIS and BABA, this list would be equivalent for “iron and steel” items or products under either requirement):

Products likely made “primarily” of iron and steel to be classified as <u>Iron and Steel</u> under BABA		
Lined and Unlined Pipe	Lined and Unlined Fittings	Tanks
Flanges	Pipe Clamps and Restraints	Structural Steel
Valves	Hydrants	Pre-Cast, Iron/Steel Reinforced Concrete (of all types, regardless of iron/steel content percentage)
Manhole Covers and other Municipal Castings	Access Hatches	Ballast Screens
Iron or Steel Benches	Bollards	Cast Bases
Cast Iron Hinged Hatches	Cast Iron Riser Rings	Catch Basin Inlets
Cleanout/Monument Boxes	Construction Covers and Frames	Curb and Corner Guards

Products likely made “primarily” of iron and steel to be classified as <u>Iron and Steel</u> under BABA		
Curb Boxes	Curb Openings	Curb Stops
Detectable Warning Plates	Downspout Shoes	Drainage Grates
Drainage Grate Frames and Curb Inlets	Inlets	Junction Boxes
Lampposts	Manhole Rings and Frames	Manhole Risers
Meter Boxes	Service Boxes	Steel Hinged Hatches
Steel Riser Rings	Trash Receptacles	Tree Grates
Tree Guards	Trench Grates	Valve Boxes
Valve Box Covers and Risers	Access Ramps	Aeration Pipes and Fittings (separate from aeration/blowers)
Angles	Backflow Preventers/Double Check Valves	Baffle Curtains
Iron or Steel Bar	Bathroom Stalls	Beam Clamps
Cable Hanging Systems	Clarifier Tanks	Coiled Steel
Column Piping	Concrete Reinforcing Bar, Wire, and Fibers	Condensate Sediment Traps
Corrugated Pipe	Couplings	Decking
Digester Covers	Dome Structures	Door Hardware
Doors	Ductwork	Expansion Joints
Expansion Tanks (diaphragm, surge, and hydropneumatics)	Fasteners	Fencing and Fence Tubing
Fire Escapes	Flanged Pipe	Flap Gates
Framing	Gate Valves	Generic Hanging Brackets
Grating	Ground Testing Boxes	Ground Test Wells
Guardrails	HVAC Registers, Diffusers, and Grilles	Joists
Knife Gates	Ladders	Lifting Hooks, J-bar, Connectors within, and Anchors for Concrete
Lockers	Man Baskets and Material Platforms	Manhole Steps
Mud Valves	Municipal Casting Junctions	Non-mechanical (aka stationary) Louvers and Dampers
Overhead Rolling Doors/ Uplifting Doors (manual open, no motor)	Pipe Connectors	Pipe Hangers
Pipe Pilings (any type of steel piling)	Pipe Spool (pipe, flanges, connectors, etc.)	Pipe Supports
Pitless Adaptors	Pre-fab Steel Buildings/Sheds (simple structure, unfurnished)	Pre-stressed Concrete Cylinder Pipe (PCCP)
Railings	Reduced Pressure Zone (RPZ) Valves	Roofing
Service Saddles	Sheet Piling	Sinks (not part of eyewash systems)
Solenoid Valves	Stairs	Static Mixers
Stationary Screens	Surface Drains	Tapping Sleeves
Telescoping Valves	Tipping Buckets	Trusses
Tubing	Valve Stem Extensions	Valve Stems (excluding handwheels and actuators)
Wall Panels	Wall Sleeves/Floor Sleeves	Welding Rods
Well Casing	Well Screens	Wire
Wire Cloth	Wire Rod	Wire Rope and Cables

Q2.6: Does EPA have a list of products that could be made “primarily” of iron and steel but would be classified as “manufactured products” under BABA?

A2.6: Although this list is not comprehensive, the following products would be considered “manufactured products” under the BABA requirements, even if the item might be composed primarily of iron and steel by materials cost (Note: These items are not subject to the AIS requirements.):

Products likely made “primarily” of iron and steel to be classified as <u>Manufactured Products</u> under BABA		
Actuator Superstructures/ Support Structures	Aeration Nozzles and Injectors	Aerators
Analytical Instrumentation	Analyzers (e.g., ozone, oxygen)	Automated Water Fill Stations
Blowers/Aeration Equipment	Boilers, Boiler Systems	Chemical Feed Systems (e.g., polymer, coagulant, treatment chemicals)
Chemical Injection Quills	Chemical Injectors	Clarifier Mechanisms/Arms
Compressors	Controls and Switches	Conveyors
Cranes	Desiccant Air Dryer Tanks	Dewatering Equipment
Dewatering Roll-offs	Disinfection Systems	Drives (e.g., variable frequency drives)
Electric/Pneumatic/Manual Accessories Used to Operate Valves (such as electric valve actuators)	Electrical Cabinetry and Housings (such as electrical boxes/enclosures)	Electrical Conduit
Electrical Junction Boxes	Electronic Door Locks	Elevator Systems (hydraulic, etc.,)
Emergency Life Systems (including eyewash stations, emergency safety showers, fire extinguishers, fire suppression systems including sprinklers /piping/valves, first aid, etc.)	Exhaust Fans	Fall Protection Anchor Points
Fiberglass Tank w/Appurtenances	Filters (and appurtenances, including underdrains, backwash systems)	Flocculators
Fluidized Bed Incinerators	Galvanized Anodes/Cathodic Protection	Gear Reducers
Generators	Geothermal Systems	Grinders
Heat Exchangers	HVAC (excluding ductwork)	HVAC Dampers (if appurtenances to aerators/blowers)
HVAC Louvers (mechanical)	Intake and Exhaust Grates (if appurtenances to aerators/blowers)	Instrumentation
Laboratory Equipment	Ladder Fall Prevention Systems	Ladder Safety Posts
Lighting Fixtures	Lightning and Grounding Rods	Mechanical or Actuated Louvers/Dampers
Membrane Bioreactor Systems	Membrane Filtration Systems	Metal Office Furniture (fixed)
Meters (including flow, wholesale, water, and service connection)	Motorized Doors (unit)	Motorized Mixers
Motorized Screens (such as traveling screens)	Motors	Pelton Wheels
Pipeline Flash Reactors (similar to injectors)	Plate Settlers	Precast Concrete without Iron/Steel Reinforcement

Products likely made “primarily” of iron and steel to be classified as <u>Manufactured Products</u> under BABA		
Furnished Pre-fab Buildings (such as furnished with pumps, mechanics inside)	Presses (including belt presses)	Pressure Gauges
Pump Cans/Barrels and Strainers	Pumps	Mechanical Rakes
Safety Climb Cable	Sampling Stations (unless also act as hydrant)	Scrubbers
Sensors	Sequencing Batch Reactors (SBR)	Steel Shelving (fixed)
Slide and Sluice Gates	Spray Header Units	Steel Cabinets (fixed interior/furniture)
Supervisory Control and Data Acquisition (SCADA) Systems	Tracer Wire	Valve Manual Gears, Actuators, Handles
Voltage Transformer	Water Electrostatic Precipitators (WESP)	Water Heaters
Weir Gates		

- Q2.7: Is asphalt paving a covered product under BABA?
  - A2.7: No. EPA interprets Section 70917(c) of the IIJA to exclude asphalt from BABA requirements. Asphalt paving is a type of concrete composed of an aggregate material mixed with a binder (bitumen). EPA considers asphalt concrete to be excluded by section 70917(c) due to its similarities with cement and cementitious materials.

SECTION 3: CO-FUNDING

- Q3.1: If projects are co-funded with funding mechanisms that don’t require BABA, must the entire project comply with BABA?
  - A3.1: Yes. Any project that is funded in whole or in part with federal assistance must comply with the BABA requirements, unless the requirements are otherwise waived. A “project” consists of all construction necessary to complete the building or work regardless of the number of contracts or assistance agreements involved so long as all the contracts and assistance agreements awarded are closely related in purpose, time, and place. This precludes the intentional splitting of projects into separate and smaller contracts or assistance agreements to avoid BABA’s applicability on some portions of a larger project, particularly where the activities are integrally and proximately related to the whole. However, there are many situations in which major construction activities are clearly undertaken in separate phases that are distinct in purpose, time, or place, in which case, separate contracts or assistance agreements would carry separate requirements.

- Q3.2: How will project requirements be determined for co-funded projects subject to potentially different general applicability/programmatic waiver conditions (such as different adjustment period waivers)?
  - A3.2: OMB Guidance M-22-11 addresses cases with project co-funding from separate programs. EPA would apply the guidance’s “cognizant” program determination to projects that are co-funded with different general applicability/programmatic waivers. For instance, if a project were co-funded between WIFIA and SRF and the majority of the Federal funding for the project is from WIFIA, then WIFIA would be the “cognizant” program for application and determination of waivers. In that case, any conditions from an applicable WIFIA waiver would apply.

SECTION 4: WAIVERS

- Q4.1: Who may apply for a waiver and how do you apply?
  - A4.1: Assistance recipients and their authorized representatives may apply for a project-specific waiver. EPA does not accept waiver requests from suppliers, distributors, or manufacturers unless the assistance recipient endorses and submits the request on its own behalf to the funding authority. In the case where multiple programs are providing federal funds to the project, the assistance recipient should submit the waiver request to the cognizant program, the one providing the greatest amount of federal funds for the project. For information on applying for cost waivers, see questions 4.4 and 4.5. For information on the SRF program roles and responsibilities, see question 7.6.

Project-specific waiver requests should generally include: (1) a brief summary of the project, (2) a description and explanation of the need for the waiver for the product(s) in question, (3) a brief summary of the due diligence conducted in search of domestic alternatives (which could include correspondence between assistance recipient and supplier/distributors), (4) the quantity and materials of the product(s) in question, (5) all engineering specifications and project design considerations relevant to the product(s) in question, (6) the approximate unit cost of items (both foreign and domestic) in addition to an estimated cost of the materials and overall project, (7) the date any products will be needed on site in order to avoid significant project schedule disruptions, and (8) any other pertinent information relevant to EPA’s consideration of the waiver (e.g., if relevant for SRF projects: whether the project is designated as an equivalency project, the date the plans and specifications were submitted to the state, the date of construction initiation, expected date of project completion, any special considerations such as local zoning and building ordinances, seismic requirements, or noise or odor control requirements).

In the case of indirect federal assistance, such as the SRF programs, the state authority reviews and conveys the waiver request to EPA. States should submit waiver requests to the appropriate program waiver request inbox. For SRF projects, please use [CWSRFWaiver@epa.gov](mailto:CWSRFWaiver@epa.gov) or [DWSRFWaiver@epa.gov](mailto:DWSRFWaiver@epa.gov).

- Q4.2: Can an assistance recipient request a waiver based on a specification written for a specific brand or model of product (that is, a specification that names a branded item or model)?
  - A4.2: In most cases, performance-based specifications are expected and required for the majority of infrastructure projects funded by EPA’s financial assistance programs. In rare cases where “branded” or product-specific sourcing may be included in project specifications, it is suggested that the specifications include the item in question (that is, not simply a catalog page, but also materials of construction, sizing, quantities, and applicable engineering performance design characteristics for the project, etc.) in addition to the standard phrase “or equal.” For the purposes of product alternative market research, EPA will evaluate the BABA requirements based on performance-based engineering specifications for the product(s) in question. If the project’s specifications do not include performance-based specifications, or at least an “or equal” designation, EPA will base its research on an “or equal” designation using best professional judgment to the extent practicable.
- Q4.3: If a manufactured product is not readily available domestically, will EPA provide short-term “limited availability” product waivers?
  - A4.3: EPA will address the unavailability of domestic products through the waiver process, including potential national short-term waivers for specific products, if appropriate. To the extent practicable and with the intent to maximize domestic market and supply chain development, EPA intends to address issues of broad product unavailability with targeted, time-limited, and conditional waivers, as prescribed in OMB Guidance M-22-11. EPA will follow its robust and thorough product research processes (those put into place for the AIS requirements for the SRF and WIFIA programs and expanded for the new BABA requirements) to identify and determine those products for which proposed national/general applicability waivers may be appropriate.
- Q4.4: What information is needed when applying for a cost waiver under BABA?
  - A4.4: As part of the cost waiver request, the assistance recipient must demonstrate that implementation of the BABA requirements will increase the overall project cost more than 25 percent. Depending on the circumstances of the overall project cost increases, documentation to justify the cost waiver can vary but may include itemized cost estimates or bid tabulations comparing project costs with and without BABA implementation. Assistance recipients should begin assessing the potential cost impacts of the BABA requirements during the design phase of a project.
- Q4.5: Can administrative costs associated with tracking and verification of certifications be considered when determining if the cost of a project increases by 25 percent or more?
  - A4.5: Yes. Section 70914(b)(3) of the IIJA states that a waiver may be provided if the overall cost of the project increases by more than 25 percent due to the “inclusion of iron, steel, manufactured products, or construction materials produced in the United States.” EPA interprets this to mean that the “inclusion” of the BABA-covered products could encompass



reasonable administrative costs associated with complying with the BABA requirements, such as staff, contractor, and technological resources to collect and track BABA compliance documentation.

- Q4.6: How can assistance recipients and construction contractors address product delivery delays?
  - A4.6: Assistance recipients should reasonably plan for material procurement to account for known potential supply chain issues or extended lead times and shall notify the funding authority well in advance of the issues so that prompt attention can be given to explore options. Where extended lead times for compliant products are impacting project schedules and may significantly impact construction progress, timely communication with the funding agency is important. For products that are unavailable within a reasonable timeframe to meet the objectives and schedule of a project, EPA may consider a non-availability waiver with adequate justification. An assistance recipient would need to apply for the waiver and contact its funding authority (such as EPA and/or a state) to initiate the waiver process.

#### SECTION 5: DOCUMENTING COMPLIANCE

- Q5.1: Who will be responsible for BABA enforcement?
  - A5.1: Responsibility for BABA implementation applies at all levels, from manufacturers to suppliers and distributors, construction contractors, assistance recipients, and funding authorities.

The manufacturers have responsibility to provide adequate and accurate documentation of the products manufactured. If suppliers and distributors are involved, they are responsible for passing along compliance documentation for products supplied to projects that are subject to the BABA requirements.

The assistance recipient and their representatives are primarily responsible for ensuring the documentation collected for products used on the project is sufficient to document compliance with the BABA requirements.

The funding authority is responsible for providing oversight and guidance as needed to ensure the proper implementation of the requirements. The Uniform Grants Guidance (UGG) (Title 2 of the Code of Federal Regulations (CFR) Part 200) applies to many Federal financial assistance agreements that will include BABA requirements. The general provisions of 2 CFR Part 200 determine the responsible party for the grant funding authority.

For information on SRF program roles and responsibilities, see question 7.6.

At all levels, where fraud, waste, abuse, or any violation of the law is suspected, the Office of Inspector General (OIG) should be contacted immediately. The OIG can be reached at 1-888-546-8740 or [OIG\\_Hotline@epa.gov](mailto:OIG_Hotline@epa.gov). More information can be found at this website: <http://www.epa.gov/oig/hotline.htm>.

- Q5.2: When will the BABA requirements be assessed for compliance? Do assistance recipients need to have waivers for potential non-domestic products before assistance agreements are in place, at the time products are procured or products are incorporated into the project (i.e., used)?
  - A5.2: Compliance is assessed where the domestic product is used (or installed) at the project site. Proper compliance documentation, whether it is a BABA certification letter or a waiver, should accompany a product prior to its “use”, in accordance with Section 70914(a) of IIJA. This may occur prior to assistance agreements being in place but is not necessary. Additionally, communication of BABA requirements through appropriate Terms and Conditions in financial assistance agreements and in project solicitation and contract documents is key in ensuring all parties involved are informed of the requirements for the project before construction is underway.
  
- Q5.3: How can product compliance with the BABA requirements be demonstrated?
  - A5.3: Assistance recipients and their representatives should ensure that the products delivered to the construction site are accompanied by proper documentation that demonstrate compliance with the law and be made available to the funding authority upon request. The documentation may be received and maintained in hard copy, electronically, or could be embedded in construction management software. The use of a signed certification letter for the project is the most direct and effective form of compliance documentation for ensuring products used on site are BABA-compliant prior to their installation; however, other forms of documentation are also acceptable as long as collectively, the following can be demonstrated:
    - (1) Documentation linked to the project. For example, this can be in the form of the project name, project location, contract number, or project number.
    - (2) Documentation linked to the product used on the project. For example, description of product(s) (simple explanation sufficient to identify the product(s)), or an attached (or electronic link to) purchase order, invoice, or bill of lading.
    - (3) Documentation includes statement attesting that the products supplied to the assistance recipient are compliant with BABA requirement. Reference to the Infrastructure Investment and Jobs Act (“IIJA”) or the Bipartisan Infrastructure Law (BIL) are also acceptable. For iron and steel items under BABA, references to the American Iron and Steel (AIS) requirements are also acceptable and reciprocal with BABA for such items.
    - (4) Documentation that manufacturing occurred in the United States, which could include, for example, the location(s) of manufacturing for each manufacturing step that is being certified. It is acceptable for manufactured products to note a single point of manufacturing, documenting that the final point of manufacturing is in the United States. Note that each BABA category may require different determinations for compliance.
    - (5) Signature of company representative (on company letterhead and signature can be electronic). The signatory of the certifying statement affirms their knowledge of the manufacturing processes for the referenced product(s) and attests that the product meets the BABA requirements.

In addition to compliance documentation, assistance recipients or their representatives should also conduct a visual inspection of the product when it arrives to the project site, especially for iron and steel products which are often stamped with the country of origin. (Note: A country of origin stamp alone is not sufficient verification of compliance with BABA and assistance receipts should not rely on it to ensure compliance.)

EPA may develop alternative procedures for demonstrating compliance. Additional project- or program-specific instructions may be developed on a case-by-case basis in order to meet individual circumstances.

- Q5.4: Will EPA provide a form or template for tracking and documenting compliance?
  - A5.4: EPA does not require a specified format for tracking or documenting compliance. Assistance recipients are free to develop any system (from simple to complex software) for tracking items used on the project and the accompanying compliance documentation, e.g., certification letters, applicable waivers, if it helps with implementation and compliance. Elements that may help with keeping track of compliance may include: product description, quantity required/used, product category (i.e., iron and steel, manufactured product, or construction material), status of obtaining certification letter, product cost, and whether the item might qualify as *de minimis*, or qualify under another applicable waiver.
- Q5.5: If a manufacturer claims to comply with the Buy American Act, does it also comply with BABA?
  - A5.5: No. With the exception of the AIS requirements – which EPA interprets to be equivalent to the “iron and steel” requirements under BABA – EPA does not have an interpretation about the comparability of other domestic preference requirements relative to BABA. Any products that are to be certified as compliant with BABA should include a specific reference to the BABA requirements and appropriate attestation from a responsible manufacturing company official. See Question 5.3 for EPA’s recommendations for BABA certification letters.
- Q5.6: How will assistance recipients manage certification letters for hundreds, possibly thousands of products?
  - A5.6: EPA recognizes that the new BABA requirements will cover most products used in typical water and wastewater infrastructure projects, and that the number of items which may require certification at large and/or complex projects may reach several hundred. EPA is concerned about the potential administrative burden that this would place on assistance recipients. EPA recommends that projects with a high number of potentially covered products meet with their funding authority about potential compliance strategies to minimize burden and streamline compliance activity. Assistance recipients should prepare contract bid solicitation documents with a statement for the consulting engineers and construction firms as follows: “By signing payment application and recommending payment, Contractor certifies they have reviewed documentation for all products and materials submitted for payment, and the documentation is sufficient to demonstrate compliance with Build America,

Buy America Act requirements.” In most cases, the assistance recipient’s representatives may assume the responsibility for their clients to conduct due diligence on compliance with applicable domestic preference requirements.

- Q5.7: Who is responsible for documenting the 55 percent content requirement for manufactured products under BABA? What if the final manufacturer cannot trace or verify domestic origin for all components?
  - A5.7: The manufacturer who signs a certification letter is responsible for documenting compliance with any of the three categories of products (iron and steel, manufactured products, or construction materials). For manufactured products, BABA requires that greater than 55 percent of the total cost of all components of the manufactured product be from domestic sources. EPA recommends that the certification letter for manufactured products document whether the item passes the content test in the final product along with a statement attesting to compliance with the BABA requirements for manufactured products.
- Q5.8: How do final product fabricators document compliance when the final step of manufacturing may be simply assembling components?
  - A5.8: It is acceptable, in many cases, especially for highly complex manufactured products that utilize many sub-components, for the final point of assembly to certify without using a “step certification” process. Multiple certifications (i.e., step certifications) or a singular certification can be used for a product, as long as the certifying official is willing to attest to the product’s compliance with BABA requirements at all stages of manufacturing.
- Q5.9: Will Material Test Reports be acceptable in lieu of a BABA certification for iron and steel?
  - A5.9: Material Test Reports (MTRs, commonly referred to as “Mill Certifications” or “Mill Certs”) provide the chemical composition of steel and iron from a mill or foundry. If an MTR accompanies the delivery of steel or iron to a project site with an invoice or bill of lading, EPA will consider it sufficient to demonstrate compliance (equivalent to a certification letter) as long as the MTR includes a manufacturer representative’s signature in addition to the location (city and state) of the mill/foundry. It is common for MTRs to be the first letter in a “step certification” if the product is further fabricated or painted, etc., by another manufacturer.
- Q5.10: Can a manufacturer use a fillable certification letter for products?
  - A5.10: EPA recommends that certifications be signed by representatives of the manufacturing entity. EPA does not oppose manufacturers using forms to internally develop letters within their company, thereby providing signed, non-manipulable certification letters to suppliers, distributors, and/or assistance recipients. A fillable form that can be changed by someone outside of the manufacturer after signature does not demonstrate compliance and may create compliance concerns for the manufacturer or assistance recipient.

- Q5.11: Are product certifications from suppliers and distributors allowed?
  - A5.11: EPA recommends that representatives of product manufacturers certify compliance and discourages suppliers and distributors from creating certification letters. EPA does not rule out the possibility that a third-party certification process, such as a certification by a distributor, may be viable. However, EPA is currently not aware of a system or proposed system that meets the EPA’s recommendations for documentation of product certification.
- Q5.12: How long should assistance recipients keep compliance documentation?
  - A5.12: Assistance recipients should apply recordkeeping requirements for the project according to the procedures dictated by the funding authority. For most EPA grant programs, this is prescribed in the UGG at 2 CFR 200.334-200.338; e.g., the SRF programs require a minimum of three years. Other funding programs may require longer documentation retention periods.

SECTION 6: PROGRAMS WITH AMERICAN IRON AND STEEL REQUIREMENTS

- Q6.1: Does BABA supersede the American Iron and Steel (AIS) Requirements?
  - A6.1: The BABA requirements for items considered “iron and steel” are equivalent to those for covered iron and steel products under the AIS requirements in the Clean Water Act and the Safe Drinking Water Act. These requirements apply to the CWSRF, DWSRF, WIFIA, and Water infrastructure Community Grants. BABA includes a “Savings Provision” (Section 70917(b)) that states that BABA does not affect existing domestic content procurement preferences for infrastructure projects funded by Federal financial assistance programs that meet the requirements of section 70914. EPA views the AIS requirements as meeting the “iron and steel” product requirements of BABA Section 70914, as they both include the key requirement that items made of iron and steel be wholly manufactured in the United States from the point of melting and/or pouring the iron or steel components through final manufacturing step. Because of the “Savings Provision” of Section 70917, the AIS requirements satisfy the “iron and steel” requirements of BABA. For the programs that have AIS requirements, EPA intends to implement BABA requirements the same way for iron and steel items as it has done for AIS products.
- Q6.2: For iron and steel products, does a manufacturer need to demonstrate compliance from initial melting through the finished product?
  - A6.2: For iron and steel products, the BABA requirements are the same as the existing AIS requirements, in that all of the iron and steel in a covered product (that is, the product is comprised of more than 50 percent iron and steel by material cost) must be melted and poured in the United States and all subsequent manufacturing processes (such as grinding, rolling, bending, reheating, and casting) must occur in the United States.

Q6.3: Will EPA apply the same manufacturing standards for BABA iron and steel products as for the American Iron and Steel (AIS) requirements?

- A6.3: Yes. For AIS, EPA did not require raw materials used in the production of steel or iron to be domestically sourced. For BABA, EPA interprets the requirements to be the same. Hence, like AIS, raw materials in the production of iron and steel subject to BABA requirements would not need to be domestically sourced. The key step for both AIS and BABA domestic iron and/or steel production is the melting/pouring (that is, the location of the furnace), which must be in the United States.

• Q6.4: Will the certification process be similar to the process established for the American Iron and Steel requirements?

- A6.4: EPA expects the certification process for the BABA requirements to be very similar to that established for the AIS requirements. For iron and steel products, the process should remain the same for AIS and BABA. EPA recommends for manufactured products and for construction materials that certification letters include direct reference to the product/material content requirements under BABA, in addition to an affirmative statement verifying that the product meets the BABA requirements.

• Q6.5: Will duplicate certification letters be required for AIS and BABA for iron/steel products?

- A6.5: No. Compliance with BABA requirements will be sufficient to demonstrate compliance with AIS requirements for iron and steel products. If a project is subject to BABA, the only demonstration of compliance necessary is with the BABA requirements, of which the iron and steel requirements are equivalent to those of the AIS statutory requirements: the iron or steel in a product made primarily or predominantly of iron and steel (comprising more than 50 percent iron and steel by material cost) must be melted and/or poured in the United States and all subsequent manufacturing processes must occur in the United States.

#### SECTION 7: PROGRAM-SPECIFIC ISSUES

• Q7.1.: How do the BABA requirements apply to Community Grants?

- A7.1: The Community Project Funding/Congressionally Directed Spending grants for the construction of drinking water, wastewater, and stormwater infrastructure and for water quality protection are subject to the requirements specified in the explanatory statement accompanying the Consolidated Appropriations Act (Explanatory Statement for Division G of P.L. 117-13, the Consolidated Appropriations Act of 2022). The explanatory statement asserts: “Applicable Federal requirements that would apply to a Clean Water State Revolving Fund or Drinking Water State Revolving Fund project grant recipient shall apply to a grantee receiving a CPF grant under this section.” Therefore, the federally funded Community Project Funding/Congressionally Directed Spending grants are subject to the same requirements that apply to CWSRF or DWSRF projects, including BABA and AIS requirements. See also A1.2.

- Q7.2: Should SRF projects covered by the BABA SRF Projects Design Planning Adjustment Period Waiver follow the same procedures for demonstrating compliance as outlined for American Iron and Steel requirements?
  - A7.2: Yes. The SRF Design Planning Adjustment Period waiver does not waive the iron and steel requirements under BABA. The SRF programs have existing domestic preference requirements for SRF projects under CWA Section 608 and SDWA Section 1452(a)(4) (AIS requirements) to use iron and steel products that are produced in the United States. Sections 70917(a) and (b) of BIL explain the application of BABA to existing domestic preference requirements. Specifically, the savings provision in Section 70917(b) states that existing domestic preference requirements that meet BABA requirements are not affected by BABA. The statutory AIS requirements were existing at the time BABA became law and satisfy the BABA iron and steel requirements. Therefore, the statutory AIS requirements that have previously applied to SRF-funded projects will continue to do so, and compliance with AIS requirements will satisfy the BABA iron and steel requirements. Demonstration of compliance for iron and steel products will follow the AIS implementation policies for projects subject to the waiver.
  
- Q7.3: For SRF programs, is BABA considered a federal cross-cutting authority? (i.e., do “equivalency” rules apply?)
  - A7.3: Yes, BABA is considered a federal cross-cutting requirement that applies to SRF assistance equivalent to the federal capitalization grant (i.e., “equivalency” projects). EPA’s SRF regulations at 40 CFR 35.3145 and 35.3575 require states and recipients of SRF funds equivalent to the amount of the federal capitalization grant to comply with federal cross-cutting requirements. Section 70914 of the IJIA, which states when a Buy America preference applies, explains that “none of the funds made available for a Federal financial assistance program for infrastructure...may be obligated for a project unless all of the iron, steel, manufactured products, and construction materials used in the project are produced in the United States.” Therefore, BABA only applies to projects funded in an amount equivalent to the federal capitalization grant and not to those projects receiving funds in excess of the capitalization grant (i.e., “non-equivalency” projects). (Note: The AIS requirements continue to apply for all SRF projects, including non-equivalency projects, and all WIFIA and Community Grant projects, because equivalency does not apply.)
  
- Q7.4: Do the BABA requirements apply to Drinking Water State Revolving Fund set-asides?
  - A7.4: Due to requirements related to the deposit of funds in the DWSRF program, almost all of the funds used to conduct set-aside activities are Federal dollars. Therefore, Federal cross-cutting requirements must be applied to all set-aside activities. However, in the case of most set-aside activities, the cross-cutting requirements will not be implicated because of the nature of the activities conducted under the set-asides. Because the BABA requirements only apply to infrastructure, and infrastructure typically is not an eligible set-aside expenditure (with one potential exception being loans for incentive-based source water protection

measures under the Local Assistance and Other State Programs Set-Aside), the BABA requirements will not apply to most set-aside activities.

- Q7.5: What if an SRF project is refinanced using Federal financial assistance on or after May 14, 2022?
  - A7.5: If an SRF project began construction, financed from another funding source, prior to May 14, 2022, but is refinanced through an assistance agreement executed on or after that date, BABA requirements will apply to all construction that occurs on or after May 14, 2022, through completion of construction, unless a waiver applies. There is no retroactive application of the BABA requirements where a refinancing occurs for an SRF project that has completed construction prior to May 14, 2022. (Note: If SRF funding is used for the refinancing, the AIS requirements may still apply depending on the timing of construction.)
- Q7.6: What are the roles and responsibilities for SRF programs for BABA implementation?
  - A7.6: Implementation of the BABA requirements for the State Revolving Fund programs will continue the roles and responsibilities from the successful AIS implementation process.

As with AIS, it is both the assistance recipient's and the state's responsibility to ensure compliance with the BABA requirements. The state is the recipient of a federal capitalization grant and must comply with all grant conditions, including a condition requiring adherence to BABA requirements.

Consequently, states are strongly advised to conduct site visits of projects during construction and review documentation demonstrating the assistance recipient's proof of compliance. In EPA's experience, most states conduct periodic site visits and arrange timely meetings with funded projects. Observed best practices typically include a meeting early in the process (sometimes before bid and usually prior to commencing construction) and at least one project site visit during the construction process. Assistance recipients must maintain documentation of compliance with the BABA requirements, as explained in question 5.3. The documents must be kept by the assistance recipient and should be reviewed by the state during project reviews.

The state's role in the waiver process is to review any waiver requests submitted to the state to ensure that all necessary information has been provided by the assistance recipient prior to forwarding the request to EPA. If a state finds the request lacking, the state should work with the assistance recipient to help obtain complete information. Question 4.1 explains the information needed by EPA to expediently review a waiver request.

In order to implement the BABA requirements, EPA has developed an approach for effective and efficient implementation of the waiver process to allow projects to proceed in a timely manner. The framework described below will allow states, on behalf of the assistance recipients, to apply for waivers of the BABA requirements directly to EPA Headquarters. Only waiver requests received and/or endorsed from states will be considered. Pursuant to BABA, EPA has the responsibility to make findings as to the issuance of waivers to the BABA requirements.



### Step-by-step SRF Waiver Process

The waiver process begins with the assistance recipient. To fulfill the BABA requirements, the assistance recipient must in good faith design the project (where applicable) and solicit bids for construction with American-made iron and steel, manufactured goods, and construction materials. It is essential that the assistance recipient include the BABA terms in any request for proposals or solicitations for bids, and in all contracts (see Appendix 2 for sample construction contract language). The assistance recipient may receive a waiver at any point before, during, or after the bid process, if one or more of three statutory conditions is demonstrated to EPA and approved.

To apply for a project-specific waiver, the assistance recipient should email the request in the form of a Word document (.doc) or editable PDF (.pdf) to the funding program. It is strongly recommended that each state identify a person or persons for BABA communications. The state designee(s) will review the application for the waiver and determine whether the necessary information has been included (Note: More information may be provided in the future regarding what information is required to be included in waiver requests). Once the waiver application is complete, the designee will forward the application to [CWSRFWaiver@epa.gov](mailto:CWSRFWaiver@epa.gov) or [DWSRFWaiver@epa.gov](mailto:DWSRFWaiver@epa.gov).

### Evaluation by EPA

After receiving an application for waiver of the BABA requirements and ensuring sufficient information was provided, EPA will publish the request on its website for 15 days and receive public comment. EPA will then determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver.

In the event that EPA finds that adequate documentation and justification has been submitted, the Administrator may grant a waiver to the assistance recipient. EPA will notify the state designee whether a waiver request has been approved or not approved as soon as such a decision has been made. Granting such a waiver is a four-step process:

1. Research – After receiving an application for a waiver, EPA will perform market research to determine whether the iron, steel, manufactured goods, or construction materials are available domestically.
2. Posting – After research, if no domestic product has been identified, EPA is required to publish the application and all material submitted with the application on EPA's website for 15 days. During that period, the public will have the opportunity to review the request and provide informal comment to EPA. The website can be found at: <https://www.epa.gov/cwsrf/build-america-buy-america-baba-waivers-open-public-comment>.
3. Evaluation – After receiving an application for waiver of the BABA requirements, EPA will determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver to determine whether or not to grant the waiver.

3. Signature of waiver approval by the Administrator or another agency official with delegated authority – As soon as the waiver is signed and dated, EPA will notify the State SRF program and post the signed waiver on the Agency’s website. The assistance recipient should keep a copy of the signed waiver in its project files.

(Note: Additional steps may be required in the future regarding the waiver process depending on additional guidance from OMB)

SECTION 00 62 79

**Byrd Anti-Lobbying Amendment, 31 U.S.C. § 1352 (as amended)**

Contractors who apply or bid for an award of \$100,000 or more shall file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, officer or employee of Congress, or an employee of a Member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. § 1352. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient who in turn will forward the certification(s) to the awarding agency.

Required Certification. If applicable, contractors must sign and submit to the non-federal entity the following certification.

**APPENDIX A, 44 C.F.R. PART 18 – CERTIFICATION REGARDING LOBBYING**

**Certification for Contracts, Grants, Loans, and Cooperative Agreements**

The undersigned certifies, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

The Contractor, \_\_\_\_\_, certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. Chap. 38, Administrative Remedies for False Claims and Statements, apply to this certification and disclosure, if any.

\_\_\_\_\_  
Signature of Contractor's Authorized Official

\_\_\_\_\_  
Name and Title of Contractor's Authorized Official

Date: \_\_\_\_\_

**ATTACHMENT B**  
**TECHNICAL DOCUMENTS REQUIRED**  
**WITH PROPOSAL**



SECTION P-00350

TECHNICAL DOCUMENTS REQUIRED WITH PROPOSAL

1. Proposer shall complete the Technical Documents Required with Proposal Schedule and include it, along with the required documentation identified, with submittal of the Proposal. Failure to completely fill out the Technical Documents Required with Proposal Schedule, with inclusion of all required attachments, may result in Proposal being declared non-responsive and rejected.
2. By submission of the Technical Documents Required with Proposal Schedule, Proposer agrees that the information provided represents guaranteed values and that all qualification statements are true representation of Proposer's qualifications. The information provided is to confirm general conformity to the Contract Documents by the Buyer and shall not supersede any Contract Document requirement(s)
3. The technical documents associated with the Oxygen Production Facility include but are not limited to the Vacuum Pressure Swing Adsorption Oxygen Generation System, Liquid Oxygen Storage and Vaporization System as well as the related Electrical, Instrumentation, and Control components of the units.
4. At a minimum, the technical documents submitted as part of this proposal include but not limited to the following:

NO FURTHER TEXT ON THIS PAGE

SECTION P-00350

**Technical Documents Required with Proposal**  
**Schedule**

<b>Reference Document</b>	<b>Technical Document</b>	<b>Check if Complete</b>
<b>11 55 10</b>	<b>Vacuum Pressure Swing Adsorption (VPSA) System</b>	
	VPSA System Description	
	Certification indicating compliance with VPSA performance specifications and guarantees.	
	Plan layout of the VPSA indicating how the systems are arranged and fit within the allocated spaces shown on the contract drawings.	
	VPSA System Flow Diagram indicating pipelines, valves and instruments.	
	List of Manufacturers for individual components of the VPSA system conforming to the design criteria including but not limited to blowers, switch valves, motors, instrument air, instrumentation, control panels, inlet and discharge silencers, and cooling system.	
	VPSA System sound mitigation performance	
	VPSA System sound mitigation features, including type of silencers	
	VPSA System cooling loads and cooling system description	
	Provide Estimated hours to erect one complete proposed VPSA unit on provided foundation	
	Description of all field assembly/erection required	
	Shipping methods and erection criteria/requirements	
	Preliminary Procurement/Production/Shipping Schedule for the VPSA System	
	Preliminary Installation and Testing Schedule for the VPSA System	
<b>11 55 20</b>	<b>Liquid Oxygen Storage and Vaporization System</b>	
	Qualifications of Liquid Oxygen Storage and Vaporization System Manufacturer(s)	
	Liquid Oxygen Storage and Vaporization System Description	
	Certification indicating compliance with the LOX systems performance guarantees	
	Plan layout of the LOX System indicating how the systems are arranged and fit within the allocated spaces shown on the contract drawings	
	LOX System Flow Diagram indicating pipelines, valves and instruments	
	List of Manufacturers for individual components of the LOX system conforming to the design criteria including but not limited to liquid oxygen storage tank, liquid oxygen vaporizers, control panels, valves, piping, etc.	
	Provide estimated hours to erect LOX system on provided foundation	
	Description of all field assembly/erection required	
	Shipping methods and erection criteria/requirements	
	Preliminary Procurement/Production/Shipping Schedule for the LOX System	



<b>Reference Document</b>	<b>Technical Document</b>	<b>Check if Complete</b>
	Preliminary Installation and Testing Schedule for the LOX System	
<b>Division 26</b>	<b>Electrical and Power Distribution</b>	
	Preliminary VPSA and LOX System electrical one line diagram	
	Preliminary VPSA and LOX System electrical load list	
	List of Manufacturers and models for electrical and power distribution equipment	
	Preliminary blower motor catalog cut sheet	
	Preliminary engineering schedule	
	Preliminary Procurement/Production/Shipping Schedule for the VPSA and LOX System	
	Preliminary Installation and Testing Schedule for the VPSA and LOX System	
<b>Division 40</b>	<b>Instrumentation and Control</b>	
	Preliminary P&ID diagram	
	An I/O list of signals from each VPSA and from the LOX system to be sent to the PVSC SCADA system	
	Preliminary network architecture block diagram	
	Confirmation that Allen Bradley PLC's will be provided for system controls	

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**ATTACHMENT C**  
**COST PROPOSAL FORM**



ATTACHMENT C

PASSAIC VALLEY SEWERAGE COMMISSION

CONTRACT NO. B355

OXYGEN PRODUCTION FACILITY EQUIPMENT PROCUREMENT

**COST PROPOSAL FORMS**

All pricing shall be in current US dollars.

Proposer's total Capital Cost shall include the summation of each Cost Item, including PVSC's identified Lump Sum, Allowance and Unit Price Items as described herein.

Proposer's Equipment Cost Pricing is inclusive of the Proposer's complete scope of supply as described in the RFP, the technical specifications and the contract drawings.

**Cost Proposal Form I – PVSC Lump Sum Items**

<b>Cost Item</b>	<b>Equipment</b>	<b>Subtotal</b>
1a	Vacuum Pressure Swing Adsorption System No. 1	\$
1b	Vacuum Pressure Swing Adsorption System No. 2	\$
1c	Vacuum Pressure Swing Adsorption System No. 3	\$
1d	Vacuum Pressure Swing Adsorption System No. 4 (If Applicable)	\$
2	Liquid Oxygen Storage Tank	\$
3	Liquid Oxygen Vaporization System	\$
<b>Subtotal Cost Proposal Form I</b>		<b>\$</b>

**Cost Proposal Form II – PVSC Allowance Items**

Allowance for Additional Authorized Work – Cost Item Number 4. Payment for the work shall be made at a price agreed upon by PVSC and shall provide full compensation for furnishing all labor, materials, equipment, and incidentals required to complete the work as necessary. The Allowance for Additional Authorized Work is intended to provide for work that may later be determined to be necessary for the completion of the project but is not covered in the other cost items. Written authorization by the Buyer for utilization of any part of the allowances for any such work shall be required. Measurement for the Allowance for Additional Authorized Work shall be on an as needed basis.

<b>Cost Item</b>	<b>Equipment</b>	<b>Subtotal</b>
4	Allowance for Additional Authorized Work	\$1,000,000.00
<b>Subtotal Cost Proposal Form II</b>		<b>\$1,000,000.00</b>

### **Cost Proposal Form III – Equipment Transportation and Storage Costs**

Payment of a unit price item shall be made for the actual quantity of work performed. Lump Sums or Quantities for the various items of work and materials are approximate only and are given solely to be used as a uniform basis for the comparison of costs and PVSC reserves the right to increase or decrease quantities, and to eliminate quantities or lump sum items, as PVSC may deem necessary. The Proposer will be paid on the basis of stipulated lump sums or unit prices set forth when directed in writing by PVSC.

Cost Item Numbers 5 through 6 are intended to provide **Off-Site Storage for the Goods** comprised of the entire **Oxygen Production System** in the event the PVSC, or its Assignee, is not ready and willing to receive the Goods at the Point of Destination by the Milestone 2 and Milestone 4 deliverable dates. No space is available at the Point of Destination for storage of equipment or materials. Equipment and materials shall not be delivered to PVSC until the separate Installation Contractor is ready to receive and install them and has provided written notice that he is ready. Proposer shall be responsible for preparing the items for, and placing them into, storage in such a manner as to be compliant with Proposer’s standard guidelines and requirements for storage of such items. The unit price or lump sum prices for Off-Site Storage shall include the following items:

Item 5: Off site Storage of VPSA units

Item 5a: Delivery, unloading, and placement into proper storage VPSA units within an off-site bonded Storage Facility. This item includes as many occurrences as required per the manufacturing schedule and the Contract B356 sequence of construction and installation schedule.

Item 5b: VPSA unit storage per unit per month at an Off-Site bonded storage facility. Storage of each VPSA unit includes storage of all the equipment, piping, electrical and instrumentation and controls as specified for a complete operating unit in as many separate and individual components as required.

Item 5c: Loading, transport, and delivery of VPSA units to the installation contractor at the Point of Destination. This item includes as many occurrences as required per the manufacturing schedule and the Contract B356 sequence of construction and installation schedule. No on-site storage space is available at the Point of Destination.

Item 6: Off site storage of LOX System.

Item 6a: Delivery, unloading, and placement into proper storage LOX system within an off-site bonded Storage Facility. This item includes as many occurrences as required per the manufacturing schedule and the Contract B356 sequence of construction and installation schedule.

Item 6b: LOX system storage per month at an Off-Site bonded storage facility. Storage of each VPSA unit includes storage of all the equipment, piping, electrical and instrumentation and controls as specified for a complete operating unit in as many separate and individual components as required.

Item 6c: Loading, transport, and delivery of LOX system to the installation contractor at the Point of Destination. This item includes as many occurrences as required per the manufacturing schedule and the Contract B356 sequence of construction and installation schedule. No on-site storage space is available at the Point of Destination.

<b>Cost Item</b>	<b>Equipment – Off-Site Storage</b>	<b>Units</b>	<b>Estimated Quantity</b>	<b>Unit Price<sup>1</sup></b>	<b>Subtotal</b>
5	VPSA System				
5a	Delivery, unloading and placement into off-site storage	Per Unit		\$	\$
5b	Monthly Storage	Per Month, Per Unit	42	\$	\$
5c	Removal from storage, loading and delivery to the Point of Destination	Per Unit		\$	\$
6	LOX System				
6a	Delivery, unloading and placement into off-site storage	Per Unit	1	\$	\$
6b	Monthly Storage	Per Month, Per Unit	9	\$	\$
6c	Removal from storage, loading and delivery to the Point of Destination	Per Unit	1	\$	\$
<b>Subtotal Cost Proposal Form III</b>					<b>\$</b>
All equipment not specifically listed are considered a part of the larger items included in the table. No separate payment will be made for storage of components of the equipment included in this Cost Proposal Form III.					

## Cost Proposal Form IV – Manufacturer’s Services

Payment of a unit price item shall be made for the actual quantity of work performed. Quantities for the various items of work and materials are approximate only and are given solely to be used as a uniform basis for the comparison of costs and PVSC reserves the right to increase or decrease quantities, and to eliminate quantities, as PVSC may deem necessary. The Proposer will be paid on the basis of stipulated unit prices set forth, whenever the Proposer is directed in writing to provide requested services. The Proposer shall have no right to such money, when he is not directed in writing to provide services.

Proposer shall provide Qualified Manufacturer’s Specialists to perform the following services:

- **Manufacturers Field Services During Installation and Testing:**
  - Installation instructions, oversight, supervision, and certification services
  - Field Testing support services
  - Startup and Commissioning support services
  - Performance and acceptance testing support services
  - Equipment and operational training of PVSC staff
- **Manufacturers Field Services After Systems Acceptance By The Owner:**
  - Operational support services
  - System Optimization Services

Payment will be at the unit price, which is an all-inclusive daily per diem rate, that shall only account for the Specialists’ labor, time and expenses and does not include the remaining specified requirements for the Proposer to train PVSC’s personnel. The remaining specified requirements shall be included in Cost Proposal Form I. The unit price shall include:

1. All salary and overhead
2. All expenses traveling to and returning from the lodging local to the job site from the Manufacturer’s Field Service home base of operations,
3. Local lodging
4. Travel between the jobsite and local lodging
5. Meals and miscellaneous expenses

A day of service shall be defined as one, eight (8) hours onsite during normal business days.

Cost Item	Equipment	Units	Estimated Quantity	Unit Price <sup>1</sup>	Subtotal
7	Manufacturer’s Field Services during Installation and Testing Prior to Systems Acceptance By the Owner	Person Days	100	\$	\$
8	Manufacturer’s Field Services After Systems Acceptance By The Owner	Person Days	108	\$	\$
<b>Subtotal Cost Proposal Form IV</b>					<b>\$</b>



**TOTAL CAPITAL COST (Sum of Cost Proposal Forms I, II, III, IV):**

\_\_\_\_\_

**(In Figures)** **Date**

**Name of Proposer:** \_\_\_\_\_

<sup>1</sup> The Unit Price shall be multiplied by the Estimated Quantity and the result entered on the corresponding Total Amount Line item.

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**ATTACHMENT D**  
**PROPOSER'S QUALIFICATION FORM**



SECTION - P 00400

PROPOSER'S QUALIFICATION FORM

**THE INFORMATION SUPPLIED IN THIS DOCUMENT IS CONFIDENTIAL TO THE EXTENT PERMITTED BY LAWS AND REGULATIONS**

**1. SUBMITTED BY:**

Official Name of Firm: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

**2. SUBMITTED TO:**

Passaic Valley Sewerage Commission

Project Name: Contract B355 – Oxygen Production Facility

Equipment Procurement

**3. SELLER'S CONTACT INFORMATION:**

Contact Person: \_\_\_\_\_

Title: \_\_\_\_\_

Phone: \_\_\_\_\_

Email: \_\_\_\_\_

**4. TYPE OF ORGANIZATION:**

SOLE PROPRIETORSHIP

Name of Owner: \_\_\_\_\_

Doing Business As: \_\_\_\_\_

Date of Organization: \_\_\_\_\_

PARTNERSHIP

Date of Organization: \_\_\_\_\_

Type of Partnership: \_\_\_\_\_

Name of General Partner(s): \_\_\_\_\_

CORPORATION

State of Organization: \_\_\_\_\_

Date of Organization: \_\_\_\_\_

Executive Officers:

- President: \_\_\_\_\_

- Vice President(s): \_\_\_\_\_

- Treasurer: \_\_\_\_\_

- Secretary: \_\_\_\_\_

LIMITED LIABILITY COMPANY

State of Organization: \_\_\_\_\_

Date of Organization: \_\_\_\_\_

Members \_\_\_\_\_

JOINT VENTURE

State of Organization: \_\_\_\_\_

Date of Organization: \_\_\_\_\_

Form of Organization: \_\_\_\_\_

Joint Venture Managing Partner:

- Name: \_\_\_\_\_
- Address: \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

Joint Venture Managing Partner:

- Name: \_\_\_\_\_
- Address: \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

Joint Venture Managing Partner:

- Name: \_\_\_\_\_
- Address: \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**5. EXPERIENCE:**

Proposer shall be a financially sound firm having at least twenty (20) years continuous experience in designing, engineering, implementing, furnishing, operating and supporting VPSA oxygen generation systems and liquid oxygen storage and vaporization systems which are comparable to the specified system in terms of size and complexity. The Proposer shall submit with the bid a list of 50 installations and a list of at least five (5) references with contact information where the Proposer has designed, engineered, furnished, and provided installation supervision for VPSA oxygen generation facilities and liquid oxygen storage and vaporization system including electrical, instrumentation, and control systems.

Complete the Schedule of References demonstrating VPSA experience in similar scope and size to that required under this contract with a minimum capacity of 100 TPD.

I HEREBY CERTIFY THAT THE INFORMATION SUBMITTED HEREWITH,  
INCLUDING ANY ATTACHMENTS, IS TRUE TO THE BEST OF MY  
KNOWLEDGE AND BELIEF.

NAME OF ORGANIZATION: \_\_\_\_\_

BY: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATED: \_\_\_\_\_

NOTARY ATTEST:

SUBSCRIBED AND SWORN TO BEFORE ME:

THIS \_\_\_\_\_ DAY OF \_\_\_\_\_, 20\_\_\_\_

NOTARY PUBLIC – STATE OF \_\_\_\_\_

MY COMISSION EXPIRES \_\_\_\_\_

REQUIRED ATTACHMENTS

1. Schedule of Reference Installations (Current Experience)
2. Evidence of authority for individuals listed in Section 6 to bind organization to an agreement.
3. Listing of Qualification installations.



<b>Ref No.</b>	<b>Project Name</b>	<b>Seller's Contact Person</b>	<b>Service Description</b>	<b>VPSA CAPACITY Tons / Day</b>	<b>Startup Year</b>	<b>Power Distribution System included. (Yes/No)</b>	<b>Instrumentation and Control System included (Yes/No)</b>	<b>Currently in Service (Yes/No)</b>
1	Name: Address:	Name: Telephone:						
2	Name: Address:	Name: Telephone:						
3	Name: Address:	Name: Telephone:						
4	Name: Address:	Name: Telephone:						
5	Name: Address:	Name: Telephone:						

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**ATTACHMENT E**  
**CONTRACT AGREEMENT**  
**MAINTENANCE BOND**  
**PERFORMANCE BOND FOR PROCUREMENT**  
**CONTRACTS**  
**PAYMENT BOND FOR PROCUREMENT**  
**CONTRACTS**

**Exhibit A-1 – Schedule of Submittals and  
Applicable Liquidated Damages**

**Exhibit B-1 – Assignment of Contract, Consent  
to Assignment and Acceptance of Assignment**

**Exhibit B-2 – Agreement to Assignment by  
Seller's Surety**



SECTION P-00500

CONTRACT NO. B355  
PASSAIC VALLEY SEWERAGE COMMISSION  
600 WILSON AVENUE  
NEWARK, NEW JERSEY 07105

CONTRACT AGREEMENT

OXYGEN PRODUCTION FACILITY EQUIPMENT PROCUREMENT

THIS AGREEMENT, made and executed this day of \_\_\_\_\_, 20\_\_\_\_, by and between the PASSAIC VALLEY SEWERAGE COMMISSION, a corporate body politic of the State of New Jersey, hereinafter called the "Owner" or "Buyer", acting through its Chairman, and \_\_\_\_\_, a corporation, partnership, individual, etc. chartered under the laws of the State of \_\_\_\_\_ with principal offices at \_\_\_\_\_ hereinafter called the "Seller". Buyer and Seller, in consideration of the mutual covenants, hereinafter set forth, agree as follows:

Article 1 - Goods and Special Services

1.1 In consideration of the payments to be made as hereinafter provided, and of the performance by Buyer of all the matters and things to be performed by Buyer and herein provided; Seller agrees, at its own sole cost and expense, to provide all Goods and Special Services as specified, described or indicated in the Contract Documents, as defined herein and Addenda within the time hereinafter specified and in accordance with the terms, conditions and provisions of the Contract Documents and Addenda.

Article 2 - Engineer

2.1 The Project has been designed by Greeley and Hansen (A TYLin Company), 1700 Market St, Suite 2130 Philadelphia, Pennsylvania, 19103, who are hereinafter called Engineer and who are to act as Buyer's representative, assume all duties and responsibilities and have the rights and authority assigned to Engineer in the Contract Documents in connection with completion of the Work in accordance with the Contract Documents.

Article 3 - Contract Times

3.1 All time limits for Milestones and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

3.2 The Contract Times shall be as follows:

Milestone 1: Completion of all submittals on or before the date per the Schedule of Submittals for each identified item attached to this Agreement as Exhibit 1.

Milestone 2: VPSA systems with 500 TPD capacity and the LOX system together with related electrical and instrumentation and control systems delivered to the Point of Destination on or before 730 calendar days after execution of Agreement with BUYER and after written notification that the site has been fully prepared for installation. No space is available at the Point of Destination for storage of equipment or materials. Equipment and materials shall not be delivered to PVSC until the separate Installation Contractor is ready to receive and install them.

Milestone 3: Completion of commissioning, startup and successful field testing, performance testing, PVSC Staff Training, delivery of approved Operation and Maintenance Manuals, and acceptance testing of VPSA systems with 500 TPD of capacity and the LOX system on or before 120 days after certified completion of installation.

Milestone 4: Remaining VPSA systems delivered to the Point of Destination on or before 30 calendar days after written notification that the site has been fully prepared for installation.

Milestone 5: Completion of commissioning, startup and successful field testing, performance testing, PVSC Staff Training, delivery of approved Operation and Maintenance Manuals, and acceptance testing of remaining VPSA systems on or before 60 days after certified completion of installation.

The Goods and Special Services shall be completed and ready for final payment in accordance with Paragraph 10.06 of Section P-00700 Standard General Conditions for Procurement Contract within the schedule specified herein after the date when the Contract Times commence to run.

- 3.3 All Submittals, Shop Drawing and Samples required by the Contract Documents shall be submitted to Buyer for Engineer's review according to the schedule specified herein.
- 3.4 The Goods are to be delivered to the Point of Destination and ready for BUYER's receipt of delivery according to the schedule specified herein.
- 3.5 There is no space available at the Point of Destination for storage of Proposers equipment and materials. Equipment and materials shall not be delivered to the Point of Destination until the separate Installation Contractor is ready to receive and install them. If the Goods are scheduled to be delivered on or after the scheduled date for delivery to the Point of Destination according to the schedule specified herein, but BUYER cannot take delivery at the Point of Destination by the time after the Scheduled Delivery Date that such Goods are estimated to be delivered to the Point of Destination, due to any cause not attributable to Seller, then, Seller if directed by Buyer shall place Goods into Off-Site Storage. The site

of such storage shall be mutually agreed between the Seller and Buyer. If such item is placed (or kept, as applicable) in storage, including storage at the facility where it is manufactured, the following conditions shall apply:

- A. Risk of loss (including responsibility for insurance coverage) shall remain with Seller;
- B. Seller shall be responsible for preparing the items for, and placing them into, storage in such a manner as to be compliant with Seller's standard guidelines and requirements for storage of such items;
- C. Seller remains responsible for shipment to the Point of Destination;
- D. Payment to Seller for Goods to be placed into storage shall be in accordance with Articles 4 and 5 of the Contract Agreement and any amounts payable to the Seller upon delivery at the Point of Destination shall become payable upon delivery of the Goods to Off-Site Storage.

#### Article 4 - Contract Price

- 4.1 Buyer shall pay Seller for completion of the Work in accordance with the Contract Documents in current funds at the prices agreed upon in the Seller's Capital Cost Proposal Form attached to this Agreement. The Contract Price shall be the Total Capital Cost Price including Allowances and Unit Prices.
- 4.2 Allowances and Unit Prices are for specific contingencies for the Seller to complete the Goods and Special Services for items and incidentals not specified in the Contract Documents or are those that are required by the Buyer as specified in the Seller's Capital Cost Proposal Form.
- 4.3 The Seller will be paid on the basis of stipulated unit prices set forth in the Proposer's Cost Proposal Form(s), however, that is the Seller is not directed to use the Allowances or Unit Prices, the Seller shall have no right to such money and it shall be deducted from the total amount of the Contract by change order.
- 4.4 Payment to Seller post assignment of Contract shall be in accordance with Paragraph 10.06 of Section P-00700 Standard General Conditions for Procurement Contracts.

#### Article 5 - Payment Procedures

- 5.1 Submittal and Processing of Payments. Seller shall submit Applications for Payment in accordance with Article 10 of Section P-00700 Standard General Conditions for Procurement Contract. Applications for Payment will be processed by Engineer as provided in Section P-00700 Standard General Conditions for Procurement Contract.

5.2 Progress Payments. Buyer shall make progress payments toward the Contract Price on the basis of Seller's Applications for Payment, submitted in accordance with Paragraph 10.01 of Section P-00700 Standard General Conditions for Procurement Contract and accompanied by Engineer's recommendation of payment in accordance with Paragraph 10.02.A of Section P-00700 Standard General Conditions for Procurement Contract and Supplemental General Conditions, as follows:

- A. Five percent (5%) of each Lump Sum Pay Item included in Cost Proposal Form I, Payable in forty-five (45) calendar days upon **Execution of Contract Agreement**.
- B. Five percent (5%) of each Lump Sum Pay Item included in Cost Proposal Form I, Payable in forty-five (45) calendar days upon Engineer's acceptance of Seller's final **Shop Drawing submittals**.
- C. Twenty five percent (25%) of each Lump Sum Pay Item included in Cost Proposal Form I, Payable in forty-five (45) calendar days upon **Acceptance of Final Factory Tests of skid mounted VPSA and LOX sub assemblies**.
- D. Ten percent (10%) of each Lump Sum Pay Item included in Cost Proposal Form I, Payable in forty-five (45) calendar days **Upon ready for shipment**.
- E. Twenty percent (20%) of each Lump Sum Pay Item included in Cost Proposal Form I, Payable in forty-five (45) calendar days **from the delivery date at the Point of Destination for** each Lump Sum Pay Item included in Cost Proposal Form I.
- F. Twenty five percent (5%) of each Lump Sum Pay Item included in Cost Proposal Form I, Payable in forty-five (45) calendar days upon **certified Installation, Startup, Commissioning, Field Testing**, and delivery of approved Operation and Maintenance Manuals, for each Lump Sum Pay Item included in Cost Proposal Form I.
- G. Five percent (5%) of each Lump Sum Pay Item included in Cost Proposal Form I, Payable in forty-five (45) calendar days upon **successful Performance and Acceptance Testing** for each Lump Sum Pay Item included in Cost Proposal Form I.
- H. Five percent (5%) of each Lump Sum Pay Item included in Cost Proposal Form I, Payable in forty-five (45) calendar days upon completion of PVSC Staff Training, for each Lump Sum Pay Item included in Cost Proposal Form I.
- I. 100 percent (100%) of the individual and separate lump sum items in Cost Proposal Form III payable upon completion of those items.
- J. Allowance items, payable in forty-five (45) calendar days upon Engineer's



acceptance of Seller's Work associated with the respective allowance item.

K. Unit Price items, payable in forty-five (45) calendar days upon Engineer's acceptance of Seller's Work associated with the respective unit price item.

5.3 Final Payment. Seller shall submit final Application for Payment upon Completion as indicated in Paragraph 10.06 of Section P-00700 Standard General Conditions for Procurement Contracts. Upon receipt of the final Application for Payment accompanied by Engineer's recommendation of payment in accordance with Paragraph 10.06 of Section P-00700 Standard General Conditions for Procurement Contract, Buyer shall pay the remainder of the Contract Price as recommended by Engineer.

#### Article 6 - Seller's Representations

In order to induce Buyer to enter into this Agreement, Seller makes the following representations:

6.1 Seller has familiarized itself with the nature and extent of the Contract Documents, Work, site, locality, and all local conditions and Laws and Regulations that in any manner may affect cost, progress, performance of the Goods and Special Services.

6.2 Seller has given Engineer written notice of all conflicts, errors or discrepancies that he has discovered in the Contract Documents and the written resolution thereof by Engineer is acceptable to Seller.

6.3 Seller is financially solvent and is experienced and competent to perform the type of work or to furnish the plant, materials, supplies or equipment to be performed or furnished by him.

6.4 The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Goods and Special Services.

#### Article 7 - Liquidated Damages and other Damages

7.1 The Buyer and Seller recognize that TIME IS OF THE ESSENCE of this Agreement and that Buyer will suffer financial loss if the Goods are delivered at the Point of Destination and ready for receipt of delivery by Buyer within the times specified herein, plus any extensions thereof allowed in accordance with Article 7 of Section P-00700 Standard General Conditions for Procurement Contract. The parties also recognize that the timely performance of services by others involved in the Project is materially dependent upon Seller's specific compliance with the requirements of Paragraph 3.3 above. Further, they recognize the delays, expense and difficulties involved in providing the actual loss suffered by the Buyer if complete acceptable Goods are not delivered on time. Accordingly, instead of requiring such proof, the parties agree that the Seller shall pay Buyer liquidated damages in the amounts set forth in the Contract Agreement.

The liquidated damages sum is hereby agreed upon, not as a penalty but as liquidated damages, which the parties hereto have agreed to be proper and reasonable, and which the Buyer will suffer by reason of such default. The Buyer reserves the right to retain and/or release liquidated damages until the Seller has corrected the delay in the schedule or has met subsequent milestones.

Milestone 1:

The Seller shall pay Buyer \$500 each calendar day for each Submittal Item marked as "Yes" in the Schedule of Submittals LD Column, attached hereto as Exhibit A-1.

Milestone 2:

The Seller shall pay Buyer \$12,000 each calendar day that expires after the time specified herein for Milestone 2.

Milestone 3:

The Seller shall pay Buyer \$12,000 each calendar day that expires after the time specified herein for Milestone 3.

Milestone 4:

The Seller shall pay Buyer \$8,000 each calendar day that expires after the time specified herein for Milestone 4.

Milestone 5:

The Seller shall pay Buyer \$8,000 each calendar day that expires after the time specified herein for Milestone 5.

Completion:

The Seller shall pay Buyer \$1,000 each calendar day that expires after the time specified herein for Completion.

- 7.2 Penalty Damages. The Seller shall pay penalty damages to the Owner for "Failure to Meet Oxygen Generation", for "Failure to Meet Total Power Consumption" or "Failure to Oxygen Purity" as specified in Section 11 55 10. Penalty damages will be paid if failure to meet the specified oxygen production and power demand guarantees is due to the design, manufacture or installation of work, materials, equipment, or systems furnished, installed, repaired, or rehabilitated as part of this Contract.

Article 8 - Contract Documents

- 8.1 The Contract Documents which comprise the Contract between Buyer and Seller are attached hereto and made a part hereof and consist of the following (Form Reference):

A. Proposal accepted by Buyer

B. Cost Proposal Forms

- C. This Agreement and Notice to Proceed
- D. Executive Order 117 Certificate
- E. New Jersey Business Registration Certificate
- F. Acknowledgement of Receipt of Changes to RFP, (00 27 00)
- G. Proposer's Affidavit, (00 45 14)
- H. Non-Collusion Affidavit, (00 45 19)
- I. Statement of Ownership, (00 45 01)
- J. Affirmative Action Affidavit, (00 45 30)
- K. Disclosure of Investments Activities in Iran, (00 45 52)
- L. Certification of Non-Involvement in Prohibited Activities in Russia or Belarus, (00 45 53)
- M. Consent of Surety, (00 62 76)
- N. Surety Disclosure Statement and Certification, (00 62 77)
- O. Byrd Anti-Lobbying Amendment Certification (00 62 79)
- P. Build America, Buy America
- Q. Performance and Payment Bond, (P-00610)
- R. Other required Bonds
- S. Certificate of Insurance
- T. Standard General Conditions for Procurement Contract, EJCDC Document P-00700, 2010 edition
- U. Procurement Supplementary Conditions, P-00800.
- V. Technical Specifications (as listed in Table of Contents)
- W. All drawings (as listed in Table of Contents)

- X. Addenda numbers \_\_\_\_\_ to \_\_\_\_\_, inclusive
- Y. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
1. Change Orders
  2. Written Amendment(s)
  3. Field Order(s).
  4. Engineer's Written Interpretation(s).
  5. Exhibits to this Agreement (enumerated as follows):
    - a. Exhibit A-1 Schedule of Submittals and Liquidated Damages
    - b. Exhibit B-1 to Agreement between Buyer and Seller dated \_\_\_\_\_, Assignment of Contract; Consent to Assignment; and Acceptance of Assignment.
    - c. Exhibit B-2 to Agreement between Buyer and Seller dated \_\_\_\_\_, Agreement to Assignment by Seller's Surety.
  6. Documentation submitted by Seller prior to Notice of Award
- 8.2 The documents listed in Paragraph 8.1 are attached to this Agreement (except as expressly noted otherwise above).
- 8.3 There are no Contract Documents other than those listed in this Article.
- 8.4 The Contract Documents may be amended, modified, or supplemented only as provided in Paragraph 3.04 of Section P-00700 Standard General Conditions for Procurement Contract.

#### Article 9 – Point Of Destination

- 9.1 The place where the Goods are to be delivered is defined in Section P-00700 Standard General Conditions for Procurement Contract as the Point of Destination. It is the Buyer's intention that the Point of Destination is designated as follows:

Passaic Valley Sewerage Commission WWTP  
600 Wilson Avenue  
Newark, New Jersey 07105

## Article 10 – Miscellaneous

10.1 Terms used in this Agreement will have the meanings indicated in Section P-00700 Standard General Conditions for Procurement Contract and Procurement Supplementary Conditions.

10.2 Assignment:

A. Seller shall not assign Contract without the express written consent of Buyer where consent can be given or withheld at Buyer's sole discretion.

B. Buyer has the right to assign the Contract for furnishing Goods and Special Services hereunder and Seller shall accept such assignment. Sample forms documenting the assignment of the Contract and consent of Seller's surety to the assignment are attached as exhibits to this Agreement.

1. The Contract will be executed in the name of Buyer initially, and will be assigned to an Installation Contractor designated by Buyer. The assignment will occur on the effective date of the agreement between Buyer and the Installation Contractor, which is expected to occur approximately 540 calendar days after execution of the Contract between the Buyer and the Seller. As of the date of acceptance of assignment by the Installation Contractor, all references in the Contract Documents to BUYER shall mean the designated contractor whose responsibilities will include the incorporation of the Goods.

2. The assignment of the Contract shall relieve Buyer from all further obligations and liabilities under the Contract. After assignment, Seller shall become a subcontractor to the assignee and, except as noted herein, all rights, duties, and obligations of Buyer under the Contract shall become the rights, duties, and obligations of the assignee.

3. After assignment:

a. All performance warranties, and guarantees, including, but not limited to, all insurances, additional insured status, waivers of subrogation, bond coverages, indemnifications, limitation of liability, and remedies required by the Contract Documents will continue to run for the benefit of Buyer and, in addition, for the benefit of the assignee.

b. Except as provided in this Paragraph 11.02.A.3.b, all rights, duties and obligations of Engineer to assignee and Seller under this Contract will cease.

1) Engineer will review Seller's Applications for Payment and make recommendations to assignee for payments as provided in

Paragraphs 10.02 and 10.06 of Section P-00700 Standard General Conditions for Procurement Contract.

- 2) Upon the written request of either the assignee or Seller, Engineer will issue with reasonable promptness such clarifications or interpretations of the Contract Documents, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents. Such written clarifications interpretations will be final and binding on assignee and Seller unless:
    1. an appeal from Engineer's clarification or interpretation is made within the time limits and in accordance with the dispute resolution procedures set forth in Article 13 of Section P-00700 Standard General Conditions for Procurement Contract; or
    2. if no such dispute resolution procedures have been set forth, a written notice of intention to appeal is delivered by assignee or Seller to the other within 30 days after the date of such decision, and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction within 60 days after the date of such decision (unless otherwise agreed to in writing by assignee and Seller), to exercise such rights or remedies as the appealing party may have with respect to such clarification or interpretation in accordance with applicable Laws and Regulations. Seller shall proceed with work to provide the Goods and Services in accordance with the Milestone and delivery times specified herein except where otherwise agreed by the Buyer or Engineer. Buyer shall continue to make payments in accordance with the provisions of the Contract.
  - 3) When rendering a clarification or interpretation under Paragraph 11.02.A.3.b.2, Engineer will not show partiality to assignee or Seller and will not be liable in connection with any clarification or interpretation rendered in good faith.
- c. No other assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound. Specifically, but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law). Unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

- 10.3 Successors and Assigns. Buyer and Seller each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect to all covenants, agreements and obligations contained in the Contract Documents.
- 10.4 Severability. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Buyer and Seller, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.
- 10.5 Business Address. The business address of Seller given herein is hereby designated as the place to which all notices, letters, and other communication to Seller will be mailed or delivered. The address of Buyer appearing herein is hereby designated as the place to which all notices, letters, and other communication to Buyer shall be mailed or delivered. Either party may change its address at any time by an instrument in writing delivered to Engineer and the other party.

The address of the assignee as indicated in Exhibit B-1 is hereby designated as the place to which all notices, letters, and other communication to assignee shall be mailed or delivered.

- 10.6 This Agreement shall be construed in accordance with the laws of the State of New Jersey.
- 10.7 Seller agrees that:
- A. It hereby voluntarily and irrevocably submits itself to the jurisdiction and venue of any court of competent jurisdiction over the subject matter of this Agreement located within the State of New Jersey in which any litigation is brought based on or arising out of this Agreement.
  - B. Any legal process or notice connected with any litigation may be served on Seller by United States registered mail, postage prepaid, addressed to Seller at its address stated in this Agreement for the furnishing of notices to Seller or at Seller's last known address, and that service in such manner shall constitute good and valid service of process upon Seller.
  - C. Seller hereby waives any defense which might be available to it in any such litigation based on or alleging lack of jurisdiction or venue, or, if process is served in the manner provided in subparagraph "B" immediately above, invalid service of process, and that it will duly enter its appearance in any such action.
  - D. This Agreement may be presented in court as conclusive evidence of the foregoing agreement.

(See following page)

**IN WITNESS WHEREOF:** The parties hereto have executed this agreement the day and year first above mentioned.

**PASSAIC VALLEY SEWERAGE COMMISSION**

(SEAL)

BY: \_\_\_\_\_

ATTEST BY: \_\_\_\_\_  
**PASSAIC VALLEY SEWERAGE COMMISSION**

\_\_\_\_\_  
**SELLER NAME**

BY: \_\_\_\_\_

**SELLER**

(SEAL)

ATTEST BY: \_\_\_\_\_

**SELLER**

Note: If Seller is a corporation, an affidavit giving the principal the right to sign the Agreement must accompany the executed Agreement.

\_\_\_\_\_  
**NAME OF CORPORATION**

BY: \_\_\_\_\_

(CORPORATE SEAL)

ATTEST BY: \_\_\_\_\_

(ADD TYPED OR PRINTED NAMES OF OFFICER AND ATTESTING WITNESS)

Date: \_\_\_\_\_



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EXHIBIT A-1

**Schedule of Submittals and Applicable Liquidated Damages**

The following schedule is not all-inclusive. The Technical Specifications also include submittal requirements. There are also requirements for Seller to “provide notice,” to “advise,” to “update,” to “inform” etc., or to “submit”. These have not been included in the following list. It is the Seller’s responsibility to comply with submittal and other requirements included on the following schedule, included in the technical specifications, and included in other sections of the specifications:

Item No.	Reference Document	Submittals Item	Calendar Days		Event	LDs Apply?
<b>1</b>	<b>115510</b>	<b>Vacuum Pressure Swing Adsorption Oxygen Generation System</b>				
1.1		Confirmation and Certification of agreement with design performance guarantees.	60	After	Effective Date Of Agreement	Yes
1.2		Equipment selection for individual components of the VPSA system including sizing, design performance criteria, with manufacturers, models, and materials information.	90	After	Effective Date of the Agreement	Yes
1.3		Project design, engineering, manufacturing, and delivery schedule	90	After	Effective Date of the Agreement	Yes
1.4		Catalogue cutsheets with data sheets, general arrangement drawings, materials, equipment structural static and dynamic loading criteria	120	After	Effective Date of the Agreement	Yes
1.5		Flow diagrams with all equipment, piping, valves, and accessories including identification tags.	120	After	Effective Date of the Agreement	Yes
1.6		Detailed plan indicating complete VPSA systems layout on each concrete foundation.	120	After	Effective Date of the Agreement	Yes
1.7		Sound performance data at all frequency bands at locations on each side of the VPSA	120	After	Effective Date of the Agreement	Yes
1.8		Blower enclosure manufacturer, model, assembly drawings, foundation requirements, heating and cooling loads, lighting, sound reduction performance, materials, access, HVAC, and electrical systems.	120	After	Effective Date of the Agreement	Yes
1.9		Description of factory test procedures and requirements for VPSA system components and for finished skids with copies of Certified Test and Inspection Report forms.	120	After	Effective Date of the Agreement	No

The following schedule is not all-inclusive. The Technical Specifications also include submittal requirements. There are also requirements for Seller to “provide notice,” to “advise,” to “update,” to “inform” etc., or to “submit”. These have not been included in the following list. It is the Seller’s responsibility to comply with submittal and other requirements included on the following schedule, included in the technical specifications, and included in other sections of the specifications:

Item No.	Reference Document	Submittals Item	Calendar Days		Event	LDs Apply?
1.10		Detail drawings for each factory assembled skid indicating all factory and field piping and other process connections.	150	After	Effective Date of the Agreement	Yes
1.11		Drawings indicating the size and location of all concrete equipment pads.	150	After	Effective Date of the Agreement	Yes
1.12		Provide certified load tables, anchor bolt sizes and locations and other information as needed to complete foundation design.	150	After	Effective Date of the Agreement	Yes
1.13		Fabrication and erection detail drawings	150	After	Effective Date of the Agreement	No
1.14		Shop and/or field coatings data	150	After	Effective Date of the Agreement	No
1.15		Drawings, performance, and operating data on all accessory equipment including valves, fittings, and other components.	150	After	Effective Date of the Agreement	No
1.16		Instrument air system catalog cuts data sheets, performance criteria, motor data, cooling loads, one line diagram, for all components.	150	After	Effective Date of the Agreement	No
1.17		Cooling system catalog cuts data sheets, performance criteria, motor data, cooling loads, one line diagram, for all components.	150	After	Effective Date of the Agreement	No
1.18		Pipe layout drawings	150	After	Effective Date of the Agreement	Yes
1.19		Recommended location for all equipment and pipe supports, recommended type of supports at each location and loads on each support.	150	After	Effective Date of the Agreement	No
1.20		Detailed installation instructions and copies of written certification of correct installation forms.	210	After	Effective Date of the Agreement	No
1.21		Submission of operation and maintenance manuals and detailed training plans	210	After	Effective Date of the Agreement	No
1.22		Detailed commissioning, startup and field testing procedures and copies of field testing data recording forms.	210	After	Effective Date of the Agreement	No
1.23		Detailed description of performance and acceptance testing procedures and copies of testing data recording forms.	210	After	Effective Date of the Agreement	No

The following schedule is not all-inclusive. The Technical Specifications also include submittal requirements. There are also requirements for Seller to “provide notice,” to “advise,” to “update,” to “inform” etc., or to “submit”. These have not been included in the following list. It is the Seller’s responsibility to comply with submittal and other requirements included on the following schedule, included in the technical specifications, and included in other sections of the specifications:

<b>Item No.</b>	<b>Reference Document</b>	<b>Submittals Item</b>	<b>Calendar Days</b>		<b>Event</b>	<b>LDs Apply?</b>
<b>2</b>	<b>115520</b>	<b>Liquid Oxygen Storage and Vaporization System</b>				
2.1		Confirmation and Certification of agreement with design performance guarantees.	60	After	Effective Date of the Agreement	Yes
2.2		Equipment selection for individual components of the LOX system including sizing, design performance criteria, with manufacturers, models, and materials information.	90	After	Effective Date of the Agreement	Yes
2.3		Catalogue cutsheets with data sheets, general arrangement drawings, materials, equipment structural static and dynamic loading criteria.	120	After	Effective Date of the Agreement	Yes
2.4		Detailed plan indicating complete LOX systems layout on the concrete foundation.	120	After	Effective Date of the Agreement	Yes
2.5		Description of factory test procedures and requirements for LOX system components and for finished skids with copies of Certified Test and Inspection Report Forms.	120	After	Effective Date of the Agreement	No
2.6		Provide certified load tables, anchor bolt sizes and locations and other information as needed to complete foundation design.	150	After	Effective Date of the Agreement	Yes
2.7		Flow diagrams with all equipment, piping, valves, and instruments.	120	After	Effective Date of the Agreement	Yes
2.8		Detail drawings for each factory assembled skid indicating all factory and field piping and other process connections.	150	After	Effective Date of the Agreement	Yes
2.9		Drawings, performance and operating data, and materials on all accessory equipment including valves, fittings, and other components.	150	After	Effective Date of the Agreement	No
2.10		Detailed installation instructions and copies of written certification of correct installation forms.	210	After	Effective Date of the Agreement	No
2.11		Submission of operation and maintenance manuals and detailed training plan.	210	After	Effective Date of the Agreement	No

The following schedule is not all-inclusive. The Technical Specifications also include submittal requirements. There are also requirements for Seller to “provide notice,” to “advise,” to “update,” to “inform” etc., or to “submit”. These have not been included in the following list. It is the Seller’s responsibility to comply with submittal and other requirements included on the following schedule, included in the technical specifications, and included in other sections of the specifications:

Item No.	Reference Document	Submittals Item	Calendar Days		Event	LDs Apply?
2.12		Detailed commissioning, startup and field testing procedures and copies of field testing data recording forms.	210	After	Effective Date of the Agreement	No
2.13		Detailed description of performance and acceptance testing procedures and copies of testing data recording forms.	210	After	Effective Date of the Agreement	No
2.14		Pipe layout drawings	150	After	Effective Date of the Agreement	Yes
2.15		Drawings indicating the size and location of all concrete equipment pads	150	After	Effective Date of the Agreement	No
2.16		Recommended location for all equipment and pipe supports, recommended type of supports at each location and loads on each support.	150	After	Effective Date of the Agreement	No
<b>3</b>	<b>Division 26 Specifications</b>	<b>Electrical and Power Distribution System</b>				
3.1		Overall one-line diagram.	150	After	Effective Date of the Agreement	Yes
3.2		Detailed load list with loads, power supply requirements, voltage, and identification tags.	150	After	Effective Date of the Agreement	Yes
3.3		Complete blower motor submission.	150	After	Effective Date of the Agreement	Yes
3.4		Equipment selection for individual components of the electrical and power distribution system including sizing, design performance criteria with manufacturers, models, and catalog information.	210	After	Effective Date of the Agreement	Yes
3.5		Switchgear and motor control center one line diagrams, block diagrams and control diagrams.	210	After	Effective Date of the Agreement	Yes
3.6		Electrical and Control Room enclosure manufacturer, model, assembly drawings, foundation requirements, heating and cooling loads, lighting, sound reduction performance, materials, access, HVAC, and electrical systems for each VPSA.	210	After	Effective Date of the Agreement	Yes
3.7		Power monitoring system specifications, equipment details, catalog cuts, diagrams, and installation details.	210	After	Effective Date of the Agreement	Yes

The following schedule is not all-inclusive. The Technical Specifications also include submittal requirements. There are also requirements for Seller to “provide notice,” to “advise,” to “update,” to “inform” etc., or to “submit”. These have not been included in the following list. It is the Seller’s responsibility to comply with submittal and other requirements included on the following schedule, included in the technical specifications, and included in other sections of the specifications:

Item No.	Reference Document	Submittals Item	Calendar Days		Event	LDs Apply?
3.8		Grounding System specifications, catalog cuts, materials, and installation details.	210	After	Effective Date of the Agreement	Yes
3.9		Lightning Protection System specifications, catalog cuts, materials, and installation details.	210	After	Effective Date of the Agreement	Yes
3.10		Short circuit and power study including voltage drop calculations.	210	After	Effective Date of the Agreement	Yes
3.11		Point to point wiring diagrams.	210	After	Effective Date of the Agreement	Yes
3.12		Plan of under concrete slab conduit and cable.	210	After	Effective Date of the Agreement	Yes
3.13		Cable and conduit schedule and specifications.	210	After	Effective Date of the Agreement	Yes
3.14		Detailed installation instructions and copies of written certification of correct installation forms.	210	After	Effective Date of the Agreement	No
3.15		Factory Test detailed procedures.	210	After	Effective Date of the Agreement	No
3.16		Detailed commissioning, startup and field testing procedures and copies of field testing data recording forms.	210	After	Effective Date of the Agreement	No
3.17		Detailed description of field performance and acceptance testing procedures and copies of testing data recording forms.	210	After	Effective Date of the Agreement	No
<b>4</b>	<b>Division 40 Specifications</b>	<b>Instrumentation and Control Systems</b>				
4.1		Network Architecture Diagram.	150	After	Effective Date of the Agreement	Yes
4.2		Process and Instrumentation Diagram (P&ID).	150	After	Effective Date of the Agreement	Yes
4.3		Control Room plan layout for each VPSA and for the central control room.	150	After	Effective Date of the Agreement	Yes
4.4		Equipment selection for individual components of the Instrumentation and Control system including sizing, design performance criteria, with manufacturers, and models information.	150	After	Effective Date of the Agreement	Yes
4.5		Submission of Allen Bradley PLC details.	150	After	Effective Date of the Agreement	Yes
4.6		Control system functional loop and logic diagrams.	210	After	Effective Date of the Agreement	No

The following schedule is not all-inclusive. The Technical Specifications also include submittal requirements. There are also requirements for Seller to “provide notice,” to “advise,” to “update,” to “inform” etc., or to “submit”. These have not been included in the following list. It is the Seller’s responsibility to comply with submittal and other requirements included on the following schedule, included in the technical specifications, and included in other sections of the specifications:

Item No.	Reference Document	Submittals Item	Calendar Days		Event	LDs Apply?
4.7		Control system instrumentation and I/O lists with manufacturers, models, catalog cuts, materials, performance data, wiring requirements, and operating ranges.	210	After	Effective Date of the Agreement	Yes
4.8		Instrument data sheets (ISA type or equal) and installation details.	210	After	Effective Date of the Agreement	No
4.9		signals from oxygen production facility to be monitored by SCADA.	210	After	Effective Date of the Agreement	Yes
4.10		VPSA and LOX System HMI Screen Displays.	210	After	Effective Date of the Agreement	Yes
4.11		Shop Witness Test detailed procedures.	210	After	Effective Date of the Agreement	No
4.12		Detailed commissioning, startup and field testing procedures and copies of field testing data recording forms.	210	After	Effective Date of the Agreement	No
4.13		Detailed description of field performance and acceptance testing procedures and copies of testing data recording.	210	After	Effective Date of the Agreement	No

**EXHIBIT B-1** to Agreement Between Buyer and Seller

Dated \_\_\_\_\_

**ASSIGNMENT OF CONTRACT, CONSENT TO ASSIGNMENT, AND  
ACCEPTANCE OF ASSIGNMENT**

This assignment will be effective on the Effective Date of the Agreement between Buyer and Installation Contractor.

The Contract between Passaic Valley Sewerage Commission (“Buyer”) and \_\_\_\_\_ (“Seller”) for furnishing Goods and Special Services under the Contract Documents entitled Passaic Valley Sewerage Commission Oxygen Production Facility Equipment Procurement is hereby assigned, transferred, and set over to \_\_\_\_\_ (“Installation Contractor”). Installation Contractor shall be totally responsible for the performance of Seller and for the duties, rights and obligations of Buyer, not otherwise retained by Buyer, under the terms of the Contract between Buyer and Seller.

**ASSIGNMENT DIRECTED BY:**  
Buyer

Passaic Valley Sewerage Commission

(If Buyer is a corporation, attach evidence of authority to sign. If Buyer is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of Buyer-Seller Agreement:

By: \_\_\_\_\_  
(Signature) (Title)

Address for giving notices

To Be Determined  
600 Wilson Avenue  
Newark, NJ 07105

**ASSIGNMENT  
ACKNOWLEDGED AND ACCEPTED BY:**

\_\_\_\_\_  
Seller

(If Seller is a corporation, attach Evidence of authority to sign.):

By: \_\_\_\_\_  
(Signature) (Title)

**ASSIGNMENT ACCEPTED BY:**

\_\_\_\_\_  
Installation Contractor

(If Installation Contractor is a corporation, attach evidence of authority to sign.)

By: \_\_\_\_\_  
(Signature) (Title)

Address for giving notices

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



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**EXHIBIT B-2** to Agreement Between Buyer and Seller

Dated \_\_\_\_\_

**AGREEMENT TO ASSIGNMENT BY SELLER’S SURETY**

Surety hereby acknowledges and agrees that the Contract for furnishing Goods and Special Services under the Contract Documents entitled Passaic Valley Sewerage Commission Oxygen Production Facility Equipment Procurement by and between Passaic Valley Sewerage Commission (“Buyer”) and \_\_\_\_\_ (“Seller”) may be assigned, transferred, and set over to \_\_\_\_\_ (“Installation Contractor”), in accordance with Paragraph 11.02 of Agreement between Buyer and Seller.

Surety further agrees that, upon assignment of the Contract, the Installation Contractor shall have all the rights of the Buyer under the Procurement Performance Bond and Procurement Maintenance Bond.

(Corporate Seal)

Surety

Company: \_\_\_\_\_

By: \_\_\_\_\_

Signature and Title  
(Attach Power of Attorney)

Address for giving notices

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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SECTION P-00610

PERFORMANCE AND PAYMENT BONDS

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, \_\_\_\_\_, as Principal and \_\_\_\_\_, a corporation organized and existing under the laws of the State of \_\_\_\_\_, as surety, are held and firmly bound unto the Passaic Valley Sewerage Commission as hereinafter set forth, in the full and just several sums of:

- (a) \_\_\_\_\_(One hundred percent (100%) of the amount of the contract) for faithful PERFORMANCE of the Contract No. 355 – OXYGEN PRODUCTION FACILITY EQUIPMENT PROCUREMENT; and
- (b) \_\_\_\_\_(One hundred percent (100%) of the amount of the contract) for PAYMENT of labor and materials

Signed this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH THAT, WHEREAS, the above named principal did on the \_\_\_\_ day of \_\_\_\_\_, 20\_\_, enter into a contract with the Passaic Valley Sewerage Commission, which said contract is made a part of this bond the same as through set forth herein; NOW, if the said principal shall sell and faithfully do and perform the things agreed by the said principal to be done and performed according to the terms of said contract, and shall pay all lawful claims of subcontractors, materialmen, laborers, persons, firms or corporations for labor performed or materials, provisions, provender or other supplies or teams, fuels, oils, implements or machinery furnished, used or consumed in the carrying forward performing or undertaking shall be for the benefit of any subcontractor, materialman, laborer, person, firm or corporation having a just claim, as well as for the obligee herein; then this obligation shall be void; otherwise the same shall remain in full force and effect; being expressly understood and agreed that the liability of the surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated. The said surety hereby stipulates and agrees that no modifications, omissions or additions in or to the terms of the said contract or in or to the plans or specifications therefore shall in any way affect the obligation of said surety on its bond.

IN WITNESS WHEREOF, the said \_\_\_\_\_ as principal has caused its corporate seal to be hereto affixed and these presents to be signed by \_\_\_ its \_\_\_\_\_ and attested by \_\_\_\_\_ its \_\_\_\_\_ and the said \_\_\_ as surety, has caused its corporate seal to be hereto affixed and these presents to be signed by its \_\_\_\_\_ this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_.

By: \_\_\_\_\_

Attest: \_\_\_\_\_

Attest: \_\_\_\_\_

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SECTION 00 61 19

MAINTENANCE BOND

KNOW ALL MEN BY THESE PRESENTS, that we \_\_\_\_\_, hereinafter called Principal, as Principal, and \_\_\_\_\_, a corporation of the State of \_\_\_\_\_, hereinafter called Surety, are held and firmly bound unto \_\_\_\_\_, hereinafter called

Obligee in the sum of \_\_\_\_\_ DOLLARS, lawful money of the United States of America, to be paid to the said Obligee, or its successors or assigns, to the payment of which sum well and truly to be made, we do bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

SIGNED, sealed and dated this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_

WHEREAS, the Principal entered into a contract with the said Obligee, dated \_\_\_\_\_ for \_\_\_\_\_ and

WHEREAS, the Obligee requires that these presents be executed on or before the final completion and acceptance of said contract and

WHEREAS said contract was completed and accepted on the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the Principal shall remedy, without cost to the Obligee, any defects which may develop during a period of \_\_\_\_\_ from the date of completion and acceptance of the work performed under the contract, caused by defective or inferior materials or workmanship, then this obligation shall be void; otherwise it shall be and remain in full force and effect.

Attest:

\_\_\_\_\_ By: \_\_\_\_\_  
Principal

Attest:

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**ATTACHMENT F**  
**STANDARD GENERAL CONDITIONS FOR**  
**PROCUREMENT CONTRACTS**  
**PROCUREMENT SUPPLEMENTAL GENERAL**  
**CONDITIONS**





# STANDARD GENERAL CONDITIONS FOR PROCUREMENT CONTRACTS

Prepared by



and

Issued and Published Jointly by



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## TABLE OF CONTENTS

	Page
ARTICLE 1 - DEFINITIONS AND TERMINOLOGY .....	1
1.01 Defined Terms.....	1
1.02 Terminology.....	4
ARTICLE 2 - PRELIMINARY MATTERS .....	5
2.01 Delivery of Bonds.....	5
2.02 Evidence of Insurance.....	5
2.03 Copies of Documents.....	5
2.04 Commencement of Contract Times; Notice to Proceed.....	5
2.05 Designated Representatives .....	5
2.06 Progress Schedule .....	5
2.07 Preliminary Conference .....	6
2.08 Safety .....	6
ARTICLE 3 - CONTRACT DOCUMENTS: INTENT AND AMENDING.....	6
3.01 Intent .....	6
3.02 Standards, Specifications, Codes, Laws and Regulations.....	6
3.03 Reporting and Resolving Discrepancies .....	7
3.04 Amending and Clarifying Contract Documents.....	7
ARTICLE 4 - BONDS AND INSURANCE.....	8
4.01 Bonds .....	8
4.02 Insurance.....	8
4.03 Licensed Sureties and Insurers.....	9
ARTICLE 5 - SELLER'S RESPONSIBILITIES .....	9
5.01 Supervision and Superintendence .....	9
5.02 Labor, Materials and Equipment.....	9
5.03 Laws and Regulations .....	10
5.04 Or Equals .....	10
5.05 Taxes .....	11
5.06 Shop Drawings and Samples.....	11
5.07 Continuing Performance .....	12
5.08 Seller's Warranties and Guarantees.....	13
5.09 Indemnification.....	14
5.10 Delegation of Professional Design Services .....	14
ARTICLE 6 - SHIPPING AND DELIVERY .....	15
6.01 Shipping.....	15
6.02 Delivery.....	15
6.03 Risk of Loss .....	16
6.04 Progress Schedule .....	16
ARTICLE 7 - CHANGES: SCHEDULE AND DELAY .....	16
7.01 Changes in the Goods and Special Services .....	16
7.02 Changing Contract Price or Contract Times .....	17

ARTICLE 8 - BUYER’S RIGHTS .....	17
8.01 Inspections and Testing .....	17
8.02 Non-Conforming Goods or Special Services .....	19
8.03 Correction Period .....	20
ARTICLE 9 - ROLE OF ENGINEER .....	20
9.01 Duties and Responsibilities .....	20
9.02 Clarifications and Interpretations .....	20
9.03 Authorized Variations .....	20
9.04 Rejecting Non-Conforming Goods and Special Services .....	21
9.05 Decisions on Requirements of Contract Documents .....	21
9.06 Claims and Disputes .....	21
ARTICLE 10 - PAYMENT .....	22
10.01 Applications for Progress Payments .....	22
10.02 Review of Applications for Progress Payments .....	22
10.03 Amount and Timing of Progress Payments .....	23
10.04 Suspension of or Reduction in Payment .....	23
10.05 Final Application for Payment .....	24
10.06 Final Payment .....	24
10.07 Waiver of Claims .....	24
ARTICLE 11 - CANCELLATION, SUSPENSION, AND TERMINATION .....	25
11.01 Cancellation .....	25
11.02 Suspension of Performance by Buyer .....	25
11.03 Suspension of Performance by Seller .....	25
11.04 Breach and Termination .....	25
ARTICLE 12 - LICENSES AND FEES .....	26
12.01 Intellectual Property and License Fees .....	26
12.02 Seller’s Infringement .....	27
12.03 Buyer’s Infringement .....	27
12.04 Reuse of Documents .....	28
12.05 Electronic Data .....	28
ARTICLE 13 - DISPUTE RESOLUTION .....	29
13.01 Dispute Resolution Method .....	29
ARTICLE 14 - MISCELLANEOUS .....	29
14.01 Giving Notice .....	29
14.02 Controlling Law .....	29
14.03 Computation of Time .....	30
14.04 Cumulative Remedies .....	30
14.05 Survival of Obligations .....	30
14.06 Entire Agreement .....	30

# STANDARD GENERAL CONDITIONS FOR PROCUREMENT CONTRACTS

## ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

### 1.01 *Defined Terms*

- A. Whenever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to the singular or plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda* - Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
  2. *Agreement* - The written instrument signed by both Buyer and Seller covering the Goods and Special Services and which lists the Contract Documents in existence on the Effective Date of the Agreement.
  2. *Application for Payment* - The form acceptable to Buyer which is used by Seller in requesting progress and final payments and which is accompanied by such supporting documentation as is required by the Contract Documents.
  4. *Bid* - The offer or proposal of a Seller submitted on the prescribed form setting forth the prices for the Goods and Special Services to be provided.
  5. *Bidder* - The individual or entity that submits a Bid directly to Buyer.
  6. *Bidding Documents* - The Bidding Requirements and the proposed Contract Documents (including all Addenda).
  7. *Bidding Requirements* - The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and Bid Form with any supplements.
  8. *Buyer* - The individual or entity purchasing the Goods and Special Services.
  9. *Change Order* - A document which is signed by Seller and Buyer and authorizes an addition, deletion, or revision to the Contract Documents or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement. Change Orders may be the result of mutual agreement by Buyer and Seller, or of resolution of a Claim.

10. *Claim* - A demand or assertion by Buyer or Seller seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.
11. *Contract* - The entire and integrated written agreement between Buyer and Seller concerning the Goods and Special Services. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.
12. *Contract Documents* - Those items so designated in the Agreement. Shop Drawings and other Seller submittals are not Contract Documents, even if accepted, reviewed, or approved by Engineer or Buyer.
13. *Contract Price* - The moneys payable by Buyer to Seller for furnishing the Goods and Special Services in accordance with the Contract Documents as stated in the Agreement.
14. *Contract Times* - The times stated in the Agreement by which the Goods must be delivered and Special Services must be furnished.
15. *Drawings* - That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Goods and Special Services to be furnished by Seller. Shop Drawings and other Seller submittals are not Drawings as so defined.
16. *Effective Date of the Agreement* - The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
17. *Engineer* - The individual or entity designated as such in the Agreement.
18. *Field Order* - A written order issued by Engineer which requires minor changes in the Goods or Special Services but which does not involve a change in the Contract Price or Contract Times.
19. *General Requirements* - Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.
20. *Goods* - The tangible and movable personal property that is described in the Contract Documents, regardless of whether the property is to be later attached to realty.
21. *Goods and Special Services*—The full scope of materials, equipment, other items, and services to be furnished by Seller, including Goods, as defined herein, and Special Services, if any, as defined herein. This term refers to both the Goods and the Special Services, or to either the Goods or the Special Services, and to any portion of the Goods or the Special Services, as the context requires.

22. *Laws and Regulations; Laws or Regulations* - Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
23. *Milestone* - A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to the Contract Times.
24. *Notice of Award* - The written notice by Buyer to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Buyer will sign and deliver the Agreement.
25. *Notice to Proceed* - A written notice given by Buyer to Seller fixing the date on which the Contract Times commence to run and on which Seller shall start to perform under the Contract.
26. *Point of Destination* - The specific address of the location where delivery of the Goods shall be made, as stated in the Agreement.
27. *Project* - The total undertaking of which the Goods and Special Services may be the whole, or only a part.
28. *Project Manual* - The documentary information prepared for bidding and furnishing the Goods and Special Services. A listing of the contents of the Project Manual is contained in its table of contents.
29. *Samples* - Physical examples of materials, equipment, or workmanship that are representative of some portion of the Goods and Special Services and which establish the standards by which such portion of the Goods and Special Services will be judged.
30. *Seller* - The individual or entity furnishing the Goods and Special Services.
31. *Shop Drawings* - All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Seller and submitted by Seller to illustrate some portion of the Goods and Special Services.
32. *Special Services* - Services associated with the Goods to be furnished by Seller as required by the Contract Documents.
33. *Specifications* - That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the furnishing of the Goods and Special Services, and certain administrative requirements and procedural matters applicable thereto.
34. *Successful Bidder* - The Bidder submitting a responsive Bid, to whom Buyer makes an award.
35. *Supplementary Conditions* - That part of the Contract Documents which amends or supplements these General Conditions.



36. *Work Change Directive* - A written statement to Seller issued on or after the Effective Date of the Agreement and signed by Buyer ordering an addition, deletion, or other revision in the Contract Documents with respect to the Goods and Special Services. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

## 1.02 Terminology

- A. The words and terms discussed in Paragraphs 1.02.B and 1.02.C are not defined, but have the indicated meanings when used in the Bidding Requirements or Contract Documents.
- B. *Intent of Certain Terms or Adjectives:*
  1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Goods and Special Services. It is intended that such exercise of professional judgment, action, or determination will be commercially reasonable and will be solely to evaluate, in general, the Goods and Special Services for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to Engineer any duty or authority to supervise or direct the furnishing of Goods or Special Services or any duty or authority to undertake responsibility contrary to any other provision of the Contract Documents.
  2. The word “non-conforming” when modifying the words “Goods and Special Services,” “Goods,” or “Special Services,” refers to Goods and Special Services that fail to conform to the Contract Documents.
  3. The word “receipt” when referring to the Goods, shall mean the physical taking and possession by the Buyer under the conditions specified in Paragraph 8.01.B.3.
  4. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
  5. The word "furnish," when used in connection with the Goods and Special Services shall mean to supply and deliver said Goods to the Point of Destination (or some other specified location) and to perform said Special Services fully, all in accordance with the Contract Documents.
- C. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

## ARTICLE 2 - PRELIMINARY MATTERS

### 2.01 *Delivery of Bonds*

- A. When Seller delivers the executed counterparts of the Agreement to Buyer, Seller also shall deliver such bonds as Seller may be required to furnish.

### 2.02 *Evidence of Insurance*

- A. When Seller delivers the executed counterparts of the Agreement to Buyer, Seller shall deliver to Buyer, with copies to each additional insured identified by name in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Seller is required to purchase and maintain in accordance with Article 4.

### 2.03 *Copies of Documents*

- A. Buyer shall furnish Seller up to five printed or hard copies of the Contract Documents. Additional copies will be furnished upon request at the cost of reproduction.

### 2.04 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

### 2.05 *Designated Representatives*

- A. Buyer and Seller shall each designate its representative at the time the Agreement is signed. Each representative shall have full authority to act on behalf of and make binding decisions in any matter arising out of or relating to the Contract.

### 2.06 *Progress Schedule*

- A. Within 15 days after the Contract Times start to run, Seller shall submit to Buyer and Engineer an acceptable progress schedule of activities, including at a minimum, Shop Drawing and Sample submittals, tests, and deliveries as required by the Contract Documents. No progress payment will be made to Seller until an acceptable schedule is submitted to Buyer and Engineer.
- B. The progress schedule will be acceptable to Buyer and Engineer if it provides an orderly progression of the submittals, tests, and deliveries to completion within the specified Milestones and the Contract Times. Such acceptance will not impose on Buyer or Engineer responsibility for the progress schedule, for sequencing, scheduling, or progress of the work nor interfere with or relieve Seller from Seller's full responsibility therefor. Such acceptance shall not be deemed to acknowledge the reasonableness and attainability of the schedule.

## 2.07 *Preliminary Conference*

- A. Within 20 days after the Contract Times start to run, a conference attended by Seller, Buyer, Engineer and others as appropriate will be held to establish a working understanding among the parties as to the Goods and Special Services and to discuss the schedule referred to in Paragraph 2.06.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

## 2.08 *Safety*

- A. Buyer and Seller shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss. When Seller's personnel, or the personnel of any subcontractor to Seller, are present at the Point of Destination or any work area or site controlled by Buyer, the Seller shall be responsible for the compliance by such personnel with any applicable requirements of Buyer's safety programs that are made known to Seller.

## **ARTICLE 3 - CONTRACT DOCUMENTS: INTENT AND AMENDING**

### 3.01 *Intent*

- A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.
- B. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce or furnish the indicated Goods and Special Services will be provided, whether or not specifically called for, at no additional cost to Buyer.
- C. Clarifications and interpretations of, or notifications of minor variations and deviations in, the Contract Documents, will be issued by Engineer as provided in Article 9.

### 3.02 *Standards, Specifications, Codes, Laws and Regulations*

- A. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws and Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws and Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents
- B. No provision of any such standard, specification, manual or code, or any instruction of a supplier shall be effective to change the duties or responsibilities of Buyer or Engineer, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall any such provision or instruction be effective to assign to Buyer or Engineer, or any of their consultants, agents, or employees any duty or authority to supervise or direct the performance of Seller's obligations or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

### 3.03 *Reporting and Resolving Discrepancies*

#### A. *Reporting Discrepancies:*

1. *Seller's Review of Contract Documents Before the Performance of the Contract:* Before performance of the Contract, Seller shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Seller shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Seller discovers or has actual knowledge of and shall obtain a written interpretation or clarification from Engineer before proceeding with the furnishing of any Goods and Special Services affected thereby.
2. *Seller's Review of Contract Documents During the Performance of the Contract:* If, during the performance of the Contract, Seller discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Contract, any standard, specification, manual or code, or of any instruction of any Supplier, Seller shall promptly report it to Engineer in writing. Seller shall not proceed with the furnishing of the Goods and Special Services affected thereby until an amendment to or clarification of the Contract Documents has been issued.
3. Seller shall not be liable to Buyer or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Seller had actual knowledge thereof.

#### B. *Resolving Discrepancies:* Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

1. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or
2. the provisions of any Laws or Regulations applicable to the furnishing of the Goods and Special Services (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

### 3.04 *Amending and Clarifying Contract Documents*

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions to the Goods and Special Services or to modify contractual terms and conditions by a Change Order.
- B. Buyer may issue a Work Change Directive providing for additions, deletions, or revisions to the Goods and Special Services, in which case (1) the Contract Price shall be equitably adjusted to account for any reasonable and necessary credits to Buyer for any such deletion, or for costs (including reasonable overhead and profit) incurred by Seller to accommodate such an addition or revision and (2) the Contract Times shall be equitably adjusted to account for any impact on progress and completion of performance. Such adjustments subsequently shall be duly set forth in a Change Order.

- C. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Goods and Special Services may be authorized, by one or more of the following ways:
  - 1. A Field Order;
  - 2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 5.06.D.3); or
  - 3. Engineer's written interpretation or clarification.

## **ARTICLE 4 - BONDS AND INSURANCE**

### **4.01 Bonds**

- A. Seller shall furnish to Buyer performance and payment bonds, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Seller's obligations under the Contract Documents. These bonds shall remain in effect until 1) one year after the date when final payment becomes due or 2) completion of the correction period specified in Paragraph 8.03, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Seller shall also furnish such other bonds as are required by the Contract Documents.
- B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.
- C. If the surety on any bond furnished by Seller is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 4.01.B, Seller shall promptly notify Buyer and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 4.01.B and 4.02.

### **4.02 Insurance**

- A. Seller shall provide insurance of the types and coverages and in the amounts stipulated in the Supplementary Conditions.
- B. Failure of Buyer to demand certificates of insurance or other evidence of Seller's full compliance with these insurance requirements or failure of Buyer to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Seller's obligation to maintain such insurance.

- C. Upon assignment of this Contract, Seller shall comply with the written request of assignee to provide certificates of insurance to assignee.
- D. Buyer does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Seller.
- E. The insurance and insurance limits required herein shall not be deemed as a limitation on Seller's liability under the indemnities granted to Buyer in the Contract Documents.

#### 4.03 *Licensed Sureties and Insurers*

- A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Buyer or Seller shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

### **ARTICLE 5 - SELLER'S RESPONSIBILITIES**

#### 5.01 *Supervision and Superintendence*

- A. Seller shall supervise, inspect, and direct the furnishing of the Goods and Special Service competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform its obligations in accordance with the Contract Documents. Seller shall be solely responsible for the means, methods, techniques, sequences, and procedures necessary to perform its obligations in accordance with the Contract Documents. Seller shall not be responsible for the negligence of Buyer or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure that is shown or indicated in and expressly required by the Contract Documents.

#### 5.02 *Labor, Materials and Equipment*

- A. Seller shall provide competent, qualified and trained personnel in all aspects of its performance of the Contract.
- B. All Goods, and all equipment and material incorporated into the Goods, shall be as specified, and unless specified otherwise in the Contract Documents, shall be:
  - 1. new, and of good quality;
  - 2. protected, assembled, connected, cleaned, and conditioned in accordance with the original manufacturer's instructions; and
  - 3. shop assembled to the greatest extent practicable.

### 5.03 *Laws and Regulations*

- A. Seller shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of its obligations in accordance with the Contract Documents. Except where otherwise expressly required by such Laws and Regulations, neither Buyer nor Engineer shall be responsible for monitoring Seller's compliance with any Laws or Regulations.
- B. If Seller furnishes Goods and Special Services knowing or having reason to know that such furnishing is contrary to Laws or Regulations, Seller shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such performance. It shall not be Seller's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this provision shall not relieve Seller of Seller's obligations under Paragraph 3.03.
- C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance shall be the subject of an adjustment in Contract Price or Contract Times. If Buyer and Seller are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 9.06.

### 5.04 *Or Equals*

- A. Whenever the Goods, or an item of material or equipment to be incorporated into the Goods, are specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular supplier or manufacturer, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item is permitted, other items of material or equipment or material or equipment of other suppliers or manufacturers may be submitted to Buyer for Engineer's review.
  - 1. If in Engineer's sole discretion, such an item of material or equipment proposed by Seller is functionally equal to that named and sufficiently similar so that no change in related work will be required, it may be considered by Engineer as an "or-equal" item.
  - 2. For the purposes of this paragraph, a proposed item of material or equipment may be considered functionally equal to an item so named only if:
    - a. in the exercise of reasonable judgment, Engineer determines that: 1) it is at least equal in quality, durability, appearance, strength, and design characteristics; 2) it will reliably perform at least equally well the function imposed by the design concept of the completed Project as a functioning whole; 3) it has an acceptable record of performance and availability of responsive service; and
    - b. Seller certifies that if approved: 1) there will be no increase in any cost, including capital, installation or operating costs, to Buyer; and 2) the proposed item will conform substantially to the detailed requirements of the item named in the Contract Documents.

- C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraph 5.04.A. Engineer will be the sole judge of whether to accept or reject such a proposal or submittal. No "or-equal" will be ordered, manufactured or utilized until Engineer's review is complete, which will be evidenced by an approved Shop Drawing. Engineer will advise Buyer and Seller in writing of any negative determination. Notwithstanding Engineer's approval of an "or-equal" item, Seller shall remain obligated to comply with the requirements of the Contract Documents.
- C. *Special Guarantee:* Buyer may require Seller to furnish at Seller's expense a special performance guarantee or other surety with respect to any such proposed "or-equal."
- D. *Data:* Seller shall provide all data in support of any such proposed "or-equal" at Seller's expense.

5.05 *Taxes*

- A. Seller shall be responsible for all taxes and duties arising out of the sale of the Goods and the furnishing of Special Services. All taxes are included in the Contract Price, except as noted in the Supplementary Conditions.

5.06 *Shop Drawings and Samples*

- A. Seller shall submit Shop Drawings and Samples to Buyer for Engineer's review and approval in accordance with the schedule required in Paragraph 2.06.A. All submittals will be identified as required and furnished in the number of copies specified in the Contract Documents. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Seller proposes to provide.
- B. Where a Shop Drawing or Sample is required by the Contract Documents, any related work performed prior to Engineer's approval of the pertinent submittal will be at the sole expense and responsibility of Seller.
- C. *Submittal Procedures:*
  - 1. Before submitting each Shop Drawing or Sample, Seller shall have determined and verified:
    - a. all field measurements (if required), quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto; and
    - b. that all materials are suitable with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the furnishing of Goods and Special Services.



2. Seller shall also have reviewed and coordinated each Shop Drawing or Sample with the Contract Documents.
3. Each submittal shall bear a stamp or include a written certification from Seller that Seller has reviewed the subject submittal and confirmed that it is in compliance with the requirements of the Contract Documents. Both Buyer and Engineer shall be entitled to rely on such certification from Seller.
4. With each submittal, Seller shall give Buyer and Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both in a written communication separate from the submittal and by specific notation on each Shop Drawing or Sample.

D. *Engineer's Review:*

1. Engineer will provide timely review of Shop Drawings and Samples.
2. Engineer's review and approval will be only to determine if the Goods and Special Services covered by the submittals will, after installation or incorporation in the Project, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole.
3. Engineer's review and approval shall not relieve Seller from responsibility for any variation from the requirements of the Contract Documents unless Seller has complied with the requirements of Paragraph 5.06.C.4 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Seller from responsibility for complying with the requirements of Paragraph 5.06.C.1.

E. *Resubmittal Procedures:*

1. Seller shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Seller shall direct specific attention in writing to any revisions other than the corrections called for by Engineer on previous submittals.

5.07 *Continuing Performance*

- A. Seller shall adhere to the progress schedule established in accordance with Paragraph 2.06.A., and the Goods shall be delivered and the Special Services furnished within the Contract Times specified in the Agreement.
- B. Seller shall carry on furnishing of the Goods and Special Services and adhere to the progress schedule during all disputes or disagreements with Buyer. No furnishing of Goods and Special Services shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraphs 11.03 or 11.04, or as Buyer and Seller may otherwise agree in writing.

5.08 *Seller's Warranties and Guarantees*

- A. Seller warrants and guarantees to Buyer that the title to the Goods conveyed shall be proper, its transfer rightful, and free from any security interest, lien, or other encumbrance. Seller shall defend, indemnify, and hold Buyer harmless against any liens, claims, or demands contesting or affecting title of the Goods conveyed.
- B. Seller warrants and guarantees to Buyer that all Goods and Special Services will conform with the Contract Documents, and with the standards established by any Samples approved by Engineer. Engineer shall be entitled to rely on Seller's warranty and guarantee. If the Contract Documents do not otherwise specify the characteristics or the quality of the Goods, the Goods shall comply with the requirements of Paragraph 5.02.B.
- C. Seller's warranty and guarantee hereunder excludes defects or damage caused by:
  - 1. abuse, improper modification, improper maintenance, or improper operation by persons other than Seller; or
  - 2. corrosion or chemical attack, unless corrosive or chemically-damaging conditions were disclosed by Buyer in the Contract Documents and the Contract Documents required the Goods to withstand such conditions;
  - 3. use in a manner contrary to Seller's written instructions for installation, operation, and maintenance; or
  - 4. normal wear and tear under normal usage.
- D. Seller's obligation to furnish the Goods and Special Services in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Goods and Special Services that are non-conforming, or a release of Seller's obligation to furnish the Goods and Special Services in accordance with the Contract Documents:
  - 1. observations by Buyer or Engineer;
  - 2. recommendation by Engineer or payment by Buyer of any progress or final payment;
  - 3. use of the Goods by Buyer;
  - 4. any acceptance by Buyer (subject to the provisions of Paragraph 8.02.D.1) or any failure to do so;
  - 5. the issuance of a notice of acceptance by Buyer pursuant to the provisions of Article 8;
  - 6. any inspection, test or approval by others; or
  - 7. any correction of non-conforming Goods and Special Services by Buyer.

- E. Buyer shall promptly notify Seller of any breach of Seller's warranties or guarantees.
- F. Seller makes no implied warranties under this Contract.

#### 5.09 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, Seller shall indemnify and hold harmless Buyer and Engineer, and the officers, directors, members, partners, employees, agents, consultants, contractors, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of Seller's obligations under the Contract Documents, provided that any such claim, cost, loss, or damages attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Goods themselves), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Seller, or any individual or entity directly or indirectly employed by Seller or anyone for whose acts Seller may be liable.
- B. In any and all claims against Buyer or Engineer or any of their respective assignees, consultants, agents, officers, directors, members, partners, employees, agents, consultants, contractors, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Seller, any subcontractor, any supplier, or any individual or entity directly or indirectly employed by any of them to furnish any of the Goods and Special Services, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 5.09.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for seller or any such subcontractor, supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Seller under Paragraph 5.09.A shall not extend to the liability of Engineer and Engineer's officers, directors, partners, employees, agents, and consultants arising out of:
  - 1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
  - 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

#### 5.10 *Delegation of Professional Design Services*

- A. Seller will not be required to provide professional design services unless such services are specifically required by the Contract Documents or unless such services are required to carry out Seller's responsibilities for furnishing the Goods and Special Services. Seller shall not be required to provide professional services in violation of applicable law.
- B. If professional design services or certifications by a design professional related to the Goods and Special Services are specifically required of Seller by the Contract Documents, Buyer and Engineer will specify all performance and design criteria that such services must satisfy. Seller

shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Goods and Special Services designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

- C. Buyer and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Buyer and Engineer have specified to Seller all performance and design criteria that such services must satisfy.
- D. Pursuant to this Paragraph 5.10, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 5.06.D.2.
- E. Seller shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

## **ARTICLE 6 - SHIPPING AND DELIVERY**

### *6.01 Shipping*

- A. Seller shall select the carrier and bear all costs of packaging, transportation, insurance, special handling and any other costs associated with shipment and delivery.

### *6.02 Delivery*

- A. Seller shall deliver the Goods F.O.B. the Point of Destination in accordance with the Contract Times set forth in the Agreement, or other date agreed to by Buyer and Seller.
- B. Seller shall provide written notice to Buyer at least 10 days before shipment of the manner of shipment and the anticipated delivery date. The notice shall also include any instructions concerning special equipment or services required at the Point of Destination to unload and care for the Goods. Seller shall also require the carrier to give Buyer at least 24 hours notice by telephone prior to the anticipated time of delivery.
- C. Buyer will be responsible and bear all costs for unloading the Goods from carrier.
- D. Buyer will assure that adequate facilities are available to receive delivery of the Goods during the Contract Times for delivery set forth in the Agreement, or another date agreed by Buyer and Seller.
- E. No partial deliveries shall be allowed, unless permitted or required by the Contract Documents or agreed to in writing by Buyer.

### 6.03 *Risk of Loss*

- A. Risk of loss and insurable interests transfer from Seller to Buyer upon Buyer's receipt of the Goods.
- B. Notwithstanding the provisions of Paragraph 6.03.A, if Buyer rejects the Goods as non-conforming, the risk of loss on such Goods shall remain with Seller until Seller corrects the non-conformity or Buyer accepts the Goods. If rejected Goods remain at the Point of Destination pending modification and acceptance, then Seller shall be responsible for arranging adequate protection and maintenance of the Goods at Seller's expense.

### 6.04 *Progress Schedule*

- A. Seller shall adhere to the progress schedule established in accordance with Paragraph 2.06 as it may be adjusted from time to time as provided below.
  - 1. Seller shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.06) proposed adjustments in the progress schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
  - 2. Proposed adjustments in the progress schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 7. Adjustments in Contract Times may only be made by a Change Order.

## **ARTICLE 7 - CHANGES: SCHEDULE AND DELAY**

### 7.01 *Changes in the Goods and Special Services*

- A. Buyer may at any time, without notice to any surety, make an addition, deletion, or other revision to the Contract Documents with respect to the Goods and Services, within the general scope of the Contract, by a Change Order or Work Change Directive. Upon receipt of any such document, Seller shall promptly proceed with performance pursuant to the revised Contract Documents (except as otherwise specifically provided).
- B. If Seller concludes that a Work Change Directive issued by Buyer affects the Contract Price or Contract Times, then Seller shall notify Buyer within 15 days after Seller has received the Work Change Directive, and submit written supporting data to Buyer within 45 days after such receipt. If Seller fails to notify Buyer within 15 days, Seller waives any Claim for such adjustment. If Buyer and Seller are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 9.06.
- C. Seller shall not suspend performance while Buyer and Seller are in the process of making such changes and any related adjustments to Contract Price or Contract Times.

## 7.02 *Changing Contract Price or Contract Times*

- A. The Contract Price or Contract Times may only be changed by a Change Order.
- B. Any Claim for an adjustment in the Contract Price or Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 9.06.
- C. If Seller is prevented from delivering the Goods or performing the Special Services within the Contract Times for any unforeseen reason beyond its control and not attributable to its actions or inactions, then Seller shall be entitled to an adjustment of the Contract Times to the extent attributable to such reason. Such reasons include but are not limited to acts or neglect by Buyer, inspection delays, fires, floods, epidemics, abnormal weather conditions, acts of God, and other like matters. If such an event occurs and delays Seller's performance, Seller shall notify Buyer in writing within 15 days of knowing or having reason to know of the beginning of the event causing the delay, stating the reason therefor.
- D. Seller shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Seller. Delays attributable to and within the control of Seller's subcontractors or suppliers shall be deemed to be delays within the control of Seller.
- E. If Seller is prevented from delivering the Goods or furnishing the Special Services within the Contract Times due to the actions or inactions of Buyer, Seller shall be entitled to any reasonable and necessary additional costs arising out of such delay to the extent directly attributable to Buyer.
- F. Neither Buyer nor Seller shall be entitled to any damages arising from delays which are beyond the control of both Buyer and Seller, including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God, and other like matters.

## **ARTICLE 8 - BUYER'S RIGHTS**

### 8.01 *Inspections and Testing*

- A. *General:*
  - 1. The Contract Documents specify required inspections and tests. Buyer shall have the right to perform, or cause to be performed, reasonable inspections and require reasonable tests of the Goods at Seller's facility, and at the Point of Destination. Seller shall allow Buyer a reasonable time to perform such inspections or tests.
  - 2. Seller shall reimburse Buyer for all expenses, except for travel, lodging, and subsistence expenses of Buyer's and Engineer's representatives, for inspections and tests specified in the Contract Documents. If as the result of any such specified testing the Goods are determined to be non-conforming, then Seller shall also bear the travel, lodging, and subsistence expenses of Buyer's and Engineer's representatives, and all expenses of re-inspection or retesting.

3. Buyer shall bear all expenses of inspections and tests that are not specified in the Contract Documents (other than any re-inspection or retesting resulting from a determination of non-conformity, as set forth in Paragraph 8.01.A.2 immediately above); provided, however, that if as the result of any such non-specified inspections or testing the Goods are determined to be non-conforming, then Seller shall bear all expenses of such inspections and testing, and of any necessary re-inspection and retesting.
4. Seller shall provide Buyer timely written notice of the readiness of the Goods for all inspections, tests, or approvals which the Contract Documents specify are to be observed by Buyer prior to shipment.
5. Buyer will give Seller timely notice of all specified tests, inspections, and approvals of the Goods which are to be conducted at the Point of Destination.
6. If, on the basis of any inspections or testing, the Goods appear to be conforming, Buyer will give Seller prompt notice thereof. If on the basis of said inspections or testing, the Goods appear to be non-conforming, Buyer will give Seller prompt notice thereof and will advise Seller of the remedy Buyer elects under the provisions of Paragraph 8.02.
7. Neither payments made by Buyer to Seller prior to any tests or inspections, nor any tests or inspections shall constitute acceptance of non-conforming Goods, or prejudice Buyer's rights under the Contract.

B. Inspection on Delivery:

1. Buyer or Engineer will visually inspect the Goods upon delivery solely for purposes of identifying the Goods and general verification of quantities and observation of apparent condition in order to provide a basis for a progress payment. Such visual inspection will not be construed as final or as receipt of any Goods and Special Services that, as a result of subsequent inspections and tests, are determined to be non-conforming.
2. Within ten days of such visual inspection, Buyer shall provide Seller with written notice of Buyer's determination regarding conformity of the Goods. In the event Buyer does not provide such notice, it will be presumed that the Goods appear to be conforming and that Buyer has acknowledged their receipt upon delivery.
3. If, on the basis of the visual inspection specified in Paragraph 8.01.B.1, the Goods appear to be conforming, Buyer's notice thereof to Seller will acknowledge receipt of the Goods.

C. Final Inspection:

1. After all of the Goods have been incorporated into the Project, tested in accordance with such testing requirements as are specified, and are functioning as indicated, Buyer or Engineer will make a final inspection.
2. If, on the basis of the final inspection, the Goods are conforming, Buyer's notice thereof will constitute Buyer's acceptance of the Goods.

3. If, on the basis of the final inspection, the Goods are non-conforming, Buyer will identify the non-conformity in writing.

#### 8.02 *Non-Conforming Goods and Special Services*

- A. If, on the basis of inspections and testing prior to delivery, the Goods and Special Services are found to be non-conforming, or if at any time after Buyer has acknowledged receipt of delivery and before the expiration of the correction period described in Paragraph 8.03, Buyer determines that the Goods and Special Services are non-conforming, then Seller shall promptly, without cost to Buyer and in response to written instructions from Buyer, either correct such non-conforming Goods and Special Services, or, if Goods are rejected by Buyer, remove and replace the non-conforming Goods with conforming Goods, including all work required for reinstallation.
- B. **Buyer's Rejection of Non-Conforming Goods:**
  1. If Buyer elects to reject the Goods in whole or in part, Buyer's notice to Seller will describe in sufficient detail the non-conforming aspect of the Goods. If Goods have been delivered to Buyer, Seller shall promptly, and within the Contract Times, remove and replace the rejected Goods.
  2. Seller shall bear all costs, losses and damages attributable to the removal and replacement of the non-conforming Goods as provided in Paragraph 8.02.E.
  3. Upon rejection of the Goods, Buyer retains a security interest in the Goods to the extent of any payments made and expenses incurred in their testing and inspection.
- C. **Remedying Non-Conforming Goods and Special Services:**
  1. If Buyer elects to permit the Seller to modify the Goods to correct the non-conformance, then Seller shall promptly provide a schedule for such modifications and shall make the Goods conforming within a reasonable time.
  2. If Buyer notifies Seller in writing that any of the Special Services are non-conforming, Seller shall promptly provide conforming services acceptable to Buyer. If Seller fails to do so, Buyer may delete the Special Services and reduce the Contract Price a commensurate amount.
- D. *Buyer's Acceptance of Non-Conforming Goods:* Instead of requiring correction or removal and replacement of non-conforming Goods discovered either before or after final payment, Buyer may accept the non-conforming Goods. Seller shall bear all reasonable costs, losses, and damages attributable to Buyer's evaluation of and determination to accept such non-conforming Goods as provided in Paragraph 8.02.E.
- E. Seller shall pay all claims, costs, losses, and damages, including but not limited to all fees and charges for re-inspection, retesting and for any engineers, architects, attorneys and other professionals, and all court or arbitration or other dispute resolution costs arising out of or relating to the non-conforming Goods and Special Services. Seller's obligations shall include the costs of the correction or removal and replacement of the non-conforming Goods and the replacement of



property of Buyer and others destroyed by the correction or removal and replacement of the non-conforming Goods, and obtaining conforming Special Services from others.

- F. *Buyer's Rejection of Conforming Goods*: If Buyer asserts that Goods and Special Services are non-conforming and such Goods and Special Services are determined to be conforming, or if Buyer rejects as non-conforming Goods and Special Services that are later determined to be conforming, then Seller shall be entitled to reimbursement from Buyer of costs incurred by Seller in inspecting, testing, correcting, removing, or replacing the conforming Goods and Special Services, including but not limited to fees and charges of engineers, architects, attorneys and other professionals, and all court or arbitration or other dispute resolution costs associated with the incorrect assertion of non-conformance or rejection of conforming Goods and Special Services.

#### 8.03 *Correction Period*

- A. Seller's responsibility for correcting all non-conformities in the Goods and Special Services will extend for a period of one year after the earlier of the date on which Buyer has placed the Goods in continuous service or the date of final payment, or for such longer period of time as may be prescribed by Laws or Regulations or by the terms of any specific provisions of the Contract Documents.

### **ARTICLE 9 - ROLE OF ENGINEER**

#### 9.01 *Duties and Responsibilities*

- A. The duties and responsibilities and the limitations of authority of Engineer are set forth in the Contract Documents.

#### 9.02 *Clarifications and Interpretations*

- A. Engineer will issue with reasonable promptness such written clarifications or interpretations of the Contract Documents as Engineer may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents. Such written clarifications and interpretations will be binding on Buyer and Seller. If either Buyer or Seller believes that a written clarification or interpretation justifies an adjustment in the Contract Price or Contract Times, either may make a Claim therefor.

#### 9.03 *Authorized Variations*

- A. Engineer may authorize minor deviations or variations in the Contract Documents by: 1) written approval of specific variations set forth in Shop Drawings when Seller has duly noted such variations as required in Paragraph 5.06.C.4, or 2) a Field Order.

#### 9.04 *Rejecting Non-Conforming Goods and Special Services*

- A. Engineer will have the authority to disapprove or reject Goods and Special Services that Engineer believes to be non-conforming. Engineer will also have authority to require special inspection or testing of the Goods or Special Services as provided in Paragraph 8.01 whether or not the Goods are fabricated or installed, or the Special Services are completed.

#### 9.05 *Decisions on Requirements of Contract Documents*

- A. Engineer will be the initial interpreter of the Contract Documents and judge of the acceptability of the Goods and Special Services. Claims, disputes and other matters relating to the acceptability of the Goods and Special Services or the interpretation of the requirements of the Contract Documents pertaining to Seller's performance will be referred initially to Engineer in writing with a request for a formal decision in accordance with this paragraph.
- B. When functioning as interpreter and judge under this Paragraph 9.05, Engineer will not show partiality to Buyer or Seller and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity. The rendering of a decision by Engineer pursuant to this Paragraph 9.05 with respect to any such Claim, dispute, or other matter (except any which have been waived by the making or acceptance of final payment as provided in Paragraph 10.07) will be a condition precedent to any exercise by Buyer or Seller of such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any such Claim, dispute, or other matter.

#### 9.06 *Claims and Disputes*

- A. *Notice:* Written notice of each Claim relating to the acceptability of the Goods and Special Services or the interpretation of the requirements of the Contract Documents pertaining to either party's performance shall be delivered by the claimant to Engineer and the other party to the Agreement within 15 days after the occurrence of the event giving rise thereto, and written supporting data shall be submitted to Engineer and the other party within 45 days after such occurrence unless Engineer allows an additional period of time to ascertain more accurate data.
- B. *Engineer's Decision:* Engineer will review each such Claim and render a decision in writing within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any.
- C. If Engineer does not render a formal written decision on a Claim within the time stated in Paragraph 9.06.B., Engineer shall be deemed to have issued a decision denying the Claim in its entirety 31 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any.
- D. Engineer's written decision on such Claim or a decision denying the Claim in its entirety that is deemed to have been issued pursuant to Paragraph 9.06.C, will be final and binding upon Buyer and Seller 30 days after it is issued unless within 30 days of issuance Buyer or Seller appeals Engineer's decision by initiating the mediation of such Claim in accordance with the dispute resolution procedures set forth in Article 13.

- E. If Article 13 has been amended to delete the mediation requirement, then Buyer or Seller may appeal Engineer's decision within 30 days of issuance by following the alternative dispute resolution process set forth in Article 13, as amended; or if no such alternative dispute resolution process has been set forth, Buyer or Seller may appeal Engineer's decision by 1) delivering to the other party within 30 days of the date of such decision a written notice of intent to submit the Claim to a court of competent jurisdiction, and 2) within 60 days after the date of such decision instituting a formal proceeding in a court of competent jurisdiction.
- F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 9.06.
- G. The parties agree to endeavor to avoid or resolve Claims through direct, good faith discussions and negotiations whenever practicable. Such discussions and negotiations should at the outset address whether the parties mutually agree to suspend the time periods established in this Paragraph 9.06; if so, a written record of such mutual agreement should be made and jointly executed.

## **ARTICLE 10 - PAYMENT**

### *10.01 Applications for Progress Payments*

- A. Seller shall submit to Buyer for Engineer's review Applications for Payment filled out and signed by Seller and accompanied by such supporting documentation as is required by the Contract Documents and also as Buyer or Engineer may reasonably require. The timing and amounts of progress payments shall be as stipulated in the Agreement.
  - 1. The first application for Payment will be submitted after review and approval by Engineer of all Shop Drawings and of all Samples required by the Contract Documents.
  - 2. The second Application for Payment will be submitted after receipt of the Goods has been acknowledged in accordance with Paragraph 8.01.B and will be accompanied by a bill of sale, invoice, or other documentation reasonably satisfactory to Buyer warranting that Buyer has rightfully received good title to the Goods from Seller and that, upon payment, the Goods will be free and clear of all liens. Such documentation will include releases and waivers from all parties with viable lien rights. In the case of multiple deliveries of Goods, additional Applications for Payment accompanied by the required documentation will be submitted as Buyer acknowledges receipt of additional items of the Goods.

### *10.02 Review of Applications for Progress Payments*

- A. Engineer will, within ten days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Buyer, or return the Application to Seller indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Seller may make the necessary corrections and resubmit the Application.
  - 1. Engineer's recommendation of payment requested in the first Application for Payment will constitute a representation by Engineer, based on Engineer's review of the Application for

Payment and the accompanying data, that the Shop Drawings and Samples have been reviewed and approved as required by the Contract Documents and Seller is entitled to payment of the amount recommended.

2. Engineer's recommendation of payment requested in the Application for Payment submitted upon Buyer's acknowledgment of receipt of the Goods will constitute a representation by Engineer, based on Engineer's review of the Application for Payment and the accompanying data Seller is entitled to payment of the amount recommended. Such recommendation will not constitute a representation that Engineer has made a final inspection of the Goods, that the Goods are free from non-conformities, acceptable or in conformance with the Contract Documents, that Engineer has made any investigation as to Buyer's title to the Goods, that exhaustive or continuous inspections have been made to check the quality or the quantity of the Goods beyond the responsibilities specifically assigned to Engineer in the Contract Documents or that there may not be other matters or issues between the parties that might entitle Seller to additional payments by Buyer or Buyer to withhold payment to Seller.
3. Engineer may refuse to recommend that all or any part of a progress payment be made, or Engineer may nullify all or any part of any payment previously recommended if, in Engineer's opinion, such recommendation would be incorrect or if on the basis of subsequently discovered evidence or subsequent inspections or tests Engineer considers such refusal or nullification necessary to protect Buyer from loss because the Contract Price has been reduced, Goods are found to be non-conforming, or Seller has failed to furnish acceptable Special Services.

#### 10.03 *Amount and Timing of Progress Payments*

- A. Subject to Paragraph 10.02.A., the amounts of the progress payments will be as provided in the Agreement. Buyer shall within 30 days after receipt of each Application for Payment with Engineer's recommendation pay Seller the amount recommended; but, in the case of the Application for Payment upon Buyer's acknowledgment of receipt of the Goods, said 30-day period may be extended for so long as is necessary (but in no event more than 60 days) for Buyer to examine the bill of sale and other documentation submitted therewith. Buyer shall notify Seller promptly of any deficiency in the documentation and shall not unreasonably withhold payment.

#### 10.04 *Suspension of or Reduction in Payment*

- A. Buyer may suspend or reduce the amount of progress payments, even though recommended for payment by Engineer, under the following circumstances:
  1. Buyer has reasonable grounds to conclude that Seller will not furnish the Goods or the Special Services in accordance with the Contract Documents, and
  2. Buyer has requested in writing assurances from Seller that the Goods and Special Services will be delivered or furnished in accordance with the Contract Documents, and Seller has failed to provide adequate assurances within ten days of Buyer's written request.
- B. If Buyer refuses to make payment of the full amount recommended by Engineer, Buyer will provide Seller and Engineer immediate written notice stating the reason for such action and

promptly pay Seller any amount remaining after deduction of the amount withheld. Buyer shall promptly pay Seller the amount withheld when Seller corrects the reason for such action to Buyer's satisfaction.

#### 10.05 *Final Application for Payment*

- A. After Seller has corrected all non-conformities to the reasonable satisfaction of Buyer and Engineer, furnished all Special Services, and delivered all documents required by the Contract Documents, Engineer will issue to Buyer and Seller a notice of acceptance. Seller may then make application for final payment following the procedure for progress payments. The final Application for Payment will be accompanied by all documentation called for in the Contract Documents, a list of all unsettled Claims, and such other data and information as Buyer or Engineer may reasonably require.

#### 10.06 *Final Payment*

- A. If, on the basis of final inspection and the review of the final Application for Payment and accompanying documentation, Engineer is reasonably satisfied that Seller has furnished the Goods and Special Services in accordance with the Contract Documents, and that Seller's has fulfilled all other obligations under the Contract Documents, then Engineer will, within ten days after receipt of the final Application for Payment, recommend in writing final payment subject to the provisions of Paragraph 10.07 and present the Application to Buyer. Otherwise, Engineer will return the Application to Seller, indicating the reasons for refusing to recommend final payment, in which case Seller shall make the necessary corrections and resubmit the Application for payment. If the Application and accompanying documentation are appropriate as to form and substance, Buyer shall, within 30 days after receipt thereof, pay Seller the amount recommended by Engineer, less any sum Buyer is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages to which Buyer is entitled.

#### 10.07 *Waiver of Claims*

- A. The making and acceptance of final payment will constitute:
  - 1. a waiver of all Claims by Buyer against Seller, except Claims arising from unsettled liens from non-conformities in the Goods or Special Services appearing after final payment, from Seller's failure to comply with the Contract Documents or the terms  
  
of any special guarantees specified therein, or from Seller's continuing obligations under the Contract Documents; and
  - 2. a waiver of all Claims by Seller against Buyer (other than those previously made in accordance with the requirements herein and listed by Seller as unsettled as required in Paragraph 10.05.A, and not resolved in writing).

## ARTICLE 11 - CANCELLATION, SUSPENSION, AND TERMINATION

### 11.01 *Cancellation*

- A. Buyer has the right to cancel the Contract, without cause, at any time prior to delivery of the Goods by written notice. Cancellation pursuant to the terms of this paragraph shall not constitute a breach of contract by Buyer. Upon cancellation:
  - 1. Buyer shall pay Seller for the direct costs incurred in producing any Goods that Seller has specially manufactured for the Project, plus a fair and reasonable amount for overhead and profit.
  - 2. For Goods that are not specially manufactured for the Project, Seller shall be entitled to a restocking charge of 10 percent of the unpaid Contract Price of such Goods.

### 11.02 *Suspension of Performance by Buyer*

- A. Buyer has the right to suspend performance of the Contract for up to a maximum of ninety days, without cause, by written notice. Upon suspension under this paragraph, Seller shall be entitled to an increase in the Contract Times and Contract Price caused by the suspension, provided that performance would not have been suspended or delayed for causes attributable to Seller.

### 11.03 *Suspension of Performance by Seller*

- A. Subject to the provisions of Paragraph 5.07.B, Seller may suspend the furnishing of the Goods and Special Services only under the following circumstance:
  - 1. Seller has reasonable grounds to conclude that Buyer will not perform its future payment obligations under the Contract; and,
  - 2. Seller has requested in writing assurances from Buyer that future payments will be made in accordance with the Contract, and Buyer has failed to provide such assurances within ten days of Seller's written request.

### 11.04 *Breach and Termination*

- A. *Buyer's Breach:*
  - 1. Buyer shall be deemed in breach of the Contract if it fails to comply with any material provision of the Contract Documents, including but not limited to:
    - a. wrongful rejection or revocation of Buyer's acceptance of the Goods,
    - b. failure to make payments in accordance with the Contract Documents, or
    - c. wrongful repudiation of the Contract.

2. Seller shall have the right to terminate the Contract for cause by declaring a breach should Buyer fail to comply with any material provisions of the Contract. Upon termination, Seller shall be entitled to all remedies provided by Laws and Regulations.
  - a. In the event Seller believes Buyer is in breach of its obligations under the Contract, Seller shall provide Buyer with reasonably prompt written notice setting forth in sufficient detail the reasons for declaring that it believes a breach has occurred. Buyer shall have seven days from receipt of the written notice declaring the breach (or such longer period of time as Seller may grant in writing) within which to cure or to proceed diligently to cure such alleged breach.

**B. *Seller's Breach:***

1. Seller shall be deemed in breach of the Contract if it fails to comply with any material provision of the Contract Documents, including, but not limited to:
  - a. failure to deliver the Goods or perform the Special Services in accordance with the Contract Documents,
  - b. wrongful repudiation of the Contract, or
  - c. delivery or furnishing of non-conforming Goods and Special Services.
2. Buyer may terminate Seller's right to perform the Contract for cause by declaring a breach should Seller fail to comply with any material provision of the Contract Documents. Upon termination, Buyer shall be entitled to all remedies provided by Laws and Regulations.
  - a. In the event Buyer believes Seller is in breach of its obligations under the Contract, and except as provided in Paragraph 11.04.B.2.b, Buyer shall provide Seller with reasonably prompt written notice setting forth in sufficient detail the reasons for declaring that it believes a breach has occurred. Seller shall have seven days from receipt of the written notice declaring the breach (or such longer period of time as Buyer may grant in writing) within which to cure or to proceed diligently to cure such alleged breach.
  - b. If and to the extent that Seller has provided a performance bond under the provisions of Paragraph 4.01, the notice and cure procedures of that bond, if any, shall supersede the notice and cure procedures of Paragraph 11.04.B.2.a.

## **ARTICLE 12 - LICENSES AND FEES**

### **12.01 *Intellectual Property and License Fees***

- A. Unless specifically stated elsewhere in the Contract Documents, Seller is not transferring any intellectual property rights, patent rights, or licenses for the Goods delivered. However, in the event the Seller is manufacturing to Buyer's design, Buyer retains all intellectual property rights in such design.

- B. Seller shall pay all license fees and royalties and assume all costs incident to the use or the furnishing of the Goods, unless specified otherwise by the Contract Documents.

#### 12.02 *Seller's Infringement*

- A. Subject to Paragraph 12.01.A, Seller shall indemnify and hold harmless Buyer, Engineer and their officers, directors, members, partners, employees, agents, consultants, contractors, and subcontractors from and against all claims, costs, losses, damages, and judgments (including but not limited to all reasonable fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement or alleged infringement of any United States or foreign patent or copyright by any of the Goods as delivered hereunder.
- B. In the event of suit or threat of suit for intellectual property infringement, Buyer will promptly notify Seller of receiving notice thereof.
- C. Seller shall promptly defend the claim or suit, including negotiating a settlement. Seller shall have control over such claim or suit, provided that Seller agrees to bear all expenses and to satisfy any adverse judgment thereof.
  - 1. If Seller fails to defend such suit or claim after written notice by Buyer, Seller will be bound in any subsequent suit or claim against Seller by Buyer by any factual determination in the prior suit or claim.
  - 2. If Buyer fails to provide Seller the opportunity to defend such suit or claim after written notice by Seller, Buyer shall be barred from any remedy against Seller for such suit or claim.
- D. If a determination is made that Seller has infringed upon intellectual property rights of another, Seller may obtain the necessary licenses for Buyer's benefit, or replace the Goods and provide related design and construction as necessary to avoid the infringement at Seller's own expense.

#### 12.03 *Buyer's Infringement*

- A. Buyer shall indemnify and hold harmless Seller, and its officers, directors, partners, employees, agents, consultants, contractors, and subcontractors from and against all claims, costs, losses, damages, and judgments (including but not limited to all reasonable fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement or alleged infringement of any United States or foreign patent or copyright caused by Seller's compliance with Buyer's design of the Goods or Buyer's use of the Goods in combination with other materials or equipment in any process (unless intent of such use was known to Seller and Seller had reason to know such infringement would result).
- B. In the event of suit or threat of suit for intellectual property infringement, Seller must after receiving notice thereof promptly notify Buyer.



- C. Upon written notice from Seller, Buyer shall be given the opportunity to defend the claim or suit, including negotiating a settlement. Buyer shall have control over such claim or suit, provided that Buyer agrees to bear all expenses and to satisfy any adverse judgment thereof.
  - 1. If Buyer fails to defend such suit or claim after written notice by Seller, Buyer will be bound in any subsequent suit or claim against Buyer by Seller by any factual determination in the prior suit or claim.
  - 2. If Seller fails to provide Buyer the opportunity to defend such suit or claim after written notice by Buyer, Seller shall be barred from any remedy against Buyer for such suit or claim.

#### 12.04 *Reuse of Documents*

- A. Neither Seller nor any other person furnishing any of the Goods and Special Services under a direct or indirect contract with Seller shall: (1) acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media versions; or (2) reuse any of such Drawings, Specifications, other documents, or copies thereof on any other project without written consent of Buyer and Engineer and specific written verification or adaptation by Engineer. This prohibition will survive termination or completion of the Contract. Nothing herein shall preclude Seller from retaining copies of the Contract Documents for record purposes.

#### 12.05 *Electronic Data*

- A. Unless otherwise stated in the Supplementary Conditions, copies of data furnished by Buyer or Engineer to Seller, or by Seller to Buyer or Engineer that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
- B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. The transferring party will correct any errors detected within the 60-day acceptance period.
- B. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

## ARTICLE 13 - DISPUTE RESOLUTION

### 13.01 *Dispute Resolution Method*

- A. Either Buyer or Seller may initiate the mediation of any Claim decided in writing by Engineer under Paragraph 9.06.B or 9.06.C before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the Engineer's decision from becoming final and binding.
- B. Buyer and Seller shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.
- C. If the mediation process does not result in resolution of the Claim, then Engineer's written decision under Paragraph 9.06.B or a denial pursuant to Paragraph 9.06.C shall become final and binding 30 days after termination of the mediation unless, within that time period, Buyer or Seller:
  - 1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions, or
  - 2. agrees with the other party to submit the Claim to another dispute resolution process, or
  - 3. if no dispute resolution process has been provided for in the Supplementary Conditions, delivers to the other party written notice of the intent to submit the Claim to a court of competent jurisdiction, and within 60 days of the termination of the mediation institutes such formal proceeding.

## ARTICLE 14 - MISCELLANEOUS

### 14.01 *Giving Notice*

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if: 1) delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or 2) if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

### 14.02 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Point of Destination is located.
- B. In the case of any conflict between the express terms of this Contract and the Uniform Commercial Code, as adopted in the state whose law governs, it is the intent of the parties that the express terms of this Contract shall apply.

#### 14.03 *Computation of Time*

- A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day shall be omitted from the computation.

#### 14.04 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents, and the provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

#### 14.05 *Survival of Obligations*

- A. All representations, indemnifications, warranties and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Goods and Special Services and termination or completion of the Agreement.

#### 14.06 *Entire Agreement*

- A. Buyer and Seller agree that this Agreement is the complete and final agreement between them, and supersedes all prior negotiations, representations, or agreements, either written or oral. This Agreement may not be altered, modified, or amended except in writing signed by an authorized representative of both parties.

SECTION P-00800

PROCUREMENT SUPPLEMENTAL GENERAL CONDITIONS

Article	Title	Page No.
1	Definitions and Terminology .....	00800-1
2	Preliminary Matters .....	00800-1
3	Contract Documents: Intent, Amending and Reuse .....	00800-3
4	Bonds and Insurance .....	00800-4
5	SELLER's Responsibilities.....	00800-8
6	Shipping and Delivery .....	00800-13
7	Changes: Schedule and Delay.....	00800-13
8	BUYER's Rights .....	00800-14
9	Role of Engineer .....	00800-14
10	Payment.....	00800-15
11	Cancellation, Suspension, and Termination .....	00800-15
12	Licenses and Fees .....	00800-15
13	Dispute Resolution.....	00800-16
14	Miscellaneous .....	00800-16

Additional Articles

15	Liquidated Damages.....	00800-16
16	Federal and State Government Provisions .....	00800-17

Exhibit No.      List of Exhibits

1	State Prevailing Wage Rate Determination Federal Wage Rates
2	List of Debarred Subcontractors and Contractors
3	Davis Bacon Act – Labor Standard Provisions for Federally Assisted USEPA Attachment 6-Requirements for Subrecipients that are Government Entities
4	Contract Modification Proposal and Acceptance (4 pages)
5	NJAC 7:22-9 and NJAC 7:22-10.11, 12 15 pages
6	SED Participation Building Phase Quarterly Report (Form OEO-002)
7	SED Participation Monthly Progress Report (Form OEO-003)
8	PVSC SED Utilization Plan
9	NJAC 7:14.2
10	NJSA 2A: 44-143, 144
11	Index of Drawings
12	USEPA Iron and Steel Provisions

SECTION P-00800

PROCUREMENT SUPPLEMENTAL GENERAL CONDITIONS

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SECTION P-00800

PROCUREMENT SUPPLEMENTAL GENERAL CONDITIONS

These Supplemental General Conditions amend or supplement the Standard General Conditions of the Construction Contract (No. P-00700, 2010 Edition) given as Specification Section 00700 and other provisions of the Contract Documents as indicated below. All provisions that are not so amended or supplemented remain in full force and effect.

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

Add the following Section at the beginning of this Article:

1.00 Terms

- A. The terms used in these Supplemental General Conditions which are defined in the Standard General Conditions of the Construction Contract (No. P-00700, 2010 Edition) given as Specification Section 00700 have the meanings assigned to them in the General Conditions.

1.01 Defined Terms

Definition 12. Delete in its entirety and replace with the following:

“Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Files in electronic media format of text, data, graphics, and the like are not Contract Documents, and may not be relied on by Seller. Shop Drawings and other Seller submittals are not Contract Documents, even if accepted or reviewed by Engineer or Buyer.”

Definition 16. Omit the word “two”.

Definition 17. Delete in its entirety and replace with the following:

“The individual or entity designated as such in the Agreement. The terms Engineer and ENGINEER are interchangeable and shall have the same meaning in the Contract Documents.”

Add the following new definitions:

“37. *Conditions of the Contract* - The combined General Conditions and Supplemental General Conditions.

38. assignee - The terms “assignee” and “Installation Contractor” are interchangeable and shall have the same meaning in the Contract Documents.

39. Contractor - The individual or entity with whom Buyer has entered into the Agreement. The terms Seller, Contractor, and CONTRACTOR are

interchangeable and shall have the same meaning in the Contract Documents.

40. Designated System Supplier (DSS) - The individual or entity with whom Buyer has entered into the Agreement. The terms Seller, Contractor, CONTRACTOR, and Designated System Supplier are interchangeable and shall have the same meaning in the Contract Documents.
41. Installation Contractor - The individual or entity with whom Buyer has entered into an agreement to install the Goods.
42. Owner - The individual or entity with whom Seller has entered into the Agreement and for whom the Goods and Special Services are to be performed. The terms Buyer, Owner and OWNER are interchangeable and shall have the same meaning in the Contract Documents.
43. Subcontractor - An individual or entity having a direct contract with Seller or with any other Subcontractor for the performance of a part of the Goods and Special Services.
44. Submittal - All drawings, diagrams, illustrations, schedule, and other data or information which are specifically prepared or assembled by or for Seller and submitted by Seller to illustrate some portion of the Goods and Special Services. The terms Shop Drawing and Submittal are interchangeable and shall have the same meaning in the Contract Documents.
45. Typ, (Typ), (TYP) - The term “Typ”, “(Typ)” or “(TYP)”, when used in the Contract Documents is the abbreviation of the word typical: used to label a feature that is to be interpreted as exactly the same as nearby comparable features
46. Unit Price Work - Work to be paid for on the basis of unit prices.
47. without exception - The term “without exception”, when used in the Contract Documents following the name of a proprietary item of equipment, product, or material, shall mean that the sources of the product are limited to the listed manufacturers or products and that no like, equivalent, or “or-equal” item and no substitution will be permitted.

## ARTICLE 2 – PRELIMINARY MATTERS

Add the following Section to the beginning of this Article:

### “2.00 *Execution of Agreement*

- A. At least six counterparts of the Agreement will be executed and delivered by the SELLER to the BUYER within ten (10) working days of the Notice of Award and receipt of Contract Documents by the SELLER for execution; and thereafter BUYER will execute and deliver one counterpart to SELLER.”

2.04 *Commencement of Contract Times; Notice to Proceed*

Delete in its entirety and substitute the following:

- “A. Except as otherwise provided in (ii) hereinafter, the Contract Time will commence to run on the day indicated in the Notice to Proceed; but in no event will the Contract Time commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement. By mutual consent of the parties to the Contract, these time limits may be changed.
- B. Notwithstanding the provisions of subsection (i) above, if award of the Bid is challenged, and the BUYER determines that a hearing is required on the challenge, or a Court or governmental entity having jurisdiction issues a stay of the award or performance of the Contract, the Contract Time and Effective Date of the Agreement shall be stayed for the time necessary for BUYER to conduct a hearing and make a determination on the challenge and/or the time that the Contract award or performance are stayed by a Court or governmental entity having jurisdiction, not to exceed an additional 180 days.”

2.07 *Preliminary Conference*

Delete in its entirety and substitute the following:

- “A. Within ten (10) days after the Contract Times start to run, but before any Work a conference shall be attended by, but without limitations to, the following: SELLER, BUYER, ENGINEER and other as appropriate will be held to establish a working understanding among the parties as to the Goods and Special Services and to discuss the schedule referred to in Paragraph 2.06.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.”

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING AND REUSE

3.01 *Intent*

Add the following subparts to Part A:

- “1. Each and every provision of law and clause required by law to be inserted in these Contract Documents shall be deemed to be inserted herein, and they shall be read and enforced as though it were included herein, and if through mistake or otherwise, any such provision is not inserted, or if not correctly inserted, then upon the application of either party, the Contract Documents shall forthwith be physically amended to make such insertion.
2. The Contract Documents indicate the extent and general arrangement of the work. It is the intent of the Contract Documents to obtain an operable Project. Equipment, components, systems, etc., therein shall be made operable by the SELLER.
3. The Contract Drawings may be supplemented from time to time with additional drawings by the ENGINEER as may be required to illustrate the work or, as the work progresses, with additional Drawings, by the SELLER, subject to the approval of the ENGINEER. Supplementary Drawings, when issued by the ENGINEER or by the SELLER, after



approval by the ENGINEER, shall be furnished in sufficient quantity to all those who, in the opinion of the ENGINEER, are affected by such Drawings.”

3.03 *Reporting and Resolving Discrepancies.*

Add the following to subpart A. 3 succeeding “thereof”

“or should have known.”

ARTICLE 4 – BONDS AND INSURANCE

4.01 *Performance, Payment, and Other Bonds*

Part A: Add the following after “payment bonds” in the first line:

“within ten (10) working days of Notice of Award”.

Delete the second sentence and replace with the following:

“The Performance Bond shall remain in effect until completion and acceptance by the BUYER as specified in paragraph 10.05”.

Delete Article 4.02 in its entirety and substitute the following:

4.02 *Certificates of Insurance*

- A. Seller shall deliver to Buyer, with copies to each additional insured identified in the Procurement Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Buyer or any other additional insured) which Seller is required to purchase and maintain.
- B. Failure of Buyer to demand such certificates or other evidence of Seller’s full compliance with these insurance requirements or failure of Buyer to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Seller’s obligation to maintain such insurance.
- C. Upon assignment of this Contract, Seller shall comply with the written request of assignee to provide certificates of insurance to assignee.
- D. Buyer does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Seller.
- E. The insurance and insurance limits required herein shall not be deemed as a limitation on Seller’s liability under the indemnities granted to Buyer in the Contract Documents
- F. Wherever in this Article the terms “The Insured” and BUYER occurs with respect to coverage in a policy, it shall mean the BUYER and its agent and agencies, all municipalities where work is being performed under the contract, the ENGINEER, and any other parties specifically designated below, who shall be named as insured in each policy issued. The insurance policies required herein shall not contain any Third Party Beneficiary Exclusion.

The State of New Jersey and its venues, employees and officers shall be named insured on each certificate of Insurance.”

Delete Article 4.03 in its entirety and substitute the following:

4.03 *License Sureties and Insurers*

- A. All Bonds and insurance required by the Contract Documents to be purchased and maintained by Seller shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue Bonds or insurance policies for the limits and coverage's so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Procurement Supplementary Conditions.

Add the following sections to this Article

4.04 *Seller's Liability Insurance*

- A. The policies of insurance so required by this Paragraph 4.04 to be purchased and maintained shall:
1. Include at least the specific coverage's and be written for not less than the limits of liability specified or required by Laws or Regulations, whichever is greater;
  2. Include contractual liability insurance covering Seller's indemnity obligations under Paragraph 5.09;
  3. Contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Buyer and Seller and to each other additional insured to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Seller pursuant to Paragraph 4.03 shall so provide);
  4. Remain in effect at least until final payment and at all times thereafter when Seller may be correcting, removing, or replacing non-conforming Goods and Special Services in accordance with Paragraph 8.02;
  5. Contain a cross liability or severability of interest clause or endorsement. Insurance covering the specified additional insureds shall be primary insurance, and all other insurance carried by the additional insured's shall be excess insurance; and
  6. With respect to workers' compensation and employers' liability, comprehensive automobile liability, commercial general liability, and umbrella liability insurance, and all other liability insurance specified herein to be provided by Seller, Seller shall require its insurance carriers to waive all rights of subrogation against Buyer, Engineer, and their respective officers, directors, partners, employees, and agents.
- B. Worker's Compensation and Employer's Liability Insurance. This insurance shall protect Seller against all claims under applicable state workers' compensation laws, including coverage as necessary for the benefits provided under the United States Longshoremen's and Harbor Workers' Act and the Jones Act. Seller shall also be protected against claims

for injury, disease, or death of employees which, for any reason, may not fall within the provisions of a workers' compensation law. This policy shall include an "all states" or "other states" endorsement.

The liability limits shall be not less than:

Workers' compensation Statutory

Employers' liability \$2,000,000 each occurrence

- C. Comprehensive Automobile Liability Insurance. This insurance shall be occurrence type, written in comprehensive form, and shall protect Seller, and Buyer and Engineer as additional insureds, against all claims for injuries to members of the public and damage to property of others arising from the use of motor vehicles, either on or off the Project site whether they are owned, non-owned, or hired.

The liability limits shall be not less than:

Bodily Injury: \$1,000,000 Each Person
\$2,000,000 Each Accident

Property Damage: \$1,000,000 Each Occurrence

- D. Commercial General Liability Insurance. This insurance shall be occurrence type, written in comprehensive form, and shall protect Seller, and Buyer and Engineer as additional insureds, against claims arising from injuries, sickness, disease, or death of any person or damage to property arising out of the furnishing of the Goods and Special Services. The policy shall also include a per project aggregate limit endorsement, personal injury liability coverage, contractual liability coverage, completed operations and products liability coverage.

The liability limits shall be not less than:

Bodily Injury: \$2,000,000 Each Occurrence
\$2,000,000 Annual Aggregate

Property Damage\*: \$1,000,000 Each Occurrence
\$2,000,000 Annual Aggregate

\*Property Damage shall include Explosion, Collapse and Underground Coverages. Property Damage shall include property in the care, custody and control of the insured.

Personal Injury, with employment exclusion deleted: \$2,000,000 Annual Aggregate

- E. Umbrella Liability Insurance. This insurance shall protect Seller, and Buyer and Engineer as additional insureds, against claims in excess of the limits provided under workers' compensation and employers' liability, comprehensive automobile liability, and commercial general liability policies. The umbrella policy shall follow the form of the primary insurance, including the application of the primary limits.

The liability limits shall be not less than:

Bodily injury and property damage:	\$5,000,000 combined single limit for each occurrence \$5,000,000 general aggregate
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- F. Professional Liability Insurance: This insurance shall be required only in cases where the Contract Documents specifically require that Seller provide for design services to be performed by a professional engineer with appropriate expertise in accordance with applicable laws and regulations, licensed or registered in the State of New Jersey, and that the Shop Drawings or other evidence of design bear the seal and signature of that professional engineer. This insurance shall provide protection against claims arising out of performance of professional design services and caused by a negligent error, omission, or act for which the insured party is legally liable; such professional liability insurance shall provide coverage in the amount of \$3,000,000 and shall be maintained throughout the duration of the Project and for one year after final payment. In the event that the professional design services are performed by an independent consultant or Subcontractor engaged by Seller, this insurance shall be furnished and maintained by the independent consultant or Subcontractor. In the event that the professional design services are performed by a member of Seller's organization, this insurance shall be furnished and maintained by Seller.

A certificate of insurance for such professional liability insurance coverage, including the amount, duration, and name of the insured party, shall be delivered to Buyer and Engineer.

- G. Transportation Insurance: This insurance shall be of the "all risks" type and shall protect Subcontractor and shall include the Indemnified Parties as insureds from all insurable risks of physical loss or damage to Goods in transit until receipt, off loaded and placed at the Point of Destination. The coverage amount shall be not less than one-hundred and twenty percent of the commercial invoice value of the Goods shipped. Transportation insurance shall provide for losses to be payable to Subcontractor and Buyer as their interests may appear.

4.05 *Acceptance of Bonds and Insurance; Option to Replace*

- A. If Buyer has any objection to the coverage afforded by or other provisions of the Bonds or insurance required to be purchased and maintained by Seller in accordance with Article 4 on the basis of non-conformance with the Contract Documents, the Buyer shall so notify the Seller in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraphs 2.01.A and 2.02.A. Seller shall provide to the Buyer such additional information in respect of insurance provided as the Buyer may reasonably request. If Seller does not purchase or maintain all of the Bonds and insurance required of Buyer by the Contract Documents, Buyer shall notify the Seller in writing of such failure to purchase prior to the start of the Contract, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the Buyer may elect to obtain equivalent Bonds or insurance to protect Buyer's interests at the expense of the Seller who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

## ARTICLE 5 - SELLER'S RESPONSIBILITIES

### 5.01 *Supervision and Superintendence*

Add the following:

“B. SELLER will be held responsible for the conduct of all personnel on site employed by or through Contract. SELLER shall employ only competent persons to perform the work of this contract. Whenever BUYER shall notify SELLER, in writing, that any person on the work, including superintendents and other Supervisors, appears to be incompetent, disorderly, or who disregards the authority of the ENGINEER and/or BUYER, or is otherwise unsatisfactory, such person shall be removed from the Project within the time frame specified by the BUYER, and shall not again be employed on it except with the consent of BUYER.”

### 5.02 *Labor, Materials and Equipment*

Add the following to subpart B:

“4. Any and all applicable technical bulletins issued by the Original Equipment Manufacturers of the Goods, prior to the delivery of the Goods at the Point of Destination, shall be implemented by the SELLER through the Original Equipment Manufacturer at no additional expense to the BUYER.”

### 5.03 *Laws and Regulations*

Delete Part B in its entirety and substitute the following:

“B. If SELLER observes that the Specifications or Drawings are at variance with any Laws or Regulations, he shall give ENGINEER prompt written notice thereof. If SELLER performs any work knowing it to be contrary to such Laws or Regulations, and without such notice to ENGINEER, he shall bear all costs arising therefrom. The SELLER shall, at all times, observe and comply with and shall cause all his agents and employees and all his Subcontractors to observe and comply with all such existing Laws or Regulations, and shall protect and indemnify the BUYER and the ENGINEER and the municipalities in which work is being performed, and their officers and agents against any claim or liability arising from or based on the violation of any such Law or Regulation, whether by himself or his employees or any of his Subcontractors.”

Add the following paragraph:

“D. The SELLER shall keep itself fully informed of all existing and future state and Federal Laws and Regulations and Municipal Ordinances and Regulations, in any manner affecting the work and the persons engaged or employed in the work, or the materials used in the work, or in any affecting the performance of the work, either with respect to hours of labor or otherwise, and of all such laws, ordinances, regulations, orders and decrees, and shall protect and indemnify BUYER and their officers and agents against any claims or liability arising from or based on the violation of any such law, ordinance, regulation, order or decree, whether by itself, or by its agents or employees.”

Add the following paragraph:

“E. Funding Agency Requirements. Seller will be required to comply with Title VI of the Civil Rights Act of 1964, the Davis-Bacon Act, as amended (40 U.S.C. 3141-3148) and the requirements of 29 C.F.R. pt. 5 as may be applicable, the Copeland (Anti-Kickback) Act (40 U.S.C. 3145), as supplemented by Department of Labor regulations (29 CFR Part 3), and the Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708). Seller will be required to comply with the President's Executive Order 11246 of September 24, 1965, as amended. Seller will be required to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).”

Add the following paragraph:

“F. Byrd Anti-Lobbying Amendment (31 U.S.C. 1352)—Contractors that apply or bid for an award exceeding \$100,000 must file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-Federal award.”

5.04 *Or Equals*

Delete Paragraph 5.04.A in its entirety and substitute the following:

“A. Whenever the Goods, or an item of material or equipment to be incorporated into the Goods is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular supplier or manufacturer, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading without exception or that no like, equivalent, or “or-equal” item is permitted, other items of material or equipment or material or equipment of other manufacturers may be submitted to Buyer for Engineer’s review.

1. If in Engineer’s sole discretion, such an item of material or equipment proposed by Seller is functionally equal to that named and sufficiently similar so that no change in related work will be required, it may be considered by Engineer as an “or-equal” item.
2. For the purposes of this paragraph, a proposed item of material or equipment may be considered functionally equal to an item so named only if:
  - a. in the exercise of reasonable judgment, Engineer determines that: 1) it is at least equal in quality, durability, appearance, strength, and design characteristics; 2) it will reliably perform at least equally well the function imposed by the design concept of the completed Project as a functioning

whole; 3) it has an acceptable record of performance and availability of responsive service; and

- b. Seller certifies that if accepted: 1) there will be no increase in any cost including capital, installation or operating costs, to Buyer; and 2) the proposed item will conform substantially to the detailed requirements of the item named in the Contract Documents.”

Delete Paragraph 5.04.B in its entirety and substitute the following:

“B. Engineer’s Evaluation: Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraph 5.04.A. Engineer will be the sole judge of whether to accept or reject such a proposal or submittal. No “or-equal” will be ordered, manufactured or utilized until Engineer’s review is complete, which will be evidenced by an accepted Shop Drawing. Engineer will advise Buyer and

Seller in writing of any negative determination. Notwithstanding Engineer’s acceptance of an “or-equal” item, Seller shall remain obligated to comply with the requirements of the Contract Documents.”

5.05 *Taxes*

Add the following to Part A:

“The materials and supplies to be used in the work of this contract are exempt from Federal sales tax and sales tax of the State of New Jersey. SELLER shall obtain the proper certificates, maintain the necessary records and otherwise comply with the requirements of state law.”

5.06 *Shop Drawings and Samples*

Delete Paragraph 5.06 in its entirety and substitute the following:

“Requirements for Shop Drawings, Samples and submittal procedures shall be as specified in the Technical Supplemental Specifications, Q500 - Shop Drawing and Instruction Manuals.”

5.08 *Sellers’s Warranties and Guarantees*

Delete Paragraph 5.08.B in its entirety and substitute the following:

“Seller warrants and guarantees to Buyer that all Goods and Special Services will conform with the Contract Documents, and with the standards established by any Samples accepted by Engineer. Engineer shall be entitled to rely on representation of Seller’s warranty and guarantee. If the Contract Documents do not otherwise specify the characteristics or the quality of the Goods, the Goods shall comply with the requirements of Paragraph 5.02.B.”

Add the following paragraph:

“G. Seller shall provide a minimum 365 day warranty from the time the Goods achieve Completion or a minimum 1,825 day warranty from the Goods date of shipment, whichever occurs first.”

5.09 *Indemnification*

Delete Part A in its entirety and substitute the following:

“A. To the fullest extent permitted by Laws and Regulations, and except for the willful misconduct of BUYER, SELLER shall indemnify and hold harmless BUYER, ENGINEER, ENGINEER’s Consultants and the officers, directors, employees, agents consultants, contractors and subcontractors of each and any of them from and against all claims, costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration of other dispute resolution costs including appeals) caused by, arising out of or relating to the performance of SELLER’s obligations under the Contract Documents, provided that any such claim, cost, loss or damage is caused in whole or in part by any negligent act or omission of the SELLER, or any individual or entity directly or indirectly employed by SELLER or anyone for whose acts SELLER may be liable.”

Add the following new Paragraphs as follows:

- “C. The indemnification obligations of Seller under Paragraph 5.09.A shall not extend to the liability of Engineers and Engineer’s officers, directors, partners, employees, agents, and consultants arising out of:
1. the preparation or acceptance of, or the failure to prepare or accept, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
  2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.
- D. Wherever in this Agreement a provision imposes upon the SELLER an obligation of indemnification, that obligation shall be as set forth in the preceding paragraphs of this provision. SELLER acknowledges that it is the intent of the parties that any indemnification obligation imposed upon SELLER pursuant to any provision of this Agreement shall be the broadest called for under this Agreement.
- E. Nothing in the Contract Documents shall create or give to third parties any claim or right of action against the SELLER, the BUYER or the ENGINEER beyond such as may legally exist irrespective of the Contract.”

5.10 *Delegation of Professional Design Services*

Delete Paragraph 5.10 in its entirety and substitute the following:

“5.10 Delegation of Professional Design Services:

- A. Seller will not be required to provide professional design services unless such services are specifically required by the Contract Documents or unless such services are required to carry out Seller’s responsibilities for furnishing the Goods and Special Services. Seller shall not be required to provide professional services in violation of applicable law.



- B. If professional design services or certifications by a design professional related to the Goods and Special Services are specifically required of Seller by the Contract Documents, Buyer and Engineer will specify all performance and design criteria that such services must satisfy or will provide reports and/or drawings from which design criteria can be derived by the Seller. Seller shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Goods and Special Services designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.
- C. Buyer and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Buyer and Engineer have specified to Seller all performance and design criteria that such services must satisfy or provided to the Seller sufficient information in reports and/or on drawings to derive the design criteria.
- D. Pursuant to this Paragraph 5.10, Engineer's review and acceptance of signed and sealed certifications of performance and design criteria used when designing systems, materials, or equipment and design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria and the design concept set forth in the Contract Documents. Where the Seller has derived design criteria from reports and/or drawings, the Engineer's review will be for the limited purpose of checking for conformance with the design concept expressed in the Contract Documents. Engineer's review and acceptance of Shop Drawings and other submittals (except performance and design criteria and design calculations and design drawings) will be only for the purpose stated in the Submittals Procedures section."

Add the following section to this Article

“5.11 *Concerning Subcontractors, Manufacturers and Others*

- A. Seller shall not employ any Subcontractor, manufacturer, or other individual or entity, whether initially or as a replacement, against whom Buyer may have reasonable objection. Seller shall not be required to employ any Subcontractor, manufacturer, or other individual or entity to furnish or perform any of the Goods and Special Services against whom Seller has reasonable objection.
- B. Seller shall be fully responsible to Buyer and Engineer for all acts and omissions of the Subcontractors, manufacturers, and other individuals or entities performing or furnishing any of the Goods and Special Services just as Seller is responsible for Seller's own acts and omissions. Nothing in the Contract Documents:
  - 1. shall create for the benefit of any such Subcontractor, manufacturer, or other individual or entity any contractual relationship between Buyer or Engineer and any such Subcontractor, manufacturer, or other individual or entity, nor
  - 2. shall anything in the Contract Documents create any obligation on the part of Buyer

or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, manufacturer, or other individual or entity except as may otherwise be required by Laws and Regulations.

- C. Seller shall be solely responsible for scheduling and coordinating the Goods and Special Services of Subcontractors, manufacturers, and other individuals or entities performing or furnishing any of the Goods and Special Services under a direct or indirect contract with Seller.
- D. Seller shall require all Subcontractors, manufacturers, and such other individuals or entities performing or furnishing any of the Goods and Special Services to communicate with Buyer and Engineer only through Seller.
- E. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Seller in dividing the Goods and Special Services among Subcontractors or manufacturers or delineating the Goods and Special Services to be performed by any specific trade.
- F. All Goods and Special Services performed for Seller by a Subcontractor or manufacturer will be pursuant to an appropriate agreement between Seller and the Subcontractor or manufacturer which specifically binds the Subcontractor or manufacturer to the applicable terms and conditions of the Contract Documents for the benefit of Buyer and Engineer.”

#### ARTICLE 6 - SHIPPING AND DELIVERY

##### 6.03 *Risk of Loss*

Delete Paragraph 6.03.A in its entirety and substitute the following:

- “A. Risk of loss and insurable interests transfer from Seller to Buyer upon Buyer’s receipt of the Goods at the Point of Destination. In the event Goods are placed into Storage, Seller shall be responsible for Risk of Loss for the duration Goods are in Storage upon Buyer’s receipt of Goods at the Point of Destination.”

#### ARTICLE 7 - CHANGES: SCHEDULE AND DELAY

##### 7.01 *Changes in the Goods and Special Services*

Add the following paragraphs:

- “D. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- E. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by SELLER will be made by ENGINEER.

- F. Each unit price will be deemed to include an amount considered by SELLER to be adequate to cover SELLER's overhead and profit for each separately identified item.
- G. BUYER or SELLER may make a Claim for an adjustment in the Contract Price if:
1. the quantity of any item of Unit Price Work performed by SELLER differs by more than plus or minus twenty percent (20%) from the estimated quantity of such item indicated in the Agreement; and
  2. there is no corresponding adjustment with respect to any other item of Work; and
  3. SELLER believes that SELLER is entitled to an increase in Contract Price as a result of having incurred additional expense or BUYER believes that BUYER is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease."

7.02 *Changing Contract Price or Contract Times*

Add the following to the end of Part B:

"SELLER certifies that this claim is made in good faith, that the supporting data are accurate and complete to the best of SELLER's knowledge and belief, and that the amount or time requested accurately reflects the contract adjustment for which SELLER believes BUYER is liable."

ARTICLE 8 - BUYER'S RIGHTS

8.03 *Correction Period*

Add the following paragraph:

"B. Nothing in this Article 8 concerning the correction period shall establish a period of limitation with respect to any other obligation which Seller has under the Contract Documents. The establishment of time periods relates only to the specific obligations of Seller to correct the Goods and Special Services, and has no relationship to the time within which Seller's obligations under the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish Seller's liability with respect to Seller's obligations other than to specifically correct the Goods and Special Services."

ARTICLE 9 - ROLE OF ENGINEER

9.01 *Duties and Responsibilities*

Add the following sentence to Part A:

"The action of the Engineer in performance of these duties shall not be construed to make the Engineer the Agent for the Buyer with respect to changes in the cost of the Goods and Special Services or changes in the Contract Documents."

9.03 *Authorized Variations*

Delete Paragraph 9.03.A in its entirety and substitute the following:

“A. Engineer may authorize minor deviations or variations in the Contract Documents by: 1) written acceptance of specific variations set forth in Shop Drawings when Seller has duly noted such variations as required in Paragraph 5.06.C.4, or 2) a Field Order.”

9.05 *Decisions on Requirements of Contract Documents*

Add the following at the end of the first sentence of Paragraph 9.05.A:

“...insofar as the subject matter of any pertinent claim, dispute, or other matter falls within the realm of the technical expertise of Engineer.”

Add the following at the end of Paragraph 9.05.A:

“Engineer shall not render any decision on any claims, disputes, or other matters that in the opinion of the Engineer, requires legal, rather than technical, interpretation.”

ARTICLE 10 - PAYMENT

10.01 *Application for Progress Payments*

Delete Paragraph 10.01 in its entirety and substitute the following:

“Seller shall submit to Buyer for Engineer’s review Applications for Payment filled out and signed by Seller and accompanied by such supporting documentation as is required by the Contract Documents and also as Buyer or Engineer may reasonably require. The timing and amounts of progress payments shall be as stipulated in the Agreement. Progress payments on account of Allowance and Unit Price Work will be based on the Work and number of units completed, respectively.”

10.05 *Final Application for Payment*

Delete the last sentence of Paragraph 10.05.A in its entirety and substitute the following:

“The final Application for Payment shall be accompanied by all documentation called for in the Contract Documents, a list of all unsettled Claims, consent of the surety, signed by an agent and accompanied by a certified copy of such agent’s authority to act for the surety, and such other data and information as Buyer or Engineer may reasonably require.”

ARTICLE 11 - CANCELLATION, SUSPENSION, AND TERMINATION

No modifications.

ARTICLE 12 - LICENSE AND FEES

12.04 *Reuse of Documents*

Delete part 2, of Paragraph 12.04.A in its entirety and replace with the following:

“(2) reuse any of such Drawings, Specifications, other documents, or copies thereof on any other project without written consent of Buyer and Engineer and specific written verification or adaptation by entity responsible for those documents. This prohibition will survive termination or completion of the Contract. Nothing herein shall preclude Seller from retaining copies of the Contract Documents for record purposes.”

Delete Paragraph 12.05.A in its entirety and replace with the following:

“A. Except as permitted in the Technical Supplemental Specifications, Q500 - Shop Drawing and Instruction Manuals, copies of data furnished by Buyer or Engineer to Seller, or by Seller to Buyer or Engineer that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of test, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user’s sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.”

ARTICLE 13 - DISPUTE RESOLUTION

No modifications.

ARTICLE 14 - MISCELLANEOUS

14.01 *Giving Notice*

Add the following subpart to Part A:

“1. No oral statement of any person whosoever shall in any manner or degree modify or otherwise affect the terms of this Contract. Any notice to the CONTRACTOR, from OWNER and ENGINEER, relative to any part of this Contract shall be in writing.”

Add the following to Paragraph 14.05:

“B. Seller shall obtain from all manufacturers any and all warranties and guarantees of such manufacturers, whether or not specifically required by the Specifications, and shall assign such warranties and guarantees to Buyer. With respect thereto, Seller shall render reasonable assistance to Buyer when requested, in order to enable Buyer to enforce such warranties and guarantees. The assignment of any warranties or guarantees shall not affect the correction period or any other provisions of these Contract Documents.”

Add the following additional Article:

“ARTICLE 15 - LIQUIDATED DAMAGES

- 15.01 If the SELLER shall fail to complete the work within the Contract Time, or extension of time granted by the BUYER in accordance with Article 7, then the SELLER will pay to the BUYER the amount for damages as specified in the Agreement for each calendar day that the Contract work remains incomplete.
- 15.02 For the purposes of calculating the number of calendar days for damaged assessment, such calculation shall include the day on which date of completion occurs, but shall not include the day of scheduled completion.
- 15.03 *Penalties and Fines*
- A. In the event BUYER is penalized by any governmental entity, including but not limited to the NJDEP, due to any act or omission by the SELLER, the SELLER shall be solely responsible for the payment of same. SELLER shall reimburse BUYER for payment of any such fine and penalty within ten (10) days of receiving notice of payment of such fine or penalty from BUYER. Any monies paid by the SELLER pursuant to this provision shall not relieve the SELLER of liability to BUYER for damages sustained by BUYER by virtue of any other provision of this Agreement.”

Add the following additional Article:

“ARTICLE 16 - FEDERAL AND STATE GOVERNMENT PROVISIONS

16.01 *Affirmative Action Requirements*

During the performance of this contract, the SELLER agrees as follows:

The SELLER, where applicable, will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Except with respect to affectional or sexual orientation and gender identity or expression, the SELLER will ensure that equal employment opportunity is afforded to such applicants in recruitment and employment, and that employees are treated during employment, without regard to their age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Such equal employment opportunity shall include, but not be limited to the following: employment, up-grading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The SELLER agrees to post in conspicuous places, available to employees and applicants foremployment, notices to be provided by the Public Agency Compliance Officer setting forth provisions of this nondiscrimination clause.

The SELLER, where applicable will, in all solicitations or advertisements for employees placed by or on behalf of the SELLER, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex.

The SELLER, where applicable, will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer advising the labor union or workers' representative of

the SELLER 's commitments under this act and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

The SELLER, where applicable, agrees to comply with any regulations promulgated by the Treasurer, pursuant to N.J.S.A. 10:5-31 et seq., as amended and supplemented from time to time and the Americans with Disabilities Act.

When hiring or scheduling workers in each construction trade, the SELLER agrees to make good faith efforts to employ minority and women workers in each construction trade consistent with the targeted employment goal prescribed by N.J.A.C. 17:27 7.2; provided, however, that the Dept. of LWD, Construction EEO Monitoring Program may, in its discretion, exempt a SELLER from compliance with the good faith procedures prescribed by the following provisions, a, b and c, as long as the Dept. of LWD, Construction EEO Monitoring Program is satisfied that the SELLER is employing workers provided by a union which provides evidence, in accordance with standards prescribed by the Dept. of LWD, Construction EEO Monitoring Program, that its percentage of active "card carrying" members who are minority and women workers is equal to or greater than the targeted employment goal established in accordance with N.J.A.C. 17:27 7.2. The SELLER agrees that a good faith effort shall include compliance with the following procedures:

(A) If the SELLER has a referral agreement or arrangement with a union for a construction trade, the SELLER shall, within three business days of the contract award, seek assurances from the union that it will cooperate with the SELLER as it fulfills its affirmative action obligations under this contract and in accordance with the rules promulgated by the Treasurer pursuant to N.J.S.A. 10:5-31 et. seq., as supplemented and amended from time to time and the Americans with Disabilities Act. If the SELLER is unable to obtain said assurances from the construction trade union at least five business days prior to the commencement of construction work, the SELLER agrees to afford equal employment opportunities minority and women workers directly, consistent with this chapter. If the SELLER's prior experience with a construction trade union, regardless of whether the union has provided said assurances, indicates a significant possibility that the trade union will not refer sufficient minority and women workers consistent with affording equal employment opportunities as specified in this chapter, the SELLER agrees to be prepared to provide such opportunities to minority and women workers directly, consistent with this chapter, by complying with the hiring or scheduling procedures prescribed under (B) below; and the SELLER further agrees to take said action immediately if it determines that the union is not referring minority and women workers consistent with the equal employment opportunity goals set forth in this chapter.

(B) If good faith efforts to meet targeted employment goals have not or cannot be met for each construction trade by adhering to the procedures of (A) above, or if the contractor does not have a referral agreement or arrangement with a union for a construction trade, the SELLER agrees to take the following actions:

(1) To notify the public agency compliance officer, the Dept. of LWD, Construction EEO Monitoring Program, and minority and women referral organizations listed by the Division pursuant to N.J.A.C. 17:27-5.3, of its workforce needs, and request referral of minority and women workers;

(2) To notify any minority and women workers who have been listed with it as awaiting available vacancies;

(3) Prior to commencement of work, to request that the local construction trade union refer minority and women workers to fill job openings, provided the SELLER has a referral agreement or arrangement with a union for the construction trade;

(4) To leave standing requests for additional referral to minority and women workers with the local construction trade union, provided the contractor or subcontractor has a referral agreement or arrangement with a union for the construction trade, the State Training and Employment Service and other approved referral sources in the area;

(5) If it is necessary to lay off some of the workers in a given trade on the construction site, layoffs shall be conducted in compliance with the equal employment opportunity and non-discrimination standards set forth in this regulation, as well as with applicable Federal and State court decisions;

(6) To adhere to the following procedure when minority and women workers apply or are referred to the SELLER:

(i) The SELLER shall interview the referred minority or women worker.

(ii) If said individuals have never previously received any document or certification signifying a level of qualification lower than that required in order to perform the work of the construction trade, the SELLER shall in good faith determine the qualifications of such individuals. The SELLER shall hire or schedule those individuals who satisfy appropriate qualification standards in conformity with the equal employment opportunity and non-discrimination principles set forth in this chapter. However, a SELLER shall determine that the individual at least possesses the requisite skills, and experience recognized by a union, apprentice program or a referral agency, provided the referral agency is acceptable to the Dept. of LWD, Construction EEO Monitoring Program. If necessary, the SELLER shall hire or schedule minority and women workers who qualify as trainees pursuant to these rules. All of the requirements, however, are limited by the provisions of (C) below.

(iii) The name of any interested women or minority individual shall be maintained on a waiting list, and shall be considered for employment as described in (i) above, whenever vacancies occur. At the request of the Dept. of LWD, Construction EEO Monitoring Program, the SELLER shall provide evidence of its good faith efforts to employ women and minorities from the list to fill vacancies.

(iv) If, for any reason, said SELLER determines that a minority individual or a woman is not qualified or if the individual qualifies as an advanced trainee or apprentice, the SELLER shall inform the individual in writing of the reasons for the determination, maintain a copy of the determination in its files, and send a copy to the public agency compliance officer and to the Dept. of LWD, Construction EEO Monitoring Program.

(7) To keep a complete and accurate record of all requests made for the referral of workers in any trade covered by the contract, on forms made available by the Dept. of LWD, Construction EEO Monitoring Program and submitted promptly to the Dept. of LWD, Construction EEO Monitoring Program upon request.

(C) The SELLER agrees that nothing contained in (B) above shall preclude the SELLER from complying with the union hiring hall or apprenticeship policies in any applicable collective bargaining agreement or union hiring hall arrangement, and, where required by custom or agreement, it shall send journeymen and trainees to the union for referral, or to the apprenticeship program for admission, pursuant to such agreement or arrangement. However, where the practices of a union or apprenticeship program will result in the exclusion of minorities and women or the failure to refer minorities and women consistent with the targeted county



employment goal, the SELLER shall consider for employment persons referred pursuant to (B) above without regard to such agreement or arrangement; provided further, however, that the contractor or subcontractor shall not be required to employ women and minority advanced trainees and trainees in numbers which result in the employment of advanced trainees and trainees as a percentage of the total workforce for the construction trade, which percentage significantly exceeds the apprentice to journey worker ratio specified in the applicable collective bargaining agreement, or in the absence of a collective bargaining agreement, exceeds the ratio established by practice in the area for said construction trade. Also, the SELLER agrees that, in implementing the procedures of (B) above, it shall, where applicable, employ minority and women workers residing within the geographical jurisdiction of the union.

After notification of award, but prior to signing a construction contract, the SELLER shall submit to the public agency compliance officer and the Dept. of LWD, Construction EEO Monitoring Program an initial project workforce report (Form AA 201) electronically provided to the public agency by the Dept. of LWD, Construction EEO Monitoring Program, through its website, for distribution to and completion by the contractor, in accordance with N.J.A.C. 17:27-7. The SELLER also agrees to submit a copy of the Monthly Project Workforce Report (Form AA 202) once a month thereafter for the duration of this contract to the Division and to the public agency compliance officer.

The SELLER agrees to cooperate with the public agency in the payment of budgeted funds, as is necessary, for on the job and/or off the job programs for outreach and training of minorities and women.

(D) The SELLER shall furnish such reports or other documents to the Dept. of LWD, Construction EEO Monitoring Program as may be requested by the Dept. of LWD, Construction EEO Monitoring Program from time to time in order to carry out the purposes of these regulations, and public agencies shall furnish such information as may be requested by the Dept. of LWD, Construction EEO Monitoring Program for conducting a compliance investigation pursuant to N.J.A.C. 17:27-1.1 et seq.

16.02 *Anti-Discrimination (N.J.S.A. 10:2-1)*

A. Every contract for or on behalf of the State or any county or municipality or other political subdivision of the State, or any agency of or authority created by any of the foregoing, for the construction, alteration or repair of any public building or public work or for the acquisition of materials, equipment, supplies or services shall contain provisions by which the SELLER agrees that:

1. In the hiring of persons for the performance of work under this contract or any subcontract hereunder, or for the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under this Contract, no SELLER, nor any person acting on behalf of such SELLER, shall, by reason of race, creed, color, national origin, ancestry, marital status, sex, affectional or sexual orientation, discriminate against any person who is qualified and available to perform the work to which the employment relates;
2. No SELLER, nor any person on his behalf shall in any manner, discriminate against or intimidate any employee engaged in the performance of work under this contract or any subcontract hereunder, or engaged in the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under such contract, on account of race, creed, color, national origin, ancestry, marital status, sex, affectional or sexual orientation;

3. There may be deducted from the amount payable to the SELLER by the contracting public agency, under this contract, a penalty of \$50.00 for each person for each calendar day during which such person is discriminated against or intimidate in violation of the provisions of the contract; and
4. This Contract may be canceled or terminated by the contracting public agency, and all money due or to become due hereunder may be forfeited, for any violation of this section of the contract occurring after notice to the SELLER from the contracting public agency of any prior violation of this section of the contract.

16.03 *Foreign Corporations (N.J.S.A. 14A: 13-3)*

- A. No foreign corporation shall have the right to transact business in this State until it shall have procured a certificate of authority so to do from the Secretary of State. A foreign corporation may be authorized to do in this State any business which may be done lawfully in this State by a domestic corporation, to the extent that it is authorized to do such business if the jurisdiction of its incorporation, but no other business.
- B. Without excluding other activities which may not constitute transacting business in this State, a foreign corporation shall not be considered to be transacting business in this State, for the purposes of this act, by reason of carrying on in this State any one or more of the following activities;
  1. maintaining, defining or otherwise participating in any action or proceeding, whether judicial, administrative, arbitative or otherwise, or effecting the settlement thereof or the settlement of claims or disputes;
  2. holding meetings of its directors or shareholders;
  3. maintaining bank accounts or borrowing money, with or without security, even if such borrowings are repeated and continuous transactions and even if such security has a situs in this State;
  4. maintaining offices or agencies for the transfer, exchange and registration of its securities, or appointing and maintaining trustees or depositories with relation to its securities.
- C. The specification in subsection 14A: 13-3(2) does not establish a standard for activities which may subject a foreign corporation to service of process or taxation in this State.

16.04 *Statement of Ownership (N.J.S.A. 52:25-24.2)*

- A. No corporation or partnership shall be awarded any contract nor shall any agreement be entered into for the performance of any work or the furnishing of any materials or supplies, the cost of which is to be paid with or out of any public funds, by the State, or any county, municipality or school district, or any subsidiary or agency of the State, or of any county, municipality or school district, or by any authority, board, or commission which exercises governmental functions, unless prior to the receipt of the bid or accompanying the bid, of said corporation or said partnership, there is submitted a statement setting forth the names and addresses of all stockholders in the corporation or partnership who own 10% or more of its stock, of any class or of all individual partners in the partnership who own a 10 % or

greater interest therein, as the case may be. If one or more such stockholder or partner is itself a corporation or partnership, the stockholders holding 10% or more of that corporation's stock, or the individual partners owning 10% or greater interest in that partnership, as the case may be, shall also be listed. The disclosure shall be continued until all names and addresses of every non-corporate stockholder, and individual partner, exceeding the 10% ownership criteria established in this act, has been listed (see Section 00305).

16.05 *State Treasurer's List of Debarred, Suspended and Disqualified Bidders (N.J.S.A. 34: 11) and Federal List of Debarred, Suspended and Disqualified Bidders (N.J.S.A. 52:32-44.1)*

- A. The SELLER, or an officer or partner of the bidder shall not, at the time of the bid, be included on the State Treasurer's List of debarred, suspended, or disqualified bidders. The SELLER shall immediately notify the BUYER whenever it appears that the SELLER is on the State Treasurer's List. The SELLER may be debarred, suspended, or disqualified from contracting with the State and the Department if the SELLER commits any of the acts listed in NJAC 7:1D-2.2. Enclosed with the State Wage Rate Determination is a list of contractors and subcontractors who are debarred from public works pursuant to N.J.S.A. 34:11-56.37 and 38, no contract will be awarded or made to the listed contractors or subcontractors.”
- B. In accordance with N.J.S.A. 52:32-44.1, the Contractor, or an officer or partner of the bidder shall not, at the time of the bid, be included on the Federal List of debarred, suspended, or disqualified bidders. The Contractor shall immediately notify the Owner whenever it appears that the Contractor is on the Federal List. No contract will be awarded or made to the listed Contractor's or subcontractors on the Federal List.
- C. Federal Debarment and Suspension (Executive Orders 12549 and 12689) - A contract award (see 2 CFR 180.220) must not be made to parties listed on the governmentwide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), “Debarment and Suspension.” SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.

NO TEXT ON THIS PAGE

**EXHIBIT NO. 1**

**PREVAILING WAGE RATES**

A copy of the Essex County, State and Federal Wage Rates are included in this Exhibit.

The CONTRACTOR is reminded that it is responsible to utilize the current and applicable rates for the work being performed.

NO TEXT ON THIS PAGE



STATE OF NEW JERSEY  
Department of Labor and Workforce Development  
Division of Wage and Hour Compliance - Public Contracts Section  
PO Box 389  
Trenton, NJ 08625-0389

**PREVAILING WAGE RATE DETERMINATION**

The New Jersey Prevailing Wage Act (N.J.S.A. 34:11-56.25 et seq.) requires that the Department of Labor and Workforce Development establish and enforce a prevailing wage level for workers engaged in public works in order to safeguard their efficiency and general well being and to protect them as well as their employers from the effects of serious and unfair competition.

Prevailing wage rates are wage and fringe benefit rates based on the collective bargaining agreements established for a particular craft or trade in the locality in which the public work is performed. In New Jersey, these rates vary by county and by the type of work performed.

Applicable prevailing wage rates are those wages and fringe benefits in effect on the date the contract is awarded. All pre-determined rate increases listed at the time the contract is awarded must also be paid, beginning on the dates specified. Rates that have expired will remain in effect until new rates are posted.

**Prevailing Wage Rate**

The prevailing wage rate for each craft will list the effective date of the rate and the following information:

**W** = Wage Rate per Hour                      **B** = Fringe Benefit Rate per Hour\*                      **T** = Total Rate per Hour

\* Fringe benefits are an integral part of the prevailing wage rate. Employers not providing such benefits must pay the fringe benefit amount directly to the employee each payday. Employers providing benefits worth less than the fringe benefit amount must pay the balance directly to the employee each payday.

Unless otherwise stated in the Prevailing Wage Rate Determination, the fringe benefit rate for overtime hours remains at the straight time rate.

When the Overtime Notes in the Prevailing Wage Rate Determination state that the overtime rates are "inclusive of benefits," the benefit rate is increased by the same factor as the wage rate (i.e. multiplied by 1.5 for time and one-half, multiplied by 2 for double time, etc.).

**Apprentice Rate Schedule**

An "apprentice" is an individual who is registered with the United States Department of Labor - Office of Apprenticeship and enrolled in a certified apprenticeship program during the period in which they are working on the public works project.

The apprentice wage rate is a percentage of the journeyman wage rate, unless otherwise indicated. The apprentice benefit rate is the full journeyman benefit rate, unless otherwise indicated.

If there is no apprentice rate schedule listed, the individual must be paid at least the journeyman rate even if that individual is in a certified apprentice program for that trade.

If there is no ratio of apprentices to journeymen listed for a particular craft, then the ratio shall be one (1) apprentice to every four (4) journeymen.

## Comments/Notes

For each craft listed there will be comments/notes that cover the definition of the regular workday, shift differentials, overtime, recognized holidays, and any other relevant information.

## Public Works Contractor Registration

The Public Works Contractor Registration Act (N.J.S.A. 34:11-56.48, et seq.) requires that **all** contractors, subcontractors, or lower tier subcontractors who are working on or who bid on public works projects register with the Department of Labor and Workforce Development. Applications are available at [www.nj.gov/labor](http://www.nj.gov/labor) (click on Wage & Hour and then go to Registration & Permits).

Pursuant to N.J.S.A. 34:11-56.51:

*No contractor shall bid on any contract for public work as defined in section 2 of P.L.1963, c. 150 (C.34:11-56.26) unless the contractor is registered pursuant to this act. No contractor shall list a subcontractor in a bid proposal for the contract unless the subcontractor is registered pursuant to P.L.1999, c.238 (C.34:11-56.48 et seq.) at the time the bid is made. No contractor or subcontractor, including a subcontractor not listed in the bid proposal, shall engage in the performance of any public work subject to the contract, unless the contractor or subcontractor is registered pursuant to that act.*

## Snow Plowing

Snow plowing contracts are not subject to the New Jersey Prevailing Wage Act or the Public Works Contractor Registration Act.



**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

County - ESSEX

**Craft: Air Conditioning & Refrigeration - Service and Repair**

**PREVAILING WAGE RATE**

	03/01/24
Journeyman (Mechanic)	W45.23 B30.03 T75.26

**Craft: Air Conditioning & Refrigeration - Service and Repair**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
As Shown	1st Year	2nd Year	3rd Year	4th Year	5th Year	Wage = %	of Jnymn	Wage		
Wage and Bene	40%	50%	60%	70%	80%	Bene = %	of Jnymn	Bene		

**Ratio of Apprentices to Journeymen - 1:4**

**Craft: Air Conditioning & Refrigeration - Service and Repair**

**COMMENTS/NOTES**

THESE RATES MAY BE USED FOR THE FOLLOWING:

- Service/Repair/Maintenance Work to EXISTING facilities.
- Replacement or Installation of air conditioning and refrigeration equipment when the combined tonnage does not exceed 15 tons for refrigeration, or 25 tons for air conditioning.
- Replacement or Installation of "packaged" or "unitary" rooftop-type units when the combined tonnage of the units does not exceed 75 tons.

NOTE: These rates may NOT be used for any work in new construction (including work on new additions).

The regular workday shall consist of 8 hours, starting between 6:00 AM and 10:00 AM, Monday through Friday.

SHIFT DIFFERENTIALS:

- The second and third shifts shall be paid an additional 15% of the hourly rate.
- All shifts must run for a minimum of 5 consecutive days.

OVERTIME:

Hours worked in excess of 8 per day or before or after the regular workday, that are not shift work, and all hours on Saturday shall be paid at time and one-half the hourly rate, inclusive of benefits. All hours on Sunday and holidays shall be paid at double the hourly rate, inclusive of benefits.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Veterans' Day, Thanksgiving Day, Christmas Day.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Boilermaker                      PREVAILING WAGE RATE**

	01/12/24
Foreman	W54.11 B47.08 T101.19
General Foreman	W56.11 B48.14 T104.25
Journeyman	W49.11 B45.31 T94.42

**Craft: Boilermaker                      APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
	65%	70%	75%	80%	85%	90%	95%			
1000 Hours										
Benefit =	38.33	39.30	40.32	41.31	42.32	43.32	44.30			

**Ratio of Apprentices to Journeymen - \***

\* 1 apprentice will be allowed for the first 5 journeymen, 1 apprentice for the next 10 journeymen and 1 apprentice for each succeeding 20 journeymen up to a maximum of 5 apprentices per contractor on any one job.

**Craft: Boilermaker                      COMMENTS/NOTES**

HIGH WORK: All apprentices working on the erection, repair, or dismantling of smoke stacks, standpipes, or water towers shall be paid the Journeyman rate.

The regular workday shall consist of 8 hours, between 8:00 AM and 4:30 PM.

**SHIFT DIFFERENTIALS:**

- The second shift shall work 7 1/2 hours and receive 8 hours pay, at a rate equal to the regular hourly rate plus 10%.
- The third shift shall work 7 hours and receive 8 hours pay, at a rate equal to the regular hourly rate plus 20%.
- For "Municipal Water Works" projects only, the following shall apply: Two, four day, 10 hour shifts may be worked at straight time Monday through Thursday. The day shift shall work four days, at 10 hours, for 10 hours pay. The second shift shall work four days, at nine and a half hours, for 10 hours pay, plus 10% the hourly rate for new work and .25 cents on repair work. Friday may be used as a make-up day at straight time, due to weather conditions, holiday or any other circumstances beyond the employer's control.

**OVERTIME:**

- Hours in excess of 8 per day, Monday through Friday, and all hours on Saturdays shall be paid at time and one-half the hourly rate. All hours on Sundays and holidays (except Labor Day) shall be paid at double the hourly rate. All hours on Labor Day shall be paid at four times the hourly rate.
- If any other craft employed by the same contractor, or a subcontractor thereof, receives double time in lieu of time and one-half, then the Boilermaker shall receive double time in lieu of time and one-half.
- For "Municipal Water Works" projects only, the following shall apply: Four 10 hour days may be worked Monday through Thursday at straight time. Friday may be used as a make-up day for a day lost to inclement weather, holiday or other conditions beyond the control of the employer. Overtime shall be paid for any hours that exceed 10 hours per day or 40 hours per week.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

RECOGNIZED HOLIDAYS: New Year's Day, Washington's Birthday, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Boilermaker - Minor Repairs**

**PREVAILING WAGE RATE**

	01/12/24
Foreman	W35.88 B17.89 T53.77
General Foreman	W36.38 B17.89 T54.27
Mechanic	W34.38 B17.89 T52.27

**Craft: Boilermaker - Minor Repairs**

**COMMENTS/NOTES**

NOTE: These rates apply to MINOR REPAIR WORK ONLY (repair work in the field for which the contract amount does not exceed \$125,000.00), for boilers that do not produce electric or are not used in the heating of petroleum products.

**OVERTIME:**

Hours in excess of 8 per day, Monday through Friday, and all hours on Saturdays shall be paid at time and one-half the hourly rate. All hours on Sundays and holidays (except Labor Day) shall be paid at double the hourly rate. All hours on Labor Day shall be paid at four times the hourly rate.

RECOGNIZED HOLIDAYS: New Year's Day, Washington's Birthday, Good Friday, Memorial Day, July 4th, Labor Day, Presidential Election Day, Thanksgiving Day, day after Thanksgiving, Christmas Day. Saturday holidays observed the preceding Friday, Sunday holidays observed the following Monday.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Bricklayer, Stone Mason**

**PREVAILING WAGE RATE**

	05/09/24
Deputy Foreman	W51.60 B37.68 T89.28
Foreman	W56.35 B37.68 T94.03
Journeyman	W48.60 B37.68 T86.28

**Craft: Bricklayer, Stone Mason**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
	40%	50%	55%	60%	65%	70%	75%	80%		
6 Months										
Benefits	5.61	6.88	7.50	8.13	28.95	30.86	32.78	34.67		

**Ratio of Apprentices to Journeymen - 1:5**

**Craft: Bricklayer, Stone Mason**

**COMMENTS/NOTES**

The regular workday shall consist of 8 hours, between 6:00 AM and 4:30 PM.

**SHIFT DIFFERENTIALS:**

- When a 2 shift schedule (including a day shift) is established, the first, or day shift, shall be established on an 8 hour basis. The second shift shall be established on an 8 hour basis, and receive the regular rate plus 10%, inclusive of benefits.
- When a three shift schedule is established, the first shift shall be established on an 8 hour basis, the second shift on a 7.5 hour basis, and the third shift on a 7 hour basis. The first shift shall receive the regular hourly rate, the second shift shall receive the regular rate plus 10%, inclusive of benefits, and the third shift shall receive the regular rate plus 15%, inclusive of benefits.
- When there is no day shift, and a second or third shift is established, it shall be established on an 8 hour basis. The second shift shall receive the regular rate plus 10%, inclusive of benefits, and the third shift shall receive the regular rate plus 15%, inclusive of benefits.
- When an irregular shift must be established, this shift shall receive the regular rate plus 10%, inclusive of benefits.

**OVERTIME:**

- The first 2 hours in excess of 8 per day, or before or after the regular workday that are not shift work, Monday through Friday, shall be paid at time and one-half the regular rate, inclusive of benefits. Any additional overtime shall be paid at double the regular rate, inclusive of benefits. The first 10 hours on Saturday shall be paid at time and one-half the regular rate, inclusive of benefits. Any additional overtime shall be paid at double the regular rate, inclusive of benefits. All hours on Sundays and holidays shall be paid at double the regular rate, inclusive of benefits.
- Saturday may be used as a make-up day for hours lost to inclement weather.
- When Bricklayers/Stone Masons work on Saturday with Laborers, and no other crafts are working on the project for the day, benefits may be paid at straight time. If other crafts are present, the applicable overtime rate for benefits shall be paid.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

RECOGNIZED HOLIDAYS: New Year's Day, President's Day, Memorial Day, July 4th, Labor Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays will be observed the following Monday.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

County - ESSEX

**Craft: Carpenter                      PREVAILING WAGE RATE**

	05/09/24
Foreman	W64.41 B38.73 T103.14
Journeyman	W56.01 B33.76 T89.77

**Craft: Carpenter                      APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
Yearly	40%	55%	65%	80%	90%					
Benefit	59.25% of	Appren	tice	Wage	for all	intervals	+ \$0.57			

**Ratio of Apprentices to Journeymen - 1:3**

For Solar installation- all work on solar projects that fall under the jurisdiction of the carpenters, and does not require an electrician, the ratio of Apprentices to Journeymen shall be 1:1.

**Craft: Carpenter                      COMMENTS/NOTES**

APPRENTICE RATE SCHEDULE FOR THOSE APPRENTICES REGISTERED AS OF 5-1-19:

INTERVAL            PERIOD AND RATES  
 Yearly    40%    55%    65%    80%  
 Benefits   59.25% of apprentice wage rate for all intervals + \$0.57

**FOREMAN REQUIREMENTS:**

- When there are 2 or more Carpenters on a job, 1 shall be designated as a Foreman.
- When there are 21 or more Carpenters on a job, 2 shall be designated as Foremen.

The regular workday shall consist of 8 hours, starting between 6:00 AM and 9:00 AM.

**SHIFT DIFFERENTIALS:**

- When a 2 shift schedule (including a day shift) is established, the day shift shall be established on an 8 hour basis. The second shift shall be established on an 8 hour basis, and receive the regular rate plus 10%, inclusive of benefits.
- When a three shift schedule is established, the first shift shall be established on an 8 hour basis, the second shift on a 7.5 hour basis, and the third shift on a 7 hour basis. The first shift shall receive the regular hourly rate, the second shift shall receive the regular rate plus 10% and the third shift shall receive the regular rate plus 15%, inclusive of benefits.
- When there is no day shift, and a second or third shift is established, it shall be established on an 8 hour basis. The second shift shall receive the regular rate plus 10% and the third shift shall receive the regular rate plus 15%, inclusive of benefits.
- When an irregular shift must be established, this shift shall receive the regular rate plus 15%, inclusive of benefits.
- All time worked before and after a regularly established shift shall be paid at the applicable overtime rate. When a portion of the regularly established shift works into Saturday, Sunday or a holiday, that time worked shall be paid at the established shift rate.

**OVERTIME:**

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

- All hours in excess of 8 per day, or before or after an established shift that are not shift work, and all hours on Saturdays shall be paid at time and one-half the hourly rate, inclusive of benefits. All hours on Sundays and holidays shall be paid at double the hourly rate, inclusive of benefits.
- Four 10-hour days may be worked, Monday to Thursday, at straight time. Friday may be used as a make-up day for a day lost due to inclement weather. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half the hourly rate, inclusive of benefits.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday. Veterans' Day may be substituted for the day after Thanksgiving.



**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

County - ESSEX

**Craft: Carpenter - Resilient Flooring**

**PREVAILING WAGE RATE**

	05/01/24
Foreman	W64.41 B38.64 T103.05
Journeyman	W56.01 B33.67 T89.68

**Craft: Carpenter - Resilient Flooring**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
Yearly	40%	55%	65%	80%	90%					
Benefit	59.25%	of	Appren	tice	Wage	for all	intervals	+ \$0.48		

**Ratio of Apprentices to Journeymen - \***

\* 1 apprentice shall be allowed to every 2 journeymen or major fraction thereof. No more than 3 apprentices on any one job or project.

**Craft: Carpenter - Resilient Flooring**

**COMMENTS/NOTES**

APPRENTICE RATE SCHEDULE FOR THOSE APPRENTICES REGISTERED AS OF 5-1-19:

INTERVAL      PERIOD AND RATES  
 Yearly    40%    55%    65%    80%  
 Benefits   59.25% of apprentice wage rate for all intervals + \$0.48.

**FOREMAN REQUIREMENTS:**

- On any job where there are 4 or more Carpenters of Resilient Flooring, 1 must be designated a Foreman.

**FOR SYNTHETIC TURF INSTALLATION ONLY:**

- The rate shall be 90% of the wage and benefit rate.

The regular workday consists of 8 hours, starting between 6:00 AM and 9:00 AM.

**SHIFT DIFFERENTIALS:**

- When a 2 shift schedule (including a day shift) is established, the day shift, shall be established on an 8 hour basis. The second shift shall be established on an 8 hour basis, and receive the regular wage rate plus 10%.
- When a three shift schedule is established, the first shift shall be established on an 8 hour basis, the second shift on a 7.5 hour basis, and the third shift on a 7 hour basis. The first shift shall receive the regular wage rate, the second shift shall receive the regular wage rate plus 10% and the third shift shall receive the regular wage rate plus 15%.
- When there is no day shift, and a second or third shift is established, it shall be established on an 8 hour basis. The second shift shall receive the regular wage rate plus 10% and the third shift shall receive the regular wage rate plus 15%.
- When an irregular shift must be established, this shift shall receive the regular rate plus 15%, inclusive of benefits.

**OVERTIME:**

- Hours in excess of 8 per day or 40 per week, or before or after the regular workday, Monday through Friday, shall be paid at time and one-half the wage rate. Saturday may be used as a make-up day, at straight time, up to 8 hours, for hours lost to reasons beyond the control of the employer, up to a total of 40 hours per week; hours in excess of 8 on Saturday shall

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

then be paid at time and one-half the wage rate. If Saturday is not a make-up day, all hours on Saturday shall be paid at time and one-half the wage rate. All hours on Sundays and holidays shall be paid at double the wage rate.

- Four 10-hour days may be worked, Monday to Thursday, at straight time. Friday may be used as a make-up day for hours lost to reasons beyond the control of the employer. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half the wage rate.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays will be observed the following Monday. Veterans' Day may be substituted for the day after Thanksgiving.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Carpenter-Residential Construction**

**PREVAILING WAGE RATE**

	05/09/24
Foreman	W54.29 B11.99 T66.28
Journeyman	W47.21 B11.14 T58.35

**Craft: Carpenter-Residential Construction**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
Yearly	40%	55%	65%	80%						
Benefit	12% of	Appren	tice	wage rate	for all	intervals	+ \$5.48			

**Ratio of Apprentices to Journeymen - 1:3**

**Craft: Carpenter-Residential Construction**

**COMMENTS/NOTES**

**FOREMAN REQUIREMENTS:**

- When there are 2 or more Carpenters on a job, 1 shall be designated as a Foreman.
- When there are 21 or more Carpenters on a job, 2 shall be designated as Foremen.

The regular workday shall consist of 8 hours, starting between 6:00 AM and 9:00 AM.

**RESIDENTIAL CONSTRUCTION:**

All residential construction (excluding commercial buildings and institutional housing), no more than four (4) floors in height above grade consisting of those projects involving the construction, alteration, or repair of town houses or row houses, single family homes, mobile homes, multi-family homes, mixed-use buildings that include commercial space on the first floor or below grade, and apartment buildings.

**SHIFT DIFFERENTIALS:**

- When a 2 shift schedule (including a day shift) is established, the day shift shall be established on an 8 hour basis. The second shift shall be established on an 8 hour basis, and receive the regular rate plus 10%, inclusive of benefits.
- When a three shift schedule is established, the first shift shall be established on an 8 hour basis, the second shift on a 7.5 hour basis, and the third shift on a 7 hour basis. The first shift shall receive the regular hourly rate, the second shift shall receive the regular rate plus 10% and the third shift shall receive the regular rate plus 15%, inclusive of benefits.
- When there is no day shift, and a second or third shift is established, it shall be established on an 8 hour basis. The second shift shall receive the regular rate plus 10% and the third shift shall receive the regular rate plus 15%, inclusive of benefits.
- When an irregular shift must be established, this shift shall receive the regular rate plus 15%, inclusive of benefits.

**OVERTIME:**

- All hours in excess of 8 per day, or before or after an established shift that are not shift work, and all hours on Saturdays shall be paid at time and one-half the hourly rate, inclusive of benefits. All hours on Sundays and holidays shall be paid at double the hourly rate, inclusive of benefits.
- Four 10-hour days may be worked, Monday to Thursday, at straight time. Friday may be used as a make-up day for a

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

day lost due to inclement weather. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half the hourly rate, inclusive of benefits.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday. Veterans' Day may be substituted for the day after Thanksgiving.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Cement Mason**

**PREVAILING WAGE RATE**

See "Bricklayer, Stone Mason" Rates

**Craft: Cement Mason**

**COMMENTS/NOTES**

\*\*\*See "Bricklayer, Stone Mason" Rates\*\*\*

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Commercial Painter**

**PREVAILING WAGE RATE**

	05/29/24
Foreman	W48.90 B30.71 T79.61
General Foreman	W53.34 B30.71 T84.05
Journeyman	W44.45 B30.71 T75.16

**Craft: Commercial Painter**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
	40%	45%	55%	65%	70%	75%	80%	80%		
6 months										
Benefits	9.40	9.40	11.90	11.90	13.00	13.00	15.90	15.90		

**Ratio of Apprentices to Journeymen - 1:4**

**Craft: Commercial Painter**

**COMMENTS/NOTES**

\* Commercial Painters perform work on all commercial structures such as offices, schools, hotels, shopping malls, restaurants, condominiums, etc.

Spraying, sandblasting, lead abatement work on commercial buildings, work performed above 3 stories or 30 feet in height, or using swing scaffolds requires an additional 10% of the wage rate.

**FOREMEN REQUIREMENTS:**

- When there are 4 or more Painters on a job, 1 shall be designated a Foreman.
- When there are 15 or more Painters on a job, 1 shall be designated a General Foreman.

The regular workday shall consist of 8 hours between 7:00 AM and 5:30 PM.

**SHIFT DIFFERENTIALS:**

- The second shift shall receive an additional 10% of the hourly rate, per hour, and the third shift shall receive an additional 15% of the hourly rate, per hour.

**OVERTIME:**

- Hours in excess of 8 per day, or before or after the regular workday, Monday through Friday, and all hours on Saturdays shall be paid at time and one-half the regular rate. All hours on Sundays and holidays shall be paid at double the regular rate.
- Saturday or Sunday may be used to make up a day lost to inclement weather, at straight time.
- Four 10-hour days may be worked, at straight time, Monday through Friday.

**RECOGNIZED HOLIDAYS:** New Year's Day, President's Day, Memorial Day, July 4th, Labor Day, General Election Day,

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

Veterans' Day, Thanksgiving Day, Christmas Day.





**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

County - ESSEX

**Craft: Dockbuilder/Pile Driver**

**PREVAILING WAGE RATE**

	05/01/24
Foreman	W60.93 B52.74 T113.67
Foreman (Concrete Form Work)	W59.82 B39.39 T99.21
Journeyman	W52.98 B52.74 T105.72
Journeyman (Concrete Form Work)	W52.02 B39.39 T91.41

**Craft: Dockbuilder/Pile Driver**

**APPRENTICE RATE SCHEDULE**

<u>INTERVAL</u>	<u>PERIOD AND RATES</u>									
Yearly	21.19	26.49	34.44	42.38						
Benefits	34.70	for all	intervals							

**Ratio of Apprentices to Journeymen - \***

\* When there are 4 or fewer Dockbuilders/Pile Drivers on a job, no more than 1 may be an apprentice. When there are 5 or more Dockbuilders/Pile Drivers, there may be 1 apprentice for every 5 Dockbuilders/Pile Drivers.

**Craft: Dockbuilder/Pile Driver**

**COMMENTS/NOTES**

APPRENTICE RATE SCHEDULE FOR CONCRETE FORM WORK ONLY:

INTERVAL	PERIOD AND RATES			
Yearly	20.81	26.01	33.81	41.62
Benefits	26.73	for all	intervals	

**CREOSOTE HANDLING:**

When handling creosote products on land piling, floating marine construction, and construction of wharves, the worker shall receive an additional \$0.25 per hour.

**HAZARDOUS WASTE WORK:**

- Hazardous waste removal work on a state or federally designated hazardous waste site where Level A, B, or C personal protection is required: an additional 20% of the hourly rate, per hour.
- Hazardous waste removal work in Level D, or where personal protection is not required: an additional \$1.00 per hour.

**CERTIFIED WELDER:** When required on the job by the project owner, a Certified Welder shall receive an additional \$1.00 per hour.

**FOREMAN REQUIREMENTS:**

The first Dockbuilder/Pile Driver on the job shall be designated a Foreman.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**SHIFT DIFFERENTIAL:**

- When a 2 shift schedule (including a day shift) is established, the day shift shall be established on an 8 hour basis. The second shift shall be established on an 8 hour basis and receive an additional 113% of the wage rate.
- When a three shift schedule is established, all three shifts shall be established on an 8 hour basis, but the second and third shifts shall receive an additional 113% of the wage rate.
- Benefits on shift work shall be paid at the straight-time rate.

**OVERTIME:**

Hours in excess of 8 per day, Monday through Friday, and all hours on Saturdays shall be paid at time and one-half the hourly rate. All hours on Sundays and holidays shall be paid at double the hourly rate.

**RECOGNIZED HOLIDAYS:** New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Veterans' Day, Presidential Election Day, Thanksgiving Day, Christmas Day. Veterans' Day may be switched with the day after Thanksgiving.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Drywall Finisher**

**PREVAILING WAGE RATE**

	05/29/24
Foreman	W47.75 B31.11 T78.86
General Foreman	W49.92 B31.11 T81.03
Journeyman	W43.41 B31.11 T74.52

**Craft: Drywall Finisher**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
	40%	50%		60%	70%		80%	90%		
6 Months										
Benefits	Intervals	1 to 2 =	11.90	Intervals	3 to 4 =	15.03	Intervals	5 to 6 =	18.84	

**Ratio of Apprentices to Journeymen - 1:4**

**Craft: Drywall Finisher**

**COMMENTS/NOTES**

The regular workday shall consist of 8 hours between 7:00 AM and 5:30 PM.

**SHIFT DIFFERENTIALS:**

- The second shift shall receive an additional 10% of the hourly rate, per hour, and the third shift shall receive an additional 15% of the hourly rate, per hour.
- When 3 shifts are worked, the second shift shall receive 8 hours pay for 7.5 hours of work, and the third shift shall receive 8 hours pay for 7 hours of work.
- Shift work must run for a minimum of 5 consecutive workdays.

**OVERTIME:**

- Hours in excess of 8 per day, Monday through Friday, and all hours on Saturdays shall be paid at time and one-half the regular rate, inclusive of benefits. All hours on Sundays and holidays shall be paid at double the regular rate, inclusive of benefits.
- Saturday or Sunday may be used to make up a day lost to inclement weather, at straight time.

**RECOGNIZED HOLIDAYS:** New Year's Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Saturday holiday observed the preceding Friday. Sunday holiday observed the following Monday.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

County - ESSEX

**Craft: Electrician**

**PREVAILING WAGE RATE**

	06/01/24
Assistant General Foreman	W76.74 B47.96 T124.70
Foreman	W73.59 B45.99 T119.58
General Foreman (150 + Journeyman workers on job site)	W84.92 B53.08 T138.00
General Foreman (23-149 Journeyman workers on job site)	W79.25 B49.53 T128.78
Journeyman as a Crane Operator, as a Welder, as a Cable Splicer	W73.59 B45.99 T119.58
Journeyman on Radio Tower Work	W76.74 B47.96 T124.70
Journeyman Wireman	W62.90 B39.31 T102.21
Layout Man	W68.56 B42.85 T111.41

**Craft: Electrician**

**APPRENTICE RATE SCHEDULE**

<u>INTERVAL</u>	<u>PERIOD AND RATES</u>										
Yearly	17.95	23.39	29.91	35.89	41.87						
Benefit =	11.22	14.62	18.69	22.43	26.17						

**Ratio of Apprentices to Journeymen - 2:3**

**Craft: Electrician**

**COMMENTS/NOTES**

APPRENTICE RATE SCHEDULE AS OF 6-1-23:

Interval	Period and Rates				
Yearly	18.43	24.57	30.71	36.85	42.99
Benefits	11.52	15.36	19.19	23.03	26.87

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**APPRENTICE RATE SCHEDULE AS OF 6-1-24:**

Interval	Period and Rates				
Yearly	18.87	25.16	31.45	37.74	44.03
Benefits	11.79	15.73	19.66	23.59	27.52

**THESE RATES ALSO APPLY TO THE FOLLOWING TYPES OF WORK:**

- All fire and burglar alarm work.
- All fiber optic work.
- Teledata work in new construction or involving 16 instruments or more.
- All residential construction (single family homes and apartments) of 5 units or more. Note: fire walls alone are not a determining criteria.

**HIGH WORK:**

- 40 feet above ground/floor: +22% of the Total Rate
- Transmission towers, and Smokestacks: +22% of the Total Rate

**FOREMAN REQUIREMENTS:**

- On any job where there is only 1 Journeyman electrician, who lays out his or her own job from plans, that electrician shall receive the Foreman rate.
- On any job where there are 2 or more electricians, 1 shall be a Foreman.
- On all jobs, every 10 electricians shall have 1 designated a Foreman.
- On any job where there are 23 or more electricians, 1 shall be a General Foreman.
- On any job where there are 50 or more electricians, 1 shall be an Assistant General Foreman, and 1 shall be a General Foreman.

The regular workday is 8 hours, between 8:00 AM and 4:30 PM.

**SHIFT DIFFERENTIAL:**

- Shift work must run for a minimum of 5 consecutive workdays.
- 1st Shift (between 8:00 AM and 4:30 PM)
- 2nd Shift (between 4:30 PM and 12:30 AM) shall receive 8 hours pay for 7.5 hours of work, plus an additional 10% of the hourly rate, per hour, inclusive of benefits.
- 3rd Shift: (between 12:30 AM and 8:00 AM) shall receive 8 hours pay for 7 hours of work, plus an additional 15% of the hourly rate, per hour, inclusive of benefits.

**OVERTIME:**

- Hours before or after the regular workday, Monday through Friday, that are not shift work, and all hours on Saturdays shall be paid at time and one-half the hourly rate, inclusive of benefits. All hours on Sundays and holidays shall be paid at double the hourly rate, inclusive of benefits.
- Four 10-hour days may be worked, Monday through Thursday, between 7:00 AM and 6:30 PM, at straight time.

**RECOGNIZED HOLIDAYS:** New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans Day, Thanksgiving Day, Christmas Day. Sunday holidays will be observed the following Monday.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Electrician - Teledata (15 Instruments and Less)**

**PREVAILING WAGE RATE**

	12/02/24
Journeyman Technician (1-2 workers on job)	W0.00 B0.00 T76.66
Master Tech./Gen. Foreman (over 25 workers on job)	W0.00 B0.00 T97.89
Senior Tech./Asst. Gen. Foreman (16-25 workers on job)	W0.00 B0.00 T90.10
Technician A/Foreman (9-15 workers on job)	W0.00 B0.00 T86.57
Technician B/Foreman (4-8 workers on job)	W0.00 B0.00 T83.03
Technician C/Foreman (2-3 workers on job)	W0.00 B0.00 T79.49

**Craft: Electrician - Teledata (15 Instruments and Less)**

**APPRENTICE RATE SCHEDULE**

<u>INTERVAL</u>	<u>PERIOD AND RATES</u>									
6 Months	35%	35%	40%	43%	48%	54%	61%	67%	74%	81%
Benefit			58.5% of	Journeyman	Tech.	wage	rate			

**Ratio of Apprentices to Journeymen - 2:3**

**Craft: Electrician - Teledata (15 Instruments and Less)**

**COMMENTS/NOTES**

NOTES:

- 1) These rates are for service, maintenance, moves and/or changes affecting 15 instruments or less. These rates may NOT be used for any new construction or any fiber optic work.
- 2) The number of workers on the jobsite is the determining factor for which Foreman category applies.

The regular workday is 8 hours, between 8:00 AM and 5:30 PM.

SHIFT DIFFERENTIAL:

- Shift work must run for a minimum of 5 consecutive workdays.
- 1st Shift (between 8:00 AM and 4:30 PM)
- 2nd Shift (between 4:30 PM and 12:30 AM) shall receive 8 hours pay for 7.5 hours of work, plus an additional 10% of the regular rate, per hour, inclusive of benefits.
- 3rd Shift: (between 12:30 AM and 8:00 AM) shall receive 8 hours pay for 7 hours of work, plus an additional 15% of the

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

regular rate, per hour, inclusive of benefits.

**OVERTIME:**

Hours before or outside the regular workday, Monday through Friday, that are not shift work, and the first 10 hours on Saturday shall be paid at time and one-half the regular rate, inclusive of benefits. Hours in excess of 10 on Saturday and all hours worked on Sunday and holidays shall be paid at double the regular rate, inclusive of benefits.

- Four 10-hour days may be worked between Monday and Friday, between the hours of 7:00 AM and 5:30 PM. A make-up day may be used for the day not being worked during the four 10-hour day schedule if a holiday occurs during the week or for any other conditions that prevent an employee from working during the four 10-hour day schedule.

**RECOGNIZED HOLIDAYS:** New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans Day, Thanksgiving Day, Christmas Day. Sunday holidays will be observed the following Monday. Saturday holidays will be observed the preceding Friday.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Electrician - Teledata (16 Instruments & More)**

**PREVAILING WAGE RATE**

See "Electrician" Rates

**Craft: Electrician - Teledata (16 Instruments & More)**

**COMMENTS/NOTES**

\*\*\*See ELECTRICIAN Rates\*\*\*



**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Electrician- Outside Commercial**

**PREVAILING WAGE RATE**

	06/03/24
Assistant General Foreman	W76.74 B48.54 T125.28
Equipment Repairman	W62.90 B39.78 T102.68
Equipment Serviceman	W62.90 B39.78 T102.68
Foreman	W73.59 B46.55 T120.14
General Foreman (150 + Journeyman workers on job site)	W84.92 B53.71 T138.63
General Foreman (23-149 Journeyman workers on job site)	W79.25 B50.13 T129.38
Groundsman (performs empty conduit installations on roadways)	W42.14 B26.65 T68.79
Journeyman as a Crane Operator, as a Welder, as a Cable Splicer	W73.59 B46.55 T120.14
Journeyman as a Lineman, as a Wireman	W62.90 B39.78 T102.68
Journeyman- Layout Man	W68.56 B43.36 T111.92
X-Ray Journeyman Technician	W62.90 B39.78 T102.68

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Electrician- Outside Commercial**

**APPRENTICE RATE SCHEDULE**

<b>INTERVAL</b>	<b>PERIOD AND RATES</b>									
Yearly	34.88	37.78	40.69	43.60	46.50	49.41	52.32			
Benefits	63.25%	of	Appren	tice	Wage	Rate				

**Craft: Electrician- Outside Commercial**

**COMMENTS/NOTES**

APPRENTICE RATE SCHEDULE AS OF 5-30-22:

INTERVAL	PERIOD AND RATES									
Yearly	35.89	38.88	41.87	44.87	47.86	50.85	53.84			
Benefits	63.25% of Apprentice Wage Rate									

APPRENTICE RATE SCHEDULE AS OF 5-29-23:

INTERVAL	PERIOD AND RATES									
Yearly	36.85	39.92	42.99	46.07	49.14	52.21	55.28			
Benefits	63.25% of Apprentice Wage Rate									

APPRENTICE RATE SCHEDULE AS OF 6-3-24:

INTERVAL	PERIOD AND RATES									
Yearly	37.74	40.89	44.03	47.18	50.32	53.47	56.61			
Benefits	63.25% of Apprentice Wage Rate									

\* FOR UTILITY WORK PLEASE SEE STATEWIDE RATES

The regular workday is 8 hours, between 8:00 AM and 4:30 PM.

**HIGH WORK:**

40 FEET ABOVE GROUND/FLOOR: +21% OF THE Total Rate.  
Radio towers, Transmission towers and Smokestacks: +21% of the Total Rate.

**FOREMAN REQUIREMENTS:**

On any job where there is only 1 Journeyman electrician, who lays out his or her own job from plans, that electrician shall receive the Foreman rate.  
On any job where there are 2 or more electricians, 1 shall be a Foreman.  
On all jobs, every 11 electricians shall have 1 designated a Foreman.  
On any job where there are 23 or more electricians, 1 shall be a General Foreman.

**SHIFT DIFFERENTIALS:**

2nd Shift (4:30 PM to 12:30 AM): 8 hrs. pay for 7.5 hrs. work + an additional 10% of the regular rate, inclusive of benefits.  
3rd Shift (12:30 AM to 8:00 AM): 8 hrs. pay for 7 hrs. work + an additional 15% of the regular rate per hour, inclusive benefits.

**OVERTIME:**

Hours before or after the regular workday, Monday through Friday, that are not shift work, and all hours on Saturdays shall be paid at time and one-half the hourly rate, inclusive of benefits. All hours on Sundays and Holidays shall be paid at double the hourly rate, inclusive of benefits.

**RECOGNIZED HOLIDAYS:**

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day and Christmas Day. Sunday holidays will be observed the following Monday.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Electrician-Utility Work (North)**

**PREVAILING WAGE RATE**

Rates are located in the "Statewide" rate package

**Craft: Electrician-Utility Work (North)**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
* 6 Months	60%	65%	70%	75%	80%	85%	90%			
Benefits	69% of	Appren	tice	Wage	Rate	for all	intervals			

**Craft: Electrician-Utility Work (North)**

**COMMENTS/NOTES**

Electrician-Utility Work (North) rates are located in the "Statewide" rate package.

\* The apprentice wage rate is paid at the percentage of the Journeyman Lineman wage rate located in the "Statewide" rate package.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Electrician-Utility Work (South)**

**PREVAILING WAGE RATE**

Rates are located in the "Statewide" rate package

**Craft: Electrician-Utility Work (South)**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
6 Months	33.69	36.50	39.31	42.11	44.92	47.73	50.54			
Benefits	29.97	31.72	33.46	35.21	36.96	38.71	40.45			

**Craft: Electrician-Utility Work (South)**

**COMMENTS/NOTES**

Electrician-Utility Work (South) rates are located in the "Statewide" rate package.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

County - ESSEX

**Craft: Elevator Constructor                      PREVAILING WAGE RATE**

	03/29/23
Journeyman	W77.49 B45.23 T122.72

**Craft: Elevator Constructor                      APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
Yearly	34.60	42.62	50.37	58.12						
Benefits	35.56	36.49	38.02	39.55						

**Ratio of Apprentices to Journeymen - 1:1**

**Craft: Elevator Constructor                      COMMENTS/NOTES**

The regular workday shall consist of either 7 or 8 hours to be established at the beginning of the project, between 7:00 AM and 4:30 PM.

**OVERTIME:**

For all hours worked before or after the regular workday, Monday through Friday, and all hours on Saturday and Sunday, shall be paid at double the hourly rate. Holiday pay is one days wages (8 hours) plus double the hourly rate for all hours worked.

**RECOGNIZED HOLIDAYS:** New Year's Day, Presidents' Day, Good Friday, Memorial Day, July 4th, Labor Day, Columbus Day, Veterans' Day, Thanksgiving Day and the day after, Christmas Day. Saturday holidays shall be observed on the previous Friday and Sunday holidays shall be observed on the following Monday.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

County - ESSEX

Craft: Elevator Modernization & Service

**PREVAILING WAGE RATE**

	03/29/23
Journeyman	W60.89 B44.07 T104.96

Craft: Elevator Modernization & Service

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
Yearly	34.60	33.49	39.58	45.67						
Benefits	35.50	36.07	37.52	38.97						

**Ratio of Apprentices to Journeymen - 1:1**

Craft: Elevator Modernization & Service

**COMMENTS/NOTES**

MODERNIZATION (addition, replacement, refurbishing, relocation, or changes in design or appearance, of elevator equipment in existing buildings):

- The regular workday consists of 8 hours, between 7:00 AM and 4:30 PM.

- Overtime:

Hours in excess of 8 per day, or before or after the regular workday, Monday through Friday, and all hours on Saturday and Sunday shall be paid at time and one-half the hourly rate. Holiday pay is one days wages (8 hours) plus time and one-half the hourly rate for all hours worked.

SERVICE (repair or replacement of parts for the purpose of maintaining elevator equipment in good operating condition):

- The regular workday consists of 8 hours, between 6:00 AM and 6:00 PM.

- Overtime:

Hours in excess of 8 per day, or before or after the regular workday, Monday through Friday, and all hours on Saturday shall be paid at time and one-half the hourly rate. All hours on Sunday and holidays shall be paid at double the hourly rate.

RECOGNIZED HOLIDAYS (Modernization and Service): New Year's Day, Presidents' Day, Good Friday, Memorial Day, July 4th, Labor Day, Columbus Day, Veterans' Day, Thanksgiving Day and the day after, Christmas Day. Saturday holidays shall be observed on the previous Friday and Sunday holidays shall be observed on the following Monday.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Glazier                      PREVAILING WAGE RATE**

	05/09/24
* Leadman	W53.43 B31.98 T85.41
Foreman	W55.43 B32.22 T87.65
General Foreman	W57.43 B32.47 T89.90
Journeyman	W51.43 B31.74 T83.17

**Craft: Glazier                      APPRENTICE RATE SCHEDULE**

<u>INTERVAL</u>	<u>PERIOD AND RATES</u>									
6 Months	46%	46%	55%	55%	61%	61%	70%	70%		
Benefits	12.44	12.44	14.76	14.76	18.16	18.16	19.79	19.79		

**Ratio of Apprentices to Journeymen - 1:4**

**Craft: Glazier                      COMMENTS/NOTES**

Hazard/Height Pay: +\$1.00 per hour

\* When there are three (3) men working on a jobsite for three (3) days or longer, 1 Journeyman may be designated as a Leadman for the duration of the job, provided he has his OSHA certification.

**FOREMAN REQUIREMENTS:**

- When there are 4 or more Glaziers on a job, 1 must be designated a Foreman.
- When there are 15 or more Glaziers on a job, 1 must be designated a General Foreman.

The regular workday shall consist of 8 hours, between 7:00 AM and 5:30 PM, Monday to Friday.

**SHIFT DIFFERENTIALS:**

- The second shift shall receive an additional 10% of the hourly rate, per hour, and the third shift shall receive an additional 15% of the hourly rate, per hour.
- When 3 shifts are worked, the second shift shall receive 8 hours pay for 7.5 hours of work, and the third shift shall receive 8 hours pay for 7 hours of work.

**OVERTIME:**

Hours in excess of 8 per day, or before or after the regular workday Monday through Friday, and all hours on Saturdays shall be paid at time and one-half the regular rate. All hours on Sundays and holidays shall be paid at double the regular



**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

rate.

RECOGNIZED HOLIDAYS: New Year's Day, Memorial Day, July 4th, Labor Day, General Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Saturday holiday observed the preceding Friday. Sunday holiday observed the following Monday.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Heat & Frost Insulator**

**PREVAILING WAGE RATE**

	09/25/24
Foreman	W61.97 B39.22 T101.19
General Foreman	W64.31 B40.33 T104.64
Journeyman	W59.44 B38.66 T98.10

**Craft: Heat & Frost Insulator**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
Yearly	27.89	33.09	39.84	46.51						
Benefits	22.35	26.53	29.50	32.61						

**Ratio of Apprentices to Journeymen - 1:3**

**Craft: Heat & Frost Insulator**

**COMMENTS/NOTES**

NOTE: These rates apply to the installing of insulation on hot and cold mechanical systems.

The regular workday shall be 8 hours between 7:00 AM and 3:30 PM. In addition, the regular workday may also be 8 hours between 6:00 AM and 2:30 PM.

**SHIFT DIFFERENTIAL:**

- Shift work must run for a minimum of 5 consecutive workdays.
- Second Shift shall work 7.5 hours and receive 8 hours pay, at the regular rate, plus 25% per hour.
- Third Shift shall work 7 hours and receive 8 hours pay, at the regular rate, plus 30% per hour.

**OVERTIME:**

The first 2 hours in excess of 8 per day, hours outside of the regular workday Monday through Friday that are not shift work, and the first 10 hours on Saturday, shall be paid at time and one-half the regular rate, inclusive of benefits. All hours in excess of 10 per day, and all hours on Sunday and holidays (except Labor Day) shall be paid at double the regular rate, inclusive of benefits. All hours on Labor Day shall be paid at triple the regular rate, inclusive of benefits.

**RECOGNIZED HOLIDAYS:** New Year's Day, President's Day, Memorial Day, July 4th, Labor Day, Veterans' Day, Presidential Election Day, Thanksgiving Day and Christmas Day. Sunday holidays observed the following Monday.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

County - ESSEX

**Craft: Heat & Frost Insulator - Asbestos Worker**

**PREVAILING WAGE RATE**

	09/25/24
Asbestos Helper	W36.89
Abatement	B24.92
	T61.81

**Craft: Heat & Frost Insulator - Asbestos Worker**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
	SEE	HEAT &	FROST	INSULAT OR						

**Ratio of Apprentices to Journeymen - 1:3**

**Craft: Heat & Frost Insulator - Asbestos Worker**

**COMMENTS/NOTES**

NOTE: These rates apply only to the removal of insulation materials/asbestos from mechanical systems, including containment erection and demolition, and placing material in appropriate containers.

The regular workday shall be 8 hours between 7:00 AM and 3:30 PM. In addition, the regular workday may also be 8 hours between 6:00 AM and 2:30 PM.

**SHIFT DIFFERENTIALS:**

- Shift work must run for a minimum of 5 consecutive workdays.
- The second shift shall work 7.5 hours and receive 8 hours pay at the regular rate, plus 25% per hour.
- The third shift shall work 7 hours and receive 8 hours pay at the regular rate, plus 30% per hour.

**OVERTIME:** The first 2 hours in excess of 8 per day, hours outside of the regular workday Monday through Friday that are not shift work, and the first 10 hours on Saturdays, shall be paid at time and one-half the regular rate, inclusive of benefits. All hours in excess of 10 per day, and all hours on Sunday and holidays (except Labor Day) shall be paid at double the regular rate, inclusive of benefits. All hours on Labor Day shall be paid at triple the regular rate, inclusive of benefits.

**RECOGNIZED HOLIDAYS:** New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Veterans' Day, Presidential Election Day, Thanksgiving Day and Christmas Day. Sunday holidays observed the following Monday.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Industrial Painter- Bridges**

**PREVAILING WAGE RATE**

	03/21/24	02/01/25	02/01/26
Foreman	W64.29 B35.91 T100.20	W0.00 B0.00 T102.20	W0.00 B0.00 T104.20
General Foreman	W66.79 B35.91 T102.70	W0.00 B0.00 T104.70	W0.00 B0.00 T106.70
Journeyman	W59.29 B35.91 T95.20	W0.00 B0.00 T97.20	W0.00 B0.00 T99.20

**Craft: Industrial Painter- Bridges**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
	50%	70%	90%							
6 Months										
Benefits	14.10	21.26	27.88							

**Ratio of Apprentices to Journeymen - 1:3**

**Craft: Industrial Painter- Bridges**

**COMMENTS/NOTES**

\* Industrial Painters perform work on all industrial structures, such as bridges.

These rates apply to: All bridges that span waterways, roadways, railways and canyons. All tunnels, overpasses, viaducts and all appurtenances.

**FOREMEN REQUIREMENTS:**

- When there are 4 or more Painters on a job, 1 shall be designated a Foreman.
- When there are 15 or more Painters on a job, 1 shall be designated a General Foreman.

The regular workday shall consist of 8 hours between 7:00 AM and 5:30 PM.

**SHIFT DIFFERENTIALS:**

- The second shift shall receive an additional 10% of the hourly rate, per hour, and the third shift shall receive an additional 15% of the hourly rate, per hour.

**OVERTIME:**

- Hours in excess of 8 per day, Monday through Friday, and all hours on Saturdays and Sundays shall be paid at time and one-half the regular rate. All hours on holidays shall be paid at double the regular rate, except Veterans Day, which shall be paid at time and one-half the regular rate.
- During a regular work week schedule, Saturday may be used as a make-up day lost to inclement weather, paid at the regular rate.
- Four 10-hour days may be worked, at the regular rate, Monday through Thursday. When the four 10-hour day schedule is used, the 11th and 12th hours shall be paid at time and one-half the regular rate. After the 12th hour, a worker shall be paid at double the regular rate. Friday may be used as a make-up day lost to inclement weather, paid at the regular rate.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

RECOGNIZED HOLIDAYS: New Year's Day, President's Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans Day, Thanksgiving Day, Christmas Day. Saturday holiday observed the preceding Friday. Sunday holiday observed the following Monday.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Industrial Painter- Structural Steel**

**PREVAILING WAGE RATE**

	03/21/24	02/01/25	02/01/26
Foreman	W53.03 B33.56 T86.59	W0.00 B0.00 T88.59	W0.00 B0.00 T90.59
General Foreman	W55.53 B33.56 T89.09	W0.00 B0.00 T91.09	W0.00 B0.00 T93.09
Journeyman	W48.03 B33.56 T81.59	W0.00 B0.00 T83.59	W0.00 B0.00 T85.59

**Craft: Industrial Painter- Structural Steel**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
	SEE	INDUST	RIAL	PAINTER	BRIDGES					

**Ratio of Apprentices to Journeymen - 1:3**

**Craft: Industrial Painter- Structural Steel**

**COMMENTS/NOTES**

\* Industrial Painters perform work on all industrial structures, such as water tanks, waste water facilities, refineries, any structural steel work, etc.

These rates apply to: All work in power plants (any aspect). On steeples, on dams, on hangers, transformers, substations, on all open steel, in refineries, tank farms, water/sewerage treatment facilities and on pipelines.

**FOREMEN REQUIREMENTS:**

- When there are 4 or more Painters on a job, 1 shall be designated a Foreman.
- When there are 15 or more Painters on a job, 1 shall be designated a General Foreman.

The regular workday shall consist of 8 hours between 7:00 AM and 5:30 PM.

**SHIFT DIFFERENTIALS:**

- The second shift shall receive an additional 10% of the hourly rate, per hour, and the third shift shall receive an additional 15% of the hourly rate, per hour.

**OVERTIME:**

- Hours in excess of 8 per day, Monday through Friday, and all hours on Saturdays and Sundays shall be paid at time and one-half the regular rate. All hours on holidays shall be paid at double the regular rate, except for Veterans Day, which shall be paid at time and one-half the regular rate.
- During the regular work week schedule, Saturday may be used to make-up a day lost to inclement weather, paid at the regular rate.
- Four 10-hour days may be worked, at the regular rate, Monday through Thursday. When the four 10-hour day schedule is used, the 11th and 12th hours shall be paid at time and one-half the regular rate. After the 12th hour, a worker shall be paid at double the regular rate. Friday may be used as a make-up day lost to inclement weather, paid at the regular rate.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

RECOGNIZED HOLIDAYS: New Year's Day, President's Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans Day, Thanksgiving Day, Christmas Day. Saturday holiday observed the preceding Friday. Sunday holiday observed the following Monday.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Industrial Painter- Water Tanks**

**PREVAILING WAGE RATE**

	03/21/24	02/01/25	02/01/26
Foreman	W54.08 B33.21 T87.29	W0.00 B0.00 T89.29	W0.00 B0.00 T91.29
General Foreman	W56.58 B33.21 T89.79	W0.00 B0.00 T91.79	W0.00 B0.00 T93.79
Journeyman	W49.08 B33.21 T82.29	W0.00 B0.00 T84.29	W0.00 B0.00 T86.29

**Craft: Industrial Painter- Water Tanks**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
	50%	70%	90%							
6 Months										
Benefits	14.10	21.26	27.88							

**Ratio of Apprentices to Journeymen - 1:3**

**Craft: Industrial Painter- Water Tanks**

**COMMENTS/NOTES**

\* Industrial Painters perform work on all industrial structures, such as water tanks, waste water facilities, refineries, any structural steel work, etc.

These rates apply to: All new and repaint water tanks (interior and exterior).

**FOREMEN REQUIREMENTS:**

- When there are 4 or more Painters on a job, 1 shall be designated a Foreman.
- When there are 15 or more Painters on a job, 1 shall be designated a General Foreman.

The regular workday shall consist of 8 hours between 7:00 AM and 5:30 PM.

**SHIFT DIFFERENTIALS:**

- The second shift shall receive an additional 10% of the hourly rate, per hour, and the third shift shall receive an additional 15% of the hourly rate, per hour.

**OVERTIME:**

- Hours in excess of 8 per day, Monday through Friday, and all hours on Saturdays and Sundays shall be paid at time and one-half the regular rate. All hours on holidays shall be paid at double the regular rate, except Veterans Day, which shall be paid at time and one-half the regular rate.
- During a regular work week schedule, Saturday may be used to make-up a day lost to inclement weather, paid at the regular rate.
- Four 10-hour days may be worked, at the regular rate, Monday through Thursday. When the four 10-hour day schedule is used, the 11th and 12th hours shall be paid at time and one-half the regular rate. After the 12th hour, a worker shall be paid at double the regular rate. Friday may be used as a make-up day lost to inclement weather, paid at the regular rate.



**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

RECOGNIZED HOLIDAYS: New Year's Day, President's Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans Day, Thanksgiving Day, Christmas Day. Saturday holiday observed the preceding Friday. Sunday holiday observed the following Monday.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

County - ESSEX

**Craft: Ironworker                      PREVAILING WAGE RATE**

	07/03/24
Rod/Fence Foreman	W53.29 B50.87 T104.16
Rod/Fence Journeyman	W48.44 B50.87 T99.31
Structural Foreman	W55.82 B50.87 T106.69
Structural Journeyman	W50.74 B50.87 T101.61

**Craft: Ironworker                      APPRENTICE RATE SCHEDULE**

<u>INTERVAL</u>	<u>PERIOD AND RATES</u>									
6 Months	50%	60%		Yearly	70%	80%	90%			
Benefits	same as	journeyma n	amount							

**Ratio of Apprentices to Journeymen - 1:4**

**Craft: Ironworker                      COMMENTS/NOTES**

**HAZARDOUS WASTE WORK:** On hazardous waste removal work on a state or federally designated hazardous waste site where the Ironworker is required to wear Level A,B, or C personal protection: + \$3.00 per hour

The regular workday consists of 8 hours between 6:00 AM and 4:30 PM.

**FOREMAN REQUIREMENTS:**

When there are 2 or more Ironworkers on a job, 1 shall be designated a Foreman.

**SHIFT DIFFERENTIALS:**

- When a 2 shift schedule is established, the first, or day shift , shall be established on an 8 hour basis .The second shift shall be established on an 8 hour basis, and receive the regular rate plus 15%.
- When a three shift schedule is established, the first shift shall be established on an 8 hour basis, the second shift on a 7.5 hour basis, and the third shift on a 7 hour basis. The first shift shall receive the regular hourly rate, the second shift shall receive the regular rate plus 15%, and the third shift shall receive the regular rate plus 20%.
- When there is no day shift, and a second or third shift is established, it shall be established on an 8 hour basis.
- When an irregular shift is established for the Ironworker (Structural) classification, the rate shall be paid at time and one-half the regular rate, inclusive of benefits. When an irregular shift is established for the Rod/Fence classification, the shift shall be established on an 8 hour basis and receive the regular rate, plus 20%.

**OVERTIME:**

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

- All hours in excess of 8 per day, or before or after an established shift that are not shift work, and all hours on Saturday, shall be paid at time and one-half the regular rate, inclusive of benefits. All hours on Sunday and holidays shall be paid at double the hourly rate, inclusive of benefits. Saturday may be used as a make-up day for a day lost to inclement weather. If Saturday is not a make-up day, all hours on Saturday shall be paid at time and one-half the hourly rate, inclusive of benefits.

- Four 10-hour days may be worked, Monday to Thursday, at straight time. Friday may be used as a make-up day for a day lost to inclement weather. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half the hourly rate, inclusive of benefits.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans Day, Thanksgiving Day, Christmas Day.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Laborer - Asbestos & Hazardous Waste Removal**

**PREVAILING WAGE RATE**

	08/21/24
Foreman	W45.88 B26.21 T72.09
Journeyman (Handler)	W40.78 B26.21 T66.99

**Craft: Laborer - Asbestos & Hazardous Waste Removal**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
Yearly	24.47	28.55	32.62	36.70						
Benefits	22.31	for	all	intervals						

**Ratio of Apprentices to Journeymen - \***

\* Ratio of apprentices to journeymen shall not be more than one apprentice for the first journeyman and no more than one (1) apprentice for each additional three (3) journeymen.

**Craft: Laborer - Asbestos & Hazardous Waste Removal**

**COMMENTS/NOTES**

NOTE: These rates apply to work in connection with Asbestos, Radiation, Hazardous Waste, Lead, Chemical, Biological, Mold Remediation and Abatement.

The regular workday shall be 8 hours.

**OVERTIME:**

- Hours in excess of 8 per day, Monday through Saturday, and all hours on Sunday and holidays shall be paid at time and one-half the regular rate.
- Benefits on ALL overtime hours shall be paid at straight time.

**RECOGNIZED HOLIDAYS:** New Year's Day, President's Day, Easter, Memorial Day, July 4th, Labor Day, Veterans Day, Thanksgiving Day, Christmas Day. (Holidays start at 12:00 am).

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Laborer - Building**

**PREVAILING WAGE RATE**

	08/28/24
Class A Journeyman	W39.25 B33.17 T72.42
Class B Journeyman	W38.25 B33.17 T71.42
Class C Journeyman	W32.51 B33.17 T65.68
Foreman	W44.16 B33.17 T77.33
General Foreman	W49.06 B33.17 T82.23

**Craft: Laborer - Building**

**APPRENTICE RATE SCHEDULE**

<u>INTERVAL</u>	<u>PERIOD AND RATES</u>									
	60%	70%	80%	90%	of Class B	wage rate				
6 Months										
Benefit	29.92	29.92	29.92	29.92						

**Ratio of Apprentices to Journeymen - \***

\* Ratio of apprentices to journeymen shall not be more than one apprentice for the first journeyman and no more than one (1) apprentice for each additional three (3) journeymen.

**Craft: Laborer - Building**

**COMMENTS/NOTES**

CLASS A: Specialist laborer including mason tender or concrete pour crew; scaffold builder (scaffolds up to 14 feet in height); operator of forklifts, Bobcats (or equivalent machinery), jack hammers, tampers, motorized tampers and compactors, vibrators, street cleaning machines, hydro demolition equipment, riding motor buggies, conveyors, burners; and nozzle men on gunite work.

CLASS B: Basic laborer - includes all laborer work not listed in Class A or Class C.

CLASS C: Janitorial-type light clean-up work associated with the TURNOVER of a project, or part of a project, to the owner. All other clean-up work is Class B.

The regular workday shall be 8 hours between 6:00 AM and 6:00 PM.

**SHIFT DIFFERENTIALS:**

- Shift work must run for a minimum of 5 consecutive workdays.

- When a 2-shift schedule is worked, including a day shift, both shifts shall be established on the basis of 8 hours pay for 8 hours worked. The second shift shall receive the regular rate plus an additional 10%.

- When a 3-shift schedule is worked, the day shift shall be established on the basis of 8 hours pay for 8 hours worked, the second shift shall be established on the basis of 8 hours pay for 7.5 hours worked, and the third shift shall be established

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

on the basis of 8 hours pay for 7 hours worked. The day shift shall receive the regular rate, the second shift shall receive the regular rate plus an additional 10%, and the third shift shall receive the regular rate plus an additional 15%.

- When a second or third shift is worked with no day shift, the second or third shift shall be established on the basis of 8 hours pay for 8 hours worked. The second shift shall receive the regular rate plus an additional 10%, and the third shift shall receive the regular rate plus an additional 15%.

- When an irregular shift must be established this shift shall receive the regular rate plus an additional 10%.

**OVERTIME:**

- Hours in excess of 8 per day, or outside the regular workday that are not shift work, Monday through Friday, and all hours on Saturdays shall be paid at time and one-half the regular rate. Saturday may be used as a make-up day (paid at straight time) for a day lost to inclement weather, or for a holiday that is observed during the work week, Monday through Friday. All hours on Sundays and holidays shall be paid at double the regular rate.

- Four 10-hour days may be worked Monday to Thursday, at straight time, with Friday used a make-up day for a day lost to inclement weather. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half the regular rate.

- Benefits on ALL overtime hours shall be paid at time and one-half.

**RECOGNIZED HOLIDAYS:** New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Veterans Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Laborer - Heavy & General**

**PREVAILING WAGE RATE**

Rates are located in the  
"Statewide" rate package

**Craft: Laborer - Heavy & General**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
1000 Hours	60%	70%	80%	90%						
Benefit	25.08	for	all	intervals						

**Ratio of Apprentices to Journeymen - \***

\* No more than 1 apprentice for the first journeyman and no more than 1 apprentice for each additional 3 journeymen.

As of 3-1-25, benefits shall be 26.13.

As of 3-1-26, benefits shall be 27.13.

**Craft: Laborer - Heavy & General**

**COMMENTS/NOTES**

Heavy & General Laborer rates are located in the "Statewide" rate package.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

County - ESSEX

**Craft: Laborer-Residential and Modular Construction**

**PREVAILING WAGE RATE**

	04/01/23
* Skilled Tradesman (only applies to Modular Construction)	W27.90 B5.45 T33.35
Foreman (person directing crew, regardless of his skill classification)	W31.90 B5.45 T37.35
Laborer (for single family and stand-alone duplex owned by single owner)	W17.85 B2.95 T20.80
Residential and Modular Construction Laborer	W23.90 B5.45 T29.35

**Craft: Laborer-Residential and Modular Construction**

**APPRENTICE RATE SCHEDULE**

<u>INTERVAL</u>	<u>PERIOD AND RATES</u>									
	As shown	800 hours	600 hours	600 hours						
wage & benefits	70%	80%	90%							

Ratio of Apprentices to Journeymen-

One (1) apprentice shall be allowed for the first journeyman on site and no more than one (1) additional apprentice for each additional three (3) journeymen on site.

**Craft: Laborer-Residential and Modular Construction**

**COMMENTS/NOTES**

\* SKILLED TRADESMAN- any worker doing work not typically done by a Building Laborer. Some examples are installing interior doors, sheet rock, hooking up appliances, installing light fixtures, installing railing systems, etc. Please note where local building codes require that certain work be performed under the supervision of a licensed tradesman (i.e. Plumber, Electrician, etc.) Laborers shall work under such supervision.

RESIDENTIAL CONSTRUCTION- All residential construction (not commercial), single-family, stand-alone duplex houses, townhouses and multi-family buildings of not more than four (4) floors. Each housing unit must be fully and independently functional; each housing unit must have its own kitchen and bathroom. The definition includes all incidental items such as site work, parking areas, utilities, streets and sidewalks. Please note the construction must be Residential in nature. A First Floor at or below grade may contain commercial space not to exceed 50% square footage of the floor; at least 50% of the First Floor must contain living accommodations or related nonresidential uses (e.g. laundry space, recreation/hobby rooms, and/or corridor space). Basement stories below grade used for storage, parking, mechanical systems/equipment, etc., are considered basement stories which are not used in determining the building's height. An attic is an unfinished space located immediately below the roof. Such space is not used in determining a building's height even if used for storage purposes. In addition, barracks and dormitories are not considered residential projects.

MODULAR RESIDENTIAL CONSTRUCTION- all aspects of modular residential construction (not commercial) at the site of installation of structures of no more than four (4) stories, including all excavation and site preparation, footings and



**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

foundation systems whether poured on-site or prefabricated, all underground waterproofing, underground utilities, concrete slabs, sidewalks, driveways, paving, hardscape and landscaping. Please note the construction must be Residential as defined above. All work performed by the Set Crew (the crew of workers who set the modular boxes on the foundation), including the rigging, setting, attaching and assembly of all modules and structural members, preparation of the foundation to accept modules, such as sill plates, connection of all in-module and under-module connections including, but not limited to, plumbing, electrical, HVAC, fire suppression, CATS, telephone, television/internet, and fiber optic, the building or installation of any porches or decks regardless of material or method of construction, the on-site installation of, or completion of any roof system, doors, windows and fenestrations, including flashing, gutter and soffit systems, waterproofing, insulation and interior and exterior trim work, and painting. Please note that modular construction does not include on-site stick built construction, tip up construction or panel built construction.

The regular workday shall be 8 hours between 6:00 AM and 6:00 PM.

**OVERTIME:**

Hours worked in excess of 8 per day/40 per week, Monday through Saturday, and all hours worked on Sunday and holidays shall be paid at time and one-half the hourly rate.

**RECOGNIZED HOILDAYS:**

New Year's Day, Martin Luther King Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day and Christmas Day.





**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Operating Engineer - Field Engineer**

**PREVAILING WAGE RATE**

Rates are located in the  
"Statewide" rate package

**Craft: Operating Engineer - Field Engineer**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
Yearly	70%	75%	of Rod/	Chainman	Wage					
Yearly			80%	90%	Transit/	Instrument	man	Wage		

**Ratio of Apprentices to Journeymen - \***

\* No more than 1 Field Engineer Apprentice per Survey Crew.

**Craft: Operating Engineer - Field Engineer**

**COMMENTS/NOTES**

Operating Engineer - Field Engineer rates are located in the "Statewide" rate package.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

County - ESSEX

**Craft: Painter - Line Striping**

**PREVAILING WAGE RATE**

	12/03/24
Apprentice (1st year)	W31.33 B16.18 T47.51
Apprentice (2nd year)	W35.74 B27.13 T62.87
Foreman (Charge Person)	W45.12 B27.91 T73.03
Journeyman 1 (at least 1 year of working exp. as a journeyman)	W40.35 B27.91 T68.26
Journeyman 2 (at least 2 years of working exp. as a journeyman)	W44.12 B27.91 T72.03

**Craft: Painter - Line Striping**

**APPRENTICE RATE SCHEDULE**

<u>INTERVAL</u>	<u>PERIOD AND RATES</u>									

**Ratio of Apprentices to Journeymen - 1:1**

**Craft: Painter - Line Striping**

**COMMENTS/NOTES**

**OVERTIME:**

Hours in excess of 8 per day, Monday through Saturday, and all hours on Sundays and holidays shall be paid at time and one-half the hourly rate.

**RECOGNIZED HOLIDAYS:** New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Veterans Day, Thanksgiving Day and Christmas Day. Veterans Day may be substituted for the day after Thanksgiving.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

County - ESSEX

**Craft: Paperhanger                      PREVAILING WAGE RATE**

	05/29/24
Foreman	W53.79 B30.71 T84.50
Journeyman	W48.90 B30.71 T79.61

**Craft: Paperhanger                      APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
	SEE	COMME	CIAL	PAINTER						
		R								

**Craft: Paperhanger                      COMMENTS/NOTES**

**FOREMEN REQUIREMENTS:**

- When there are 4 or more Paperhangers on a job, 1 shall be designated a Foreman.

The regular workday shall consist of 8 hours between 7:00 AM and 5:30 PM.

**SHIFT DIFFERENTIALS:**

- The second shift shall receive an additional 10% of the hourly rate, per hour, and the third shift shall receive an additional 15% of the hourly rate, per hour.

**OVERTIME:**

- Hours in excess of 8 per day, Monday through Friday, and all hours on Saturdays shall be paid at time and one-half the regular rate. All hours on Sundays and holidays shall be paid at double the regular rate.
- Saturday or Sunday may be used to make up a day lost to inclement weather, at straight time.
- Four 10-hour days may be worked, at straight time, Monday through Friday.

**RECOGNIZED HOLIDAYS:** New Year's Day, President's Day, Memorial Day, July 4th, Labor Day, General Election Day, Veterans Day, Thanksgiving Day, Christmas Day



**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

hours on Sundays and holidays shall be paid at double time, inclusive of benefits.

NOTE: Maintenance work is work to repair, restore, or improve the efficiency of existing facilities. This does NOT apply to ANY new construction.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays are observed the following Monday.



**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Plasterer                      PREVAILING WAGE RATE**

See Bricklayer, Stone Mason Rates

**Craft: Plasterer                      COMMENTS/NOTES**

\*\*\*See BRICKLAYER, STONE MASON Rates\*\*\*

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Plumber                      PREVAILING WAGE RATE**

	05/01/24
Foreman	W65.33 B43.22 T108.55
General Foreman	W69.56 B43.22 T112.78
Journeyman	W60.49 B43.22 T103.71

**Craft: Plumber                      APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
Yearly	30%	45%	55%	65%	75%					
Benefits	18.23	24.72	27.02	29.31	31.60					

**Ratio of Apprentices to Journeymen - \***

\* Employers may employ 1 apprentice on any job where 1 or 2 journeymen are employed. Thereafter, 1 apprentice may be employed for every 4 journeymen.

**Craft: Plumber                      COMMENTS/NOTES**

**FOREMAN REQUIREMENTS:**

- On any job having 2 or more Plumbers, 1 shall be designated as a Foreman.
- On any job having 9 or more Plumbers, 2 shall be designated as Foremen.

The regular workday consists of 8 hours, between 7:00 AM and 4:30 PM.

**SHIFT DIFFERENTIALS:**

- Shift work must continue for a minimum of 5 consecutive workdays.
- When two shifts are worked, the second shift shall work 7.5 hours and receive 8 hours pay, at a rate equal to the regular rate plus 10%, inclusive of benefits.
- When a third shift is worked, the third shift shall work 7 hours and receive 8 hours pay, at a rate equal to the regular rate plus 15%, inclusive of benefits.

**OVERTIME:**

- All hours in excess of 8 per day, or before or after the regular workday that are not shift work, Monday through Friday, and all hours on Saturday, shall be paid at time and one-half the regular rate, inclusive of benefits. All hours on Sunday and holidays shall be paid at double the hourly rate, inclusive of benefits.
- Four 10-hour days may be worked, Monday to Thursday, at straight time. Friday may be used as a make-up day for a lost day. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half the regular rate, inclusive of benefits.

**RECOGNIZED HOLIDAYS:** New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

County - ESSEX

**Craft: Roofer                      PREVAILING WAGE RATE**

	06/01/24
Foreman	W47.52 B32.34 T79.86
Journeyman	W44.52 B32.34 T76.86

**Craft: Roofer                      APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
6 Months	17.80	22.26	26.71	28.94	31.16	33.39	35.62	40.07		
Benefits	2.19	2.19	28.34	28.34	28.34	28.34	28.34	28.34		

**Ratio of Apprentices to Journeymen - \***

- \* [A] For roofing jobs that are of the 1 or single ply nature: 1:2 or fraction thereof
- [B] For roofing jobs on new built up roofs: 1:3 or fraction thereof
- [C] For roofing jobs that are of a tear-off nature: 1:2 or fraction thereof
- [D] For re-roofing jobs {not requiring complete removal of existing systems; installation done over existing roof}: 1:3 or fraction thereof

**Craft: Roofer                      COMMENTS/NOTES**

Pitch: +.50 per hour

Mop Man: +.30 per hour

The regular workday consists of 8 hours between 8:00 AM and 4:30 PM.

**OVERTIME:**

Hours in excess of 8 per day, or before or after the regular workday, Monday through Friday, and all hours on Saturdays, Sundays, and holidays shall be paid at time and one-half the regular rate.

**RECOGNIZED HOLIDAYS:** New Year's Day, Good Friday, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Sheet Metal Sign Installation**

**PREVAILING WAGE RATE**

	04/17/24
Foreman	W44.19 B43.87 T88.06
Journeyman	W41.69 B43.87 T85.56

**Craft: Sheet Metal Sign Installation**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
1000 hours	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%
Benefits	14.62	16.66	18.72	20.79	23.33	25.43	27.52	29.62	31.73	33.82

**Ratio of Apprentices to Journeymen - 1:3**

**Craft: Sheet Metal Sign Installation**

**COMMENTS/NOTES**

**FOREMAN REQUIREMENT:**

When there are 6 or more Sheet Metal Sign Installers on a job, 1 shall be designated a Foreman.

The regular workday consists of 8 hours, between 7:00 AM and 3:30 PM.

**OVERTIME:**

Hours before or after the regular workday, Monday through Friday, and all hours worked on Saturday shall be paid at time and one-half the hourly rate. All hours on Sunday and holidays shall be paid at double the hourly rate.

Four (4) 10 hour days may be worked, Monday through Friday, at straight time, for projects lasting at least one week in duration. The fifth day may be used as a make-up day at straight time for a day lost due to inclement weather. However, if the fifth day is not a make-up day, all hours worked will be paid at time and one-half the hourly rate.

**RECOGNIZED HOLIDAYS:** New Year's Day, Presidents' Day, Good Friday, Memorial Day, July 4th, Labor Day, Veterans' Day, Thanksgiving Day and the day after, Christmas Day. Saturday holidays observed the preceding Friday, Sunday holidays observed the following Monday.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

County - ESSEX

**Craft: Sheet Metal Worker**

**PREVAILING WAGE RATE**

	06/13/24
Foreman	W61.90 B50.32 T112.22
General Foreman	W62.90 B50.32 T113.22
Journeyman	W57.90 B50.32 T108.22

**Craft: Sheet Metal Worker**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
Yearly	45%	48%	52%	65%	of	Journey	man	Wage	Rate	
Benefit	45%	48%	52%	65%	of	Journey	man	Benefit	Rate	

**Ratio of Apprentices to Journeymen - 1:4**

**Craft: Sheet Metal Worker**

**COMMENTS/NOTES**

**FOREMAN REQUIREMENTS:**

- When there are 2 or more Sheet Metal Workers on a project, 1 must be designated a Foreman.
- When there are 17 or more Sheet Metal Workers on a project, 1 must be designated a General Foreman.
- When there is only 1 Sheet Metal Worker (1 Journeyman) on a project, he/she shall receive \$1.00 more than the regular Journeyman's rate.

The regular workday is 8 hours between 7:00 AM and 4:30 PM.

**SHIFT DIFFERENTIAL:**

- 2nd Shift (3:30 PM - 12:00 AM) : +17% of regular hourly rate
- Shift work must run for a minimum of 5 consecutive workdays.

**OVERTIME:**

- Hours in excess of 8 per day, or before or after the regular workday, that are not shift work, and the first 10 hours on Saturdays shall be paid at time and one-half of the regular rate, inclusive of benefits. Hours in excess of 10 per day on Saturday, and all hours on Sundays and holidays shall be at double the regular rate, inclusive of benefits.
- Four 10-hour days may be worked, Monday through Friday, at straight time, with hours in excess of 10 per day, and hours in excess of 40 per week paid at the overtime rates listed above.

**RECOGNIZED HOLIDAYS:** New Year's Day, Presidents' Day, Good Friday, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays will be observed the following Monday.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Sprinkler Fitter**

**PREVAILING WAGE RATE**

	07/01/24
Foreman	W73.06 B39.71 T112.77
General Foreman	W76.79 B39.71 T116.50
Journeyman	W68.56 B39.71 T108.27

**Craft: Sprinkler Fitter**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
1000 hours									80%	85%
Benefits							Intervals	9 to 10	Jourymn	Ben.

**Ratio of Apprentices to Journeymen - 1:3**

**Craft: Sprinkler Fitter**

**COMMENTS/NOTES**

Apprentice rate schedule for those apprentices registered as of 7-1-13:

Interval                      Period and Rates  
 1000 Hrs. 25% 30% 40% 45% 55% 60% 70% 75% 85% 90%  
 Ben.    14.31 14.31 29.86 29.86 29.86 29.86 Intervals 7-10 Journey. Ben.

Apprentice rate schedule for those apprentices registered as of 7-1-22:

Interval                      Period and Rates  
 1000 Hrs. 30% 35% 40% 45% 50% 55% 60% 70% 85% 95%  
 Ben.    14.31 14.31 29.86 29.86 29.86 29.86 Intervals 7-10 Journey. Ben.

APPRENTICE RATE SCHEDULES AS OF 7-1-24:

Apprentice rate schedule for those apprentices registered as of 7-1-13:

Interval                      Period and Rates  
 1000 Hrs. 25% 30% 40% 45% 55% 60% 70% 75% 85% 90%  
 Ben.    14.41 14.41 30.71 30.71 30.71 30.71 Intervals 7-10 Journey. Ben.

Apprentice rate schedule for those apprentices registered as of 7-1-22:

Interval                      Period and Rates  
 1000 Hrs. 30% 35% 40% 45% 50% 55% 60% 70% 85% 95%  
 Ben.    14.41 14.41 30.71 30.71 30.71 30.71 Intervals 7-10 Journey. Ben.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

The regular workday consists of 8 consecutive hours between 6:00 AM and 4:30 PM.

**FOREMAN REQUIREMENTS:**

- The first Sprinkler Fitter on the job must be designated a Foreman.
- On any job having 12 or more Sprinkler Fitters, one must be designated a General Foreman.

**SHIFT DIFFERENTIALS:**

- Shift work must run for a minimum of 2 consecutive workdays.
- 2nd and 3rd shift shall receive an additional 15% of the regular rate, per hour.
- Any "off hours" shift starting at 8:00 PM or later shall receive an additional 25% of the regular rate, per hour.

**OVERTIME:**

The first 2 hours in excess of 8 per day, after the regular workday that are not shift work, Monday through Friday, shall be paid at time and one-half the regular rate. Hours worked in excess of 10 per day, Monday through Friday, and all hours on Saturday, Sunday and holidays, shall be paid double the regular rate.

Four 10 hour days may be worked, Monday through Friday, at straight-time.

**RECOGNIZED HOLIDAYS:** New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Veterans Day, Thanksgiving Day, Christmas Day.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Tile Finisher-Marble**

**PREVAILING WAGE RATE**

	07/01/24
Finisher	W49.99 B37.54 T87.53

**Craft: Tile Finisher-Marble**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
750 Hours	40%	60%	65%	70%	75%	85%	95%			
Benefits	Interval 1	thru 5 =	75% of	jyrm. ben	rate	Interval 6	thru 7 =	full jyrm	benefit	rate

**Ratio of Apprentices to Journeymen - 1:4**

**Craft: Tile Finisher-Marble**

**COMMENTS/NOTES**

**OVERTIME:**

Hours in excess of 7 per day, Monday through Friday, and the first 7 hours on Saturdays shall be paid at time and one half the regular rate, inclusive of benefits. Hours in excess of 7 on Saturdays and all hours on Sundays and holidays shall be paid at double the regular rate, inclusive of benefits.

**RECOGNIZED HOLIDAYS:** New Year's Day, Presidents' Day, Good Friday, Memorial Day, July 4th, Labor Day, Columbus Day, Veterans' Day, Thanksgiving Day and the day after, Christmas Day. Sunday holidays observed the following Monday.



**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Tile Setter - Ceramic**

**PREVAILING WAGE RATE**

	12/03/24
Finisher	W49.21 B33.44 T82.65
Setter	W64.16 B36.72 T100.88

**Craft: Tile Setter - Ceramic**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
750 hours	35%	40%	50%	55%	60%	65%	70%	75%	80%	90%

**Ratio of Apprentices to Journeymen - 1:4**

**Craft: Tile Setter - Ceramic**

**COMMENTS/NOTES**

**OVERTIME:**

Hours in excess of 7 per day, and the first 10 hours on Saturdays shall be paid at time and one-half the hourly rate. All hours on Saturdays after 10 hours shall be paid double the hourly rate. All hours on Sundays and holidays shall be paid at double the hourly rate.

**RECOGNIZED HOLIDAYS:** New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day, Christmas Day.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Tile Setter - Marble**

**PREVAILING WAGE RATE**

	07/01/24
Tile Setter	W63.92 B40.20 T104.12

**Craft: Tile Setter - Marble**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
750 Hours	40%	60%	65%	70%	75%	85%	95%			
Benefits	Interval	1 thru 5 =	75% of	jyrm. ben	rate	Interval 6	thru 7=	full jyrm	benefit	rate

**Ratio of Apprentices to Journeymen - 1:4**

**Craft: Tile Setter - Marble**

**COMMENTS/NOTES**

**OVERTIME:**

Hours in excess of 7 per day, Monday through Friday, and the first 7 hours on Saturdays shall be paid at time and one-half the regular rate, inclusive of benefits. Hours in excess of 7 on Saturdays, and all hours on Sundays and holidays shall be paid at double the regular rate, inclusive of benefits.

**RECOGNIZED HOLIDAYS:** New Year's Day, Presidents' Day, Good Friday, Memorial Day, July 4th, Labor Day, Columbus Day, Veterans' Day, Thanksgiving Day and the day after, Christmas Day. Sunday holidays observed the following Monday.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Tile Setter - Mosaic & Terrazzo**

**PREVAILING WAGE RATE**

	07/01/24
Grinder or Assistant	W59.37 B41.48 T100.85
Mechanic	W60.98 B41.49 T102.47
Terrazzo Resinous Worker	W50.76 B33.86 T84.62

**Craft: Tile Setter - Mosaic & Terrazzo**

**APPRENTICE RATE SCHEDULE**

INTERVAL	PERIOD AND RATES									
1500 Hours	35%	45%	60%	70%	80%	90%				

**Ratio of Apprentices to Journeymen - 1:5**

**Craft: Tile Setter - Mosaic & Terrazzo**

**COMMENTS/NOTES**

The regular workday consists of 7 hours, between 8:00 AM and 3:30 PM.

**OVERTIME:**

- Hours in excess of 7 per day, or before or after the regular workday, Monday through Friday, and all hours on Saturdays shall be paid at time and one-half the hourly rate. All hours on Sundays and holidays shall be paid at double the hourly rate.

**RECOGNIZED HOLIDAYS:** New Year's Day, Presidents' Day, Good Friday, Monday after Easter, Memorial Day, July 4th, Labor Day, Columbus Day, Veterans' Day, Thanksgiving Day and the day after, Christmas Day. Sunday holidays observed the following Monday.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Truck Driver**

**PREVAILING WAGE RATE**

	05/01/24
Bucket, Utility, Pick-up, Fuel Delivery trucks	W45.41 B43.28 T88.69
Dump truck, Asphalt Distributor, Tack Spreader	W45.41 B43.28 T88.69
Euclid-type vehicles (large, off-road equipment)	W45.51 B43.28 T88.79
Helper on Asphalt Distributor truck	W45.41 B43.28 T88.69
Low Boy Driver	W47.01 B43.28 T90.29
Slurry Seal, Seeding/Fertilizing/ Mulching truck	W45.41 B43.28 T88.69
Straight 3-axle truck	W45.41 B43.28 T88.69
Tractor Trailer (all types)	W45.51 B43.28 T88.79
Vacuum or Vac-All truck (entire unit)	W45.41 B43.28 T88.69
Winch Trailer	W45.61 B43.28 T88.89

**Craft: Truck Driver**

**COMMENTS/NOTES**

**BLENDED RATE:**

When a truck driver is performing work on the site and also serving as a material delivery driver, the driver shall be paid a "blended rate" which shall be 80% of the above-listed wage rates, plus the full benefit rate. This rate shall be used when the driver "round robins" for a minimum of 6 hours during the work day.

**HAZARDOUS WASTE REMOVAL:**

- On hazardous waste removal work on a State designated hazardous waste site where the driver is in direct contact with hazardous materials and when personal protective equipment is required for respiratory, skin, and eye protection, the driver shall receive an additional \$3.00 per hour (with or without protective gear).
- A hazardous waste related certified worker at a designated hazardous waste site who is not working in a zone requiring level A, B or C personal protection shall receive an additional \$1.00 per hour.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

TRUCK FOREMAN: \$.75 cents per hour above regular rate. Overtime shall be increased accordingly.

The regular workday shall be 8 hours, starting between 6:00 AM and 8:00 AM.

**SHIFT DIFFERENTIAL:**

- Shifts starting at 4:00 PM (2nd Shift): + \$3.00 per hour.
- Shifts starting at 12:00 AM (midnight/3rd Shift): time and one-half the hourly rate.
- Shifts starting at a time other than from 6:00 AM to 8:00 AM, when such hours are mandated by the project owner: + \$3.00 per hour.

**OVERTIME:**

- Hours in excess of 8 per day, or before or after the regular workday, Monday through Friday, that are not shift work, and all hours on Saturdays shall be paid at time and one-half the hourly rate. All hours on Sundays and holidays shall be paid at double the hourly rate.
- Employees may work four 10-hour days at straight time, Monday through Thursday, with Friday used as a make-up day for a lost day. If Friday is not a make-up day, then all hours on Friday shall be paid at time and one-half the hourly rate.
- Benefits on overtime shall be \$40.03.
- As of 5-1-23, benefits on overtime shall be \$41.53.
- As of 5-1-24, benefits on overtime shall be \$43.03.

**RECOGNIZED HOLIDAYS:** New Year's Day, President's Day, Memorial Day (Decoration Day), July 4th, Labor Day, Veterans Day, Thanksgiving Day, Christmas Day. Sunday holidays will be observed the following Monday. The day after Thanksgiving may be substituted for Veterans Day.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

**County - ESSEX**

**Craft: Truck Driver-Material Delivery Driver**

**PREVAILING WAGE RATE**

	05/01/24
Driver	W37.62 B43.28 T80.90

**Craft: Truck Driver-Material Delivery Driver**

**COMMENTS/NOTES**

**BLENDED RATE:**

When a truck driver is performing work on the site and also serving as a material delivery driver, the driver shall be paid a "blended rate". See the "Truck Driver" craft for the blended rates.

Truck Foreman/Shop Steward: +\$0.25 per hour

**SHIFT DIFFERENTIALS:**

- 2nd Shift shall receive an additional \$0.50 per hour
- 3rd Shift shall receive time and one-half the hourly rate.

**OVERTIME:**

- Hours in excess of 8 per day, or before or after the regular workday that are not shift work, Monday through Friday, and all hours on Saturday shall be paid at time and one-half the hourly rate. All hours on Sunday and holidays shall be paid at double the hourly rate.

**RECOGNIZED HOLIDAYS:** New Year's Day, President's Day, Memorial Day (Decoration Day), July 4th, Labor Day, Veterans Day, Thanksgiving Day, Christmas Day. Sunday holidays will be observed the following Monday. The day after Thanksgiving may be substituted for Veterans Day.

**NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION**

County - ESSEX

**Craft: Welder                      PREVAILING WAGE RATE**

Welder

**Craft: Welder                      COMMENTS/NOTES**

Welders rate is the same as the craft to which the welding is incidental .

# STATEWIDE RATES



**OPERATING ENGINEERS**    **Rates Expiration Date :**

{For apprentice rates refer to "Operating Engineers" apprentice rates in any county rate package}

The regular workday consists of 8 hours, Monday to Friday, between 6:00 AM and 5:30 PM.

**SHIFT DIFFERENTIALS:**

- Shift work must be established for 5 consecutive workdays.
- Any work started outside of the allowed start time, 6:00 AM to 9:00 AM, except for \* tidal work, shall be considered an irregular shift and paid at straight time, plus 15% for the first eight hours, inclusive of benefits.
- \* FOR TIDAL WORK- a contractor can start their job according to tide schedules (tide schedules are the various high and low tides related to this work), providing the eight hour shift is completed between the hours of 5:00 AM and 6:30 PM.
- All time worked in excess of an established shift (an established shift is a shift that is determined at the time of the bid) shall be paid at the applicable overtime rate. When a portion of an established shift works into Saturday, Sunday or a holiday, that time worked shall be paid at the established shift rate.
- When working with other trades who receive a higher irregular shift differential, these employees shall also receive the higher differential rate.

**OVERTIME:**

- Hours in excess of 8 per day, or outside of the regular workday, Monday through Friday, that are not shift work, and all hours on Saturday shall be paid at time and one-half the regular rate, inclusive of benefits. All hours on Sunday and holidays shall be paid at double the regular rate, inclusive of benefits.
- Four 10-hour days may be worked, Monday through Thursday, at straight time, with all hours on Friday paid at time and one-half the regular rate, inclusive of benefits.

**RECOGNIZED HOLIDAYS:** New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday. When all trades on a particular job site agree, the day after Thanksgiving may be substituted for Veterans Day.

For projects bid after April 1, 2020, on hazardous waste removal work of any kind, including a state or federally designated site, where the operating engineer is required to wear level A, B, or C personal protection, the operating engineer shall receive an hourly wage rate of his regular hourly wage plus \$5.00 per hour.

- An operating engineer working at a hazardous waste removal project or site at a task requiring hazardous waste related certification, but who is not working in a zone requiring level A, B, or C personal protection, shall receive an hourly wage rate of his regular rate plus \$1.00 per hour.

**OPERATING ENGINEERS**    **Rates Expiration Date :**

**Effective Dates:**

07/01/2024			07/01/2025
Rate	Fringe	Total	Total
58.88	39.15	98.03	100.53

**CLASSIFICATIONS:**

A-Frame

Backhoe (combination)

Boom Attachment on loaders (Except pipehook)

Boring & Drilling Machine

Brush Chopper, Brush Shredder, Tree Shredder, Tree Shearer

Bulldozer, finish grade

Cableway

Carryall

Concrete Pump

Concrete Pumping System (Pumpcrete & similar types)

Conveyor, 125 feet or longer

Drill Doctor (Duties include dust collector and maintenance)

Front End Loader (2 cu. yds. but less than 5 cu. yds.)

Grader, finish

Groove Cutting Machine (ride-on type)

Heater Planer

Hoist: Outside Material Tower Hoist (all types including steam, gas, diesel, electric, air hydraulic, single and double drum, concrete, brick shaft caisson, snorkle roof, and other similar types, Except Chicago-boom type) \* receives an additional \$1.00 per hour on 100 ft. up to 199 ft. total height, and an additional \$2.00 per hour on 200 ft. and over total height.

Hydraulic Crane (10 tons & under)

Hydraulic Dredge

Hydro-Axe

Hydro-Blaster

**OPERATING ENGINEERS**    **Rates Expiration Date :**

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
58.88	39.15	98.03	100.53

**CLASSIFICATIONS:**

Jack (screw, air hydraulic, power-operated unit, or console type, Except hand jack or pile load test type)

Log Skidder

Pan

Paver, concrete

Plate & Frame Filter Press

Pumpcrete (unit type)

Pumpcrete, Squeezecrete, or Concrete Pumping machine (regardless of size)

Scraper

Side Boom

Straddle Carrier (Ross and similar types)

Whiphammer

Winch Truck (hoisting)

**OPERATING ENGINEERS**    **Rates Expiration Date :**

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
56.97	39.15	96.12	98.62

**CLASSIFICATIONS:**

- Asphalt Curbing Machine
- Asphalt Plant Engineer
- Asphalt Spreader
- Autograde Curb Trimmer & Sidewalk Shoulder Slipform (CMI & similar types)
- Autograde Curecrete Machine (CMI & similar types)
- Autograde Tube Finisher & Texturing Machine (CMI & similar types)
- Bar Bending Machines (Power)
- Batcher, Batching Plant, & Crusher [On Site]
- Belt Conveyor System
- Boom-Type Skimmer Machine
- Bridge Deck Finisher
- Bulldozer (all sizes)
- Captain (Power Boats)
- Car Dumper (railroad)
- Compressor & Blower unit for loading/unloading of concrete, cement, fly ash, or similar type materials (used independently or truck-mounted)
- Compressor (2 or 3 battery)
- Concrete Breaking Machine
- Concrete Cleaning/Decontamination Machine
- Concrete Finishing Machine
- Concrete Saw or Cutter (ride-on type)
- Concrete Spreader (Hetzl, Rexomatic & similar types)
- Concrete Vibrator

**OPERATING ENGINEERS**    **Rates Expiration Date :**

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
56.97	39.15	96.12	98.62

**CLASSIFICATIONS:**

- Conveyors - under 125 feet
- Crane Signalman
- Crushing Machine
- Directional Boring Machine
- Ditching Machine - Small (Ditchwitch, Vermeer or similar types)
- Dope Pot - Mechanical (with or without pump)
- Dumpster
- Elevator
- Fireman
- Fork Lift (Economobile, Lull & similar types)
- Front End Loader (1 cu. yd. and over but less than 2 cu. yds.)
- Generator (2 or 3 battery)
- Giraffe Grinder
- Goldhofer/Hydraulic Jacking Trailer
- Grader & Motor Patrols
- Grout Pump
- Gunnite Machine (Excluding nozzle)
- Hammer - Vibratory (in conjunction with generator)
- Heavy Equipment Robotics - Operator/Technician
- Hoist (roof, tigger, aerial platform hoist, house car)
- Hopper
- Hopper Doors (power operated)
- Ladder (motorized)

**OPERATING ENGINEERS**    **Rates Expiration Date :**

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
56.97	39.15	96.12	98.62

**CLASSIFICATIONS:**

Laddervator

Locomotive (Dinky-type)

Maintenance Utility Man

Master Environmental Maintenance Technician

Mechanic

Mixer (Except paving mixers)

Pavement Breaker (truck-mounted or small self-propelled ride-on type)

Pavement Breaker - maintenance of compressor or hydraulic unit

Pipe Bending Machine (power)

Pitch Pump

Plaster Pump (regardless of size)

Post Hole Digger (post pounder, auger)

Rod Bending Machines

Roller (black top)

Scale (power)

Seamen Pulverizing Mixer

Shoulder Widener

Silo

Skimmer Machine (boom type)

Steel Cutting Machine (service & maintenance)

Tamrock Drill

Tractor

Transfer Machines

**OPERATING ENGINEERS**     **Rates Expiration Date :**

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
56.97	39.15	96.12	98.62

**CLASSIFICATIONS:**

Tug Captains

Tug Master (Power Boats)

Ultra High Pressure Waterjet Cutting Tool System -  
Operator/Maintenance Technician

Vacuum Blasting Machine - Operator/Maintenance Technician

Vibrating Plant (used with unloading)

Welder & Repair Mechanic

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
51.63	39.15	90.78	93.28

**CLASSIFICATIONS:**

Assistant Engineer/Oiler

Driller's Helper

Field Engineer - Transit man or Instrument man

Maintenance Apprentice (Deckhand)

Maintenance Apprentice (Oiler)

Mechanic's Helper

Off Road Back Dump

Tire Repair & Maintenance

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
49.05	39.15	88.20	90.70

**CLASSIFICATIONS:**

Field Engineer - Rodman or Chainman

TERRITORY  
ENTIRE STATE

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION

OPERATING ENGINEERS     Rates Expiration Date :

Effective Dates:

07/01/2024			07/01/2025
Rate	Fringe	Total	Total
59.21	39.15	98.36	100.86

**CLASSIFICATIONS:**

Lead Engineer, Foreman Engineer, Safety Engineer (minimum)



**OPERATING ENGINEERS**    **Rates Expiration Date :**

**Effective Dates:**

07/01/2024			07/01/2025
Rate	Fringe	Total	Total
60.47	39.15	99.62	102.12

**CLASSIFICATIONS:**

Autograde Pavement Profiler (CMI & similar types)

Autograde Pavement Profiler - Recycle Type (CMI & similar types)

Autograde Placer/Trimmer/Spreader Combination (CMI & similar types)

Autograde Slipform Paver (CMI & similar types)

Backhoe (Excavator)

Central Power Plant

Concrete Paving Machine

Cranes, Derricks, Pile Drivers (all types), under 100 tons with a boom (including jib and/or leads) under 100 ft.

Draglines

Drill, Bauer, AMI and similar types

Drillmaster, Quarrymaster

Drillmaster/Quarrymaster (down-the-hole drill), rotary drill, self-propelled hydraulic drill, self-powered drill

Elevator Grader

Field Engineer-Chief of Party

Front End Loader (5 cu. yards or larger)

Gradall

Grader, Rago

Helicopter Co-Pilot

Helicopter Communications Engineer

Juntann Pile Driver

Locomotive (large)

Mucking Machine

**OPERATING ENGINEERS**     **Rates Expiration Date :**

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
60.47	39.15	99.62	102.12

**CLASSIFICATIONS:**

Pavement & Concrete Breaker (Superhammer & Hoe Ram)

Pile Driver

Prentice Truck

Roadway Surface Grinder

Scooper (loader & shovel)

Shovel (Excavator)

Trackhoe (Excavator)

Tree Chopper with boom

Trenching Machine (cable plow)

Tunnel Boring Machine

Vacuum Truck

**OPERATING ENGINEERS**    **Rates Expiration Date :**

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
55.34	39.15	94.49	96.99

**CLASSIFICATIONS:**

- Chipper
- Compressor (single)
- Concrete Spreader (small type)
- Conveyor Loader (Except elevator graders)
- Engines, Large Diesel (1620 HP) & Staging Pump
- Farm Tractor
- Fertilizing Equipment (operation & maintenance)
- Fine Grade Machine (small type)
- Form Line Grader (small type)
- Front End Loader (under 1 cubic yard)
- Generator (single)
- Grease, Gas, Fuel, & Oil Supply Trucks
- Heaters (Nelson or other type)
- Lights - portable generating light plant
- Mixer, Concrete (small)
- Mulching Equipment (operation & maintenance)
- Power Broom or Sweeper
- Pump (diesel engine & hydraulic - regardless of power)
- Pump (larger than 2 inch suction, including submersible pumps)
- Road Finishing Machine (small type)
- Roller - grade, fill, or stone base
- Seeding Equipment (operation & maintenance)
- Sprinkler & Water Pump Trucks

**OPERATING ENGINEERS**    **Rates Expiration Date :**

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
55.34	39.15	94.49	96.99

**CLASSIFICATIONS:**

Steam Generator or Boiler

Stone Spreader

Tamping Machine (vibrating ride-on type)

Temporary Heating Plant (Nelson or other type, including propane, natural gas, and flow-type units)

Water or Sprinkler Truck

Welding Machine (gas, diesel, or electric convertor, of any type)

Welding System - Multiple (rectifier transformer type)

Wellpoint Systems (including installation by bull gang and maintenance)

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
62.29	39.15	101.44	103.94

**CLASSIFICATIONS:**

Helicopter Pilot/Engineer

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
66.97	39.15	106.12	108.62

**CLASSIFICATIONS:**

Cranes, Derricks, Pile Driver (all types), 100 tons and over and TOWER CRANE with boom (including jib and/or leads) 140 ft. and over

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
65.97	39.15	105.12	107.62

**CLASSIFICATIONS:**

Cranes, Derricks, Pile Driver (all types), 100 tons and over and TOWER CRANE with boom (including jib and/or leads) from 100 ft. to 139 ft.

**OPERATING ENGINEERS**     **Rates Expiration Date :**

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
62.47	39.15	101.62	104.12

**CLASSIFICATIONS:**

Cranes, Derricks, Pile Driver (all types) , under 100 tons with a boom (including jib and/or leads) 140 ft. and over

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
64.97	39.15	104.12	106.62

**CLASSIFICATIONS:**

Cranes, Derricks, Pile Driver (all types), 100 tons and over and TOWER CRANE with a boom (including jib and/or leads) under 100 ft.

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
61.47	39.15	100.62	103.12

**CLASSIFICATIONS:**

Cranes, Derricks, Pile Driver (all types), under 100 tons with a boom (including jib and/or leads) from 100 ft. to 139 ft.

STRUCTURAL STEEL ERECTION     Rates Expiration Date :

{For apprentice rates refer to "Operating Engineers" apprentice rates in any county rate package}

The regular workday consists of 8 hours, Monday to Friday, between 6:00 AM and 5:30 PM.

**SHIFT DIFFERENTIALS:**

- Shift work must be established for 5 consecutive workdays.
- Any work started outside of the allowed start time, 6:00 AM to 9:00 AM, except for \* tidal work, shall be considered an irregular shift and paid at straight time, plus 15% for the first eight hours, inclusive of benefits.
- \* FOR TIDAL WORK- a contractor can start their job according to tide schedules (tide schedules are the various high and low tides related to this work), providing the eight hour shift is completed between the hours of 5:00 AM and 6:30 PM.
- All time worked in excess of an established shift (an established shift is a shift that is determined at the time of the bid) shall be paid at the applicable overtime rate. When a portion of an established shift works into Saturday, Sunday or a holiday, that time worked shall be paid at the established shift rate.
- When working with other trades who receive a higher irregular shift differential, these employees shall also receive the higher differential rate.

**OVERTIME:**

- Hours in excess of 8 per day, or outside of the regular workday, Monday through Friday, that are not shift work, and all hours on Saturday shall be paid at time and one-half the regular rate, inclusive of benefits. All hours on Sunday and holidays shall be paid at double the regular rate, inclusive of benefits.
- Four 10-hour days may be worked, Monday through Thursday, at straight time, with all hours on Friday paid at time and one-half the regular rate, inclusive of benefits.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday. When all trades on a particular job site agree, the day after Thanksgiving may be substituted for Veterans Day.

For projects bid after April 1, 2020, on hazardous waste removal work of any kind, including a state or federally designated site, where the operating engineer is required to wear level A, B, or C personal protection, the operating engineer shall receive an hourly wage rate of his regular hourly wage plus \$5.00 per hour.

- An operating engineer working at a hazardous waste removal project or site at a task requiring hazardous waste related certification, but who is not working in a zone requiring level A, B, or C personal protection, shall receive an hourly wage rate of his regular rate plus \$1.00 per hour.

**Effective Dates:**

	<b>07/01/2024</b>		<b>07/01/2025</b>
Rate	Fringe	Total	Total
64.10	39.15	103.25	105.75

**CLASSIFICATIONS:**

Helicopter Co-Pilot & Communications Engineer

TERRITORY  
ENTIRE STATE

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION

STRUCTURAL STEEL ERECTION      Rates Expiration Date :

**Effective Dates:**

07/01/2024			07/01/2025
Rate	Fringe	Total	Total
60.04	39.15	99.19	101.69

**CLASSIFICATIONS:**

A-Frame

Cherry Picker -10 tons or less (Over 10 tons use crane rate)

Hoist (all types Except Chicago-boom)

Jack (screw, air hydraulic, power-operated unit or console type, Except hand jack or pile load test type)

Side Boom

Straddle Carrier

**STRUCTURAL STEEL ERECTION**      **Rates Expiration Date :**

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
57.38	39.15	96.53	99.03

**CLASSIFICATIONS:**

- Aerial Platform Used On Hoists
- Apprentice Engineer/Oiler with Compressor or Welding Machine
- Captain (Power Boats)
- Compressor (2 or 3 in battery)
- Concrete Cleaning/Decontamination Machine Operator
- Conveyor or Tugger Hoist
- Directional Boring Machine
- Elevator or House Car
- Fireman
- Forklift
- Generator (2 or 3)
- Heavy Equipment Robotics, Operator/Technician
- Maintenance Utility Man
- Master Environmental Maintenance Technician
- Tug Master (Power Boats)
- Ultra High Pressure Waterjet Cutting Tool System Operator/Maintenance Technician
- Vacuum Blasting Machine Operator/Maintenance Technician
- Welding Machines, Gas or Electric Converters on any type-2 or 3 in battery including diesels



**STRUCTURAL STEEL ERECTION**      **Rates Expiration Date :**

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
55.85	39.15	95.00	97.50

**CLASSIFICATIONS:**

Compressor (Single)

Generators

Welding Machines, Gas, Diesel, Or Electric Converters of any type-single

Welding System, Multiple (Rectifier Transformer Type)

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
52.09	39.15	91.24	93.74

**CLASSIFICATIONS:**

Assistant Engineer/Oiler

Drillers Helper

Field Engineer - Transit/Instrument Man

Maintenance Apprentice (Deckhand)

Maintenance Apprentice (Oiler)

Off Road Back Dump

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
59.66	39.15	98.81	101.31

**CLASSIFICATIONS:**

Lead Engineer, Foreman Engineer, Safety Engineer (Minimum)

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
49.05	39.15	88.20	90.70

**CLASSIFICATIONS:**

Field Engineer - Rodman or Chainman

**STRUCTURAL STEEL ERECTION**      **Rates Expiration Date :**

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
60.80	39.15	99.95	102.45

**CLASSIFICATIONS:**

Field Engineer-Chief of Party

Vacuum Truck

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
68.99	39.15	108.14	110.64

**CLASSIFICATIONS:**

Cranes (all cranes, land or floating with booms, including jib, 140 ft. and over, above ground). Derricks (all derricks, land, floating or Chicago Boom type with booms including jib, 140 ft. and over, above ground), and Pile Drivers (all types) 100 tons and over and Tower Cranes.

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
67.33	39.15	106.48	108.98

**CLASSIFICATIONS:**

Cranes (all cranes, land or floating with booms including jib, less than 140 ft. above ground), Derricks (all derricks, land, floating or Chicago Boom type with booms including jib, less than 140 ft. above ground), Pile Drivers (all types), 100 tons and over and Tower Crane.

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
64.49	39.15	103.64	106.14

**CLASSIFICATIONS:**

Cranes (all cranes, land or floating with booms including jib, 140 ft. and over, above ground), Derricks (all derricks, land, floating or Chicago Boom type with booms including jib, 140 ft. and over, above ground), Pile Drivers (all types), under 100 tons.

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
62.83	39.15	101.98	104.48

**CLASSIFICATIONS:**

Cranes (all cranes, land or floating with booms including jib, less than 140 ft. above ground), Derricks (all derricks, land, floating or Chicago Boom type with booms including jib, less than 140 ft. above ground), Pile Drivers (all types), under 100 tons.

TERRITORY  
ENTIRE STATE

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION

STRUCTURAL STEEL ERECTION      Rates Expiration Date :

Effective Dates:

07/01/2024			07/01/2025
Rate	Fringe	Total	Total
64.49	39.15	103.64	106.14

**CLASSIFICATIONS:**

Helicopter Pilot & Engineer

TEST BORING PRELIMINARY TO CONSTRUCTION-SOUTH/WEST      Rates Expiration Date :

THESE RATES APPLY IN THE FOLLOWING COUNTIES ONLY:

Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Hunterdon, Mercer, Monmouth, Ocean, Salem, Sussex, Warren

The regular workday consists of 8 hours, Monday to Friday, between 6:00 AM and 5:30 PM.

SHIFT DIFFERENTIALS:

- Shift work must be established for 5 consecutive workdays.
- Any work started outside of the allowed start time, 6:00 AM to 9:00 AM, except for \* tidal work, shall be considered an irregular shift and paid at straight time, plus 15% for the first eight hours, inclusive of benefits.
- \* FOR TIDAL WORK- a contractor can start their job according to tide schedules (tide schedules are the various high and low tides related to this work), providing the eight hour shift is completed between the hours of 5:00 AM and 6:30 PM.
- All time worked in excess of an established shift (an established shift is a shift that is determined at the time of the bid) shall be paid at the applicable overtime rate. When a portion of an established shift works into Saturday, Sunday or a holiday, that time worked shall be paid at the established shift rate.
- When working with other trades who receive a higher irregular shift differential, these employees shall also receive the higher differential rate.

OVERTIME:

- Hours in excess of 8 per day, or outside of the regular workday, Monday through Friday, that are not shift work, and all hours on Saturday shall be paid at time and one-half the regular rate, inclusive of benefits. All hours on Sunday and holidays shall be paid at double the regular rate, inclusive of benefits.
- Four 10-hour days may be worked, Monday through Thursday, at straight time, with all hours on Friday paid at time and one-half the regular rate, inclusive of benefits.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday. When all trades on a particular job site agree, the day after Thanksgiving may be substituted for Veterans Day.

For projects bid after April 1, 2020, on hazardous waste removal work of any kind, including a state or federally designated site, where the operating engineer is required to wear level A, B, or C personal protection, the operating engineer shall receive an hourly wage rate of his regular hourly wage plus \$5.00 per hour.

- An operating engineer working at a hazardous waste removal project or site at a task requiring hazardous waste related certification, but who is not working in a zone requiring level A, B, or C personal protection, shall receive an hourly wage rate of his regular rate plus \$1.00 per hour.

**Effective Dates:**

07/01/2024			07/01/2025
Rate	Fringe	Total	Total
60.47	39.15	99.62	102.12

**CLASSIFICATIONS:**

Driller

**Effective Dates:**

07/01/2024			07/01/2025
Rate	Fringe	Total	Total
53.63	39.15	92.78	95.28

**CLASSIFICATIONS:**

Driller's Helper

**FREE AIR TUNNEL JOBS**    **Rates Expiration Date :**

{For apprentice rates refer to "Heavy & General" apprentice rates in any county rate package}

The regular workday consists of 8 hours, starting at 7:00 AM or 8:00 AM.

**SHIFT DIFFERENTIALS:**

- Shifts must start at 3:00 PM, 4:00 PM, 12:00 AM, or 1:00 AM, to be considered shift work, except when the project owner mandates special hours of work in the job specifications, in which case those hours may be considered shift work.
- When such hours are mandated by the project owner, a shift that begins before midnight on Friday and ends on Saturday morning, or that begins at or after 8:00 PM on Sunday and ends on Monday morning may be paid at the shift differential rate.
- Shifts shall receive an additional \$3.00 per hour.

**OVERTIME:**

- Hours in excess of 8 per day, Monday through Friday, or outside of the regular workday that are not shift work, and all hours on Saturdays, shall be paid at time and one-half the hourly rate. All hours on Sundays and holidays shall be paid at double the hourly rate.
- Four 10-hour days may be worked, Monday through Thursday, at straight time, with Friday used as a make-up day for a day lost to inclement weather. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half the hourly rate.

**RECOGNIZED HOLIDAYS:** New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday. Veterans Day may be substituted for the day after Thanksgiving. However, in the trading of Veterans Day for the day after Thanksgiving, if overtime is worked on Veterans Day, it shall be paid at double the hourly rate.

**Hazardous Waste Work:**

- where Level A, B, or C protection is required: + \$5.00/hr
- other Hazardous Waste site: + \$1.00/hr

**Traffic Control Coordinator:** When either of the work classifications found below are working as a Traffic Control Coordinator they are to receive \$.75 above their current rate of pay.

**Effective Dates:**

	04/17/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
65.06	37.33	102.39	106.26	109.94

**CLASSIFICATIONS:**

Walking Boss & Superintendent

**Effective Dates:**

	04/17/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
64.69	37.33	102.02	105.88	109.57

**CLASSIFICATIONS:**

Heading Foreman, Shaft Foreman, Rod Foreman, Electrician Foreman, Rigging Foreman

**FREE AIR TUNNEL JOBS**      **Rates Expiration Date :**

**Effective Dates:**

	04/17/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
64.06	37.33	101.39	105.26	108.94

**CLASSIFICATIONS:**

Iron Foreman, Caulking Foreman, Form Foreman, Cement Finishing Foreman, Concrete Foreman, Track Foreman, Cleanup Foreman, Grout Foreman

**Effective Dates:**

	04/17/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
67.19	37.33	104.52	108.38	112.07

**CLASSIFICATIONS:**

Blaster

**Effective Dates:**

	04/17/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
63.38	37.33	100.71	104.57	108.26

**CLASSIFICATIONS:**

Top Labor Foreman

**Effective Dates:**

	04/17/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
62.94	37.33	100.27	104.13	107.82

**CLASSIFICATIONS:**

Skilled Men (including Caulker, Powder Carrier, all other skilled men)

Skilled Men (including Miner, Drill Runner, Iron Man, Conveyor Man, Manintenance Man, Safety Miner, Rigger, Block Layer, Cement Finisher, Tod Man)

**Effective Dates:**

	04/17/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
62.75	37.33	100.08	103.94	107.63

**CLASSIFICATIONS:**

Semi-Skilled Men (including Bell or Signal Man Top or Bottom, Form Worker & Mover, Concrete Worker, Shaft Man, Tunnel Laborer, Caulker's Helper, all other semi-skilled)

Semi-Skilled Men (including Miner's Helper, Chuck Tender, Track Man, Nipper, Brake Man, Derail Man, Cable Man, Hose Man, Gravel Man, Form Man)

TERRITORY  
ENTIRE STATE

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION

FREE AIR TUNNEL JOBS      Rates Expiration Date :

Effective Dates:

04/17/2024			03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
62.25	37.33	99.58	103.44	107.13

**CLASSIFICATIONS:**

All Others (including Powder Watchman, Change House Attendant, Top Laborer)

**DRILL FOR GROUND WATER SUPPLY**    **Rates Expiration Date :**

The well driller and/or helper may perform all work relative to the construction, finishing, and servicing of wells, pumps and borings for ground water supply. The present methods of well drilling entailing as they do, many diverse job operations calling for drilling, pump discharge, piping, and the operation of various types of related power equipment, shall all be within the job duties and functions of the well driller and/or helper. In the event that an extension of work should occur beyond water well drilling functions, into the field of general construction work, such extension of work would come under the appropriate rates listed elsewhere in this wage determination.

- For Work Hours, Shift Differentials, Overtime Rates, and Recognized Holidays see the "Operating Engineers" section of this wage determination.

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
59.22	39.15	98.37	100.87

**CLASSIFICATIONS:**

Driller

**Effective Dates:**

<b>07/01/2024</b>			<b>07/01/2025</b>
Rate	Fringe	Total	Total
52.38	39.15	91.53	94.03

**CLASSIFICATIONS:**

Driller's Helper



**OPERATING ENGINEERS MARINE-DREDGING**     **Rates Expiration Date :**

NOTE: These wage rates only apply to dredging and other marine construction activities occurring in navigable waters and their tributaries.

Boat crews carrying explosive material (dynamite, pourfex, and other similar materials) shall be paid at 120% of the hourly wage rate for hours engaged in handling of said materials. Employees required to possess a Hazardous Material Certification as a condition of employment shall be compensated at 120% of the hourly wage rate.

**OVERTIME:**

Hours in excess of 40 per week, and all hours on Saturdays and Sundays, shall be paid at time and one-half the hourly rate. All hours on holidays shall be paid at double the hourly rate.

RECOGNIZED HOLIDAYS: New Year's Day, Martin Luther King Day, Good Friday, Memorial Day, July 4th, Labor Day, Veterans Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday.

**Effective Dates:**

10/03/2024			10/01/2025	10/01/2026
Rate	Fringe	Total	Total	Total
47.07	15.34	62.41	63.92	65.74

**CLASSIFICATIONS:**

Lead Dredgerman, Operator, Leverman

Licensed Tug Operator with MOTV, Deck Captain

**Effective Dates:**

10/03/2024			10/01/2025	10/01/2026
Rate	Fringe	Total	Total	Total
40.71	14.90	55.61	56.92	58.47

**CLASSIFICATIONS:**

Derrick Operator, Spider/Spill Barge Operator

Engineer, Electrician, Chief Welder, Chief Mate

Fill Placer, Operator II

Licensed Boat Operator

Maintenance Engineer

**Effective Dates:**

10/03/2024			10/01/2025	10/01/2026
Rate	Fringe	Total	Total	Total
38.31	14.73	53.04	54.27	55.75

**CLASSIFICATIONS:**

Certified Welder

**OPERATING ENGINEERS MARINE-DREDGING**      **Rates Expiration Date :**

**Effective Dates:**

<b>10/03/2024</b>			<b>10/01/2025</b>	<b>10/01/2026</b>
Rate	Fringe	Total	Total	Total
37.26	14.66	51.92	53.12	54.54

**CLASSIFICATIONS:**

Mate, Drag Barge Operator, Steward, Assistant Fill Placer

Welder

**Effective Dates:**

<b>10/03/2024</b>			<b>10/01/2025</b>	<b>10/01/2026</b>
Rate	Fringe	Total	Total	Total
36.07	14.57	50.64	51.80	53.18

**CLASSIFICATIONS:**

Boat Operator

**Effective Dates:**

<b>10/03/2024</b>			<b>10/01/2025</b>	<b>10/01/2026</b>
Rate	Fringe	Total	Total	Total
29.96	14.15	44.11	45.07	46.22

**CLASSIFICATIONS:**

Shoreman, Deckhand, Rodman, Scowman

**Effective Dates:**

<b>10/03/2024</b>			<b>10/01/2025</b>	<b>10/01/2026</b>
Rate	Fringe	Total	Total	Total
41.94	14.99	56.93	58.27	59.89

**CLASSIFICATIONS:**

Crane Operator

MICROSURFACING/SLURRY SEAL     Rates Expiration Date :

THESE RATES APPLY IN THE FOLLOWING COUNTIES ONLY:

Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Mercer, Ocean, Salem

\*\*\*IN ALL OTHER COUNTIES use the Heavy and General Laborers - North "Slurry Seal Laborer" rates.\*\*\*

SHIFT DIFFERENTIALS:

Any shift starting at 3:30 PM or later shall receive an additional \$0.35/hr

OVERTIME:

Hours in excess of 8 per day or 40 per week shall be paid at time and one-half the hourly rate. All hours on holidays shall be paid at double the hourly rate.

RECOGNIZED HOLIDAYS: New Year's Day, Washington's Birthday, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day.

**Effective Dates:**

**03/01/2017**

Rate	Fringe	Total
36.50	21.27	57.77

**CLASSIFICATIONS:**

Foreman

**Effective Dates:**

**03/01/2017**

Rate	Fringe	Total
33.80	21.27	55.07

**CLASSIFICATIONS:**

Box man

**Effective Dates:**

**03/01/2017**

Rate	Fringe	Total
31.75	21.27	53.02

**CLASSIFICATIONS:**

Microsurface/Slurry Preparation

**Effective Dates:**

**03/01/2017**

Rate	Fringe	Total
31.75	21.27	53.02

**CLASSIFICATIONS:**

Squeegee man

TERRITORY  
ENTIRE STATE

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION

MICROSURFACING/SLURRY SEAL      Rates Expiration Date :

Effective Dates:

03/01/2017

Rate	Fringe	Total
30.30	21.27	51.57

**CLASSIFICATIONS:**

Cleaner, Taper

**ASPHALT LABORERS - SOUTH**    **Rates Expiration Date :**

"THESE RATES APPLY IN THE FOLLOWING COUNTIES ONLY: Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Mercer, Ocean, Salem

{For apprentice rates refer to "Laborer - Heavy & General" apprentice rates in any county rate package}

The regular workday consists of 8 hours, starting at 7:00 AM or 8:00 AM.

**SHIFT DIFFERENTIALS:**

- Shifts must start at 3:00 PM, 4:00 PM, 12:00 AM, or 1:00 AM, to be considered shift work, except when the project owner mandates special hours of work in the job specifications, in which case those hours may be considered shift work.
- When such hours are mandated by the project owner, a shift that begins before midnight on Friday and ends on Saturday morning, or that begins at or after 8:00 PM on Sunday and ends on Monday morning may be paid at the shift differential rate.
- Shifts shall receive an additional \$3.00 per hour.

**OVERTIME:**

- Hours in excess of 8 per day, Monday through Friday, or outside of the regular workday that are not shift work, and all hours on Saturdays, shall be paid at time and one-half the hourly rate. All hours on Sundays and holidays shall be paid at double the hourly rate.
- Four 10-hour days may be worked, Monday through Thursday, at straight time, with Friday used as a make-up day for a day lost to inclement weather. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half the hourly rate.

**RECOGNIZED HOLIDAYS:** New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday. Veterans Day may be substituted for the day after Thanksgiving. However, in the trading of Veterans Day for the day after Thanksgiving, if overtime is worked on Veterans Day, it shall be paid at double the hourly rate.

**Hazardous Waste Work:**

- where Level A, B, or C protection is required: + \$5.00/hr
- other Hazardous Waste site: + \$1.00/hr

**FOR TIDE WORK** (pertains to tidal water): A contractor can start their job according to tide schedules (tide schedules are the various high and low tides related to this work) providing the eight (8) hour shift is completed between the hours of 5:00 AM and 6:30 PM.

**Effective Dates:**

	03/21/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
53.55	37.33	90.88	94.33	97.58

**CLASSIFICATIONS:**

Paving Foreman

**Effective Dates:**

	03/21/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
50.10	37.33	87.43	90.88	94.13

**CLASSIFICATIONS:**

Head Raker

**Effective Dates:**

	03/21/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
50.25	37.33	87.58	91.03	94.28

**CLASSIFICATIONS:**

Screedman

**ASPHALT LABORERS - SOUTH**    **Rates Expiration Date :**

**Effective Dates:**

03/21/2024			03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
49.70	37.33	87.03	90.48	93.73

**CLASSIFICATIONS:**

Tampers, Smoothers, Kettlemen,  
Painters, Shovelers, Roller Boys

**Effective Dates:**

03/21/2024			03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
49.80	37.33	87.13	90.58	93.83

**CLASSIFICATIONS:**

Milling Controller

**Effective Dates:**

03/21/2024			03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
50.00	37.33	87.33	90.78	94.03

**CLASSIFICATIONS:**

Traffic Control Coordinator

**Effective Dates:**

03/21/2024			03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
49.95	37.33	87.28	90.73	93.98

**CLASSIFICATIONS:**

Raker, Luteman

TEST BORING PRELIMINARY TO CONSTRUCTION-NORTH     Rates Expiration Date :

THESE RATES APPLY IN THE FOLLOWING COUNTIES ONLY:  
Bergen, Essex, Hudson, Middlesex, Morris, Passaic, Somerset, Union

**SHIFT DIFFERENTIAL:**

Employees on a shift other than between the hours of 8:00 AM and 5:00 PM shall receive an additional \$2.00 per hour.

**OVERTIME:**

Hours in excess of 8 per day, Monday through Friday, and all hours on Saturday shall be paid at time and one-half the regular rate. All hours on Sundays and holidays shall be paid at double the regular rate.

**RECOGNIZED HOLIDAYS:** New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day, and Christmas Day. Sunday holidays observed the following Monday.

Hazardous Waste Pay (for Levels A, B, and C): an additional 15% of the hourly rate, per hour.

A newly hired Helper with no experience in the industry shall be paid as follows:

- 1st year on the job - 70% of Helper wage rate
- 2nd year on the job - 80% of Helper wage rate
- 3rd year on the job - 90% of Helper wage rate
- All helpers receive full fringe benefit rate.

**Effective Dates:**

**10/18/2024**

Rate	Fringe	Total
37.58	34.49	72.07

**CLASSIFICATIONS:**

Helper (4th year helper)

**Effective Dates:**

**10/18/2024**

Rate	Fringe	Total
47.88	34.49	82.37

**CLASSIFICATIONS:**

Driller

**Effective Dates:**

**10/18/2024**

Rate	Fringe	Total
54.50	34.49	88.99

**CLASSIFICATIONS:**

Foreman

**HEAVY & GENERAL LABORERS - NORTH**     **Rates Expiration Date :**

THESE RATES APPLY IN THE FOLLOWING COUNTIES ONLY:

Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Passaic, Somerset, Sussex, Union, Warren

{For apprentice rates refer to "Laborer - Heavy & General" apprentice rates in any county rate package}

The regular workday consists of 8 hours, starting at 7:00 AM or 8:00 AM.

**SHIFT DIFFERENTIALS:**

- Shifts must start at 3:00 PM, 4:00 PM, 12:00 AM, or 1:00 AM, to be considered shift work, except when the project owner mandates special hours of work in the job specifications, in which case those hours may be considered shift work.
- When such hours are mandated by the project owner, a shift that begins before midnight on Friday and ends on Saturday morning, or that begins at or after 8:00 PM on Sunday and ends on Monday morning may be paid at the shift differential rate.
- Shifts shall receive an additional \$3.00 per hour.

FOR TIDE WORK (pertains to tidal water): A contractor can start their job according to tide schedules (tide schedules are the various high and low tides related to this work) providing the eight (8) hour shift is completed between the hours of 5:00 AM and 6:30 PM.

**OVERTIME:**

- Hours in excess of 8 per day, Monday through Friday, or outside of the regular workday that are not shift work, and all hours on Saturdays, shall be paid at time and one-half the hourly rate. All hours on Sundays and holidays shall be paid at double the hourly rate.
- Four 10-hour days may be worked, Monday through Thursday, at straight time, with Friday used as a make-up day for a day lost to inclement weather. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half the hourly rate.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday. Veterans Day may be substituted for the day after Thanksgiving. However, in the trading of Veterans Day for the day after Thanksgiving, if overtime is worked on Veterans Day, it shall be paid at double the hourly rate.

**Hazardous Waste Work:**

- where Level A, B, or C protection is required: + \$5.00/hr
- other Hazardous Waste site: + \$1.00/hr

**Effective Dates:**

	11/12/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
49.30	37.33	86.63	90.08	93.33

**CLASSIFICATIONS:**

**"D" Rate:**

basic, landscape, asphalt, slurry seal, or railroad track laborer; utility meter installer; flagman; salamander tender; pitman; dumpman; rakers or tampers on cold patch work; wrappers or coaters of pipe; waterproofer; timberman; wagon drill or drill master helper; powder carrier; magazine tender; signal man; power buggy operator; tree cutter; operator of basic power tools

**Effective Dates:**

	11/12/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
50.00	37.33	87.33	90.78	94.03

**CLASSIFICATIONS:**

**"C" Rate:**

pipe layer; laser man; conduit or duct line layer; operator of jack hammer, chipping hammer, pavement breaker, concrete cutter, asphalt cutter, sheet hammer, or walk-behind saw cutter; sandblaster; acetylene cutting or burning; wagon drill, directional drill, or hydraulic drill operator; drill master; core driller; asphalt raker or lute man



**HEAVY & GENERAL LABORERS - NORTH**      **Rates Expiration Date :**

**Effective Dates:**

	11/12/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
50.25	37.33	87.58	91.03	94.28

**CLASSIFICATIONS:**

"B" Rate:

concrete finisher; setter of brick or stone pavers; stone cutter; form setter; manhole, catch basin, or inlet builder; asphalt screedman; rammer; hardscaping; gunite nozzle man

**Effective Dates:**

	11/12/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
53.80	37.33	91.13	94.58	97.83

**CLASSIFICATIONS:**

"A" Rate:

blaster

**Effective Dates:**

	11/12/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
53.55	37.33	90.88	94.33	97.58

**CLASSIFICATIONS:**

"FOREMAN" Rate:

labor foreman, asphalt foreman, drill foreman, pipe foreman, grade foreman, finisher foreman, concrete foreman

**Effective Dates:**

	11/12/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
54.55	37.33	91.88	95.33	98.58

**CLASSIFICATIONS:**

"GENERAL FOREMAN" Rate

**Effective Dates:**

	11/12/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
50.75	37.33	88.08	91.53	94.78

**CLASSIFICATIONS:**

TRAFFIC CONTROL COORDINATOR Rate

TERRITORY  
ENTIRE STATE

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION

**HEAVY & GENERAL LABORERS - NORTH**      **Rates Expiration Date :**

**Effective Dates:**

<b>11/12/2024</b>			<b>03/01/2025</b>	<b>03/01/2026</b>
Rate	Fringe	Total	Total	Total
54.05	37.33	91.38	95.83	100.08

**CLASSIFICATIONS:**

" CERTIFIED FOREMAN Rate" :

**Effective Dates:**

<b>11/12/2024</b>			<b>03/01/2025</b>	<b>03/01/2026</b>
Rate	Fringe	Total	Total	Total
55.05	37.33	92.38	96.83	101.08

**CLASSIFICATIONS:**

" CERTIFIED GENERAL FOREMAN Rate" :

**HEAVY & GENERAL LABORERS - SOUTH**    **Rates Expiration Date :**

THESE RATES APPLY IN THE FOLLOWING COUNTIES ONLY:

Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Mercer, Ocean, Salem

{For apprentice rates refer to "Laborer - Heavy & General" apprentice rates in any county rate package}

The regular workday consists of 8 hours, starting at 7:00 AM or 8:00 AM.

**SHIFT DIFFERENTIALS:**

- Shifts must start at 3:00 PM, 4:00 PM, 12:00 AM, or 1:00 AM, to be considered shift work, except when the project owner mandates special hours of work in the job specifications, in which case those hours may be considered shift work.
- When such hours are mandated by the project owner, a shift that begins before midnight on Friday and ends on Saturday morning, or that begins at or after 8:00 PM on Sunday and ends on Monday morning may be paid at the shift differential rate.
- Shifts shall receive an additional \$3.00 per hour.

FOR TIDE WORK (pertains to tidal water): A contractor can start their job according to tide schedules (tide schedules are the various high and low tides related to this work) providing the eight (8) hour shift is completed between the hours of 5:00 AM and 6:30 PM.

**OVERTIME:**

- Hours in excess of 8 per day, Monday through Friday, or outside of the regular workday that are not shift work, and all hours on Saturdays, shall be paid at time and one-half the hourly rate. All hours on Sundays and holidays shall be paid at double the hourly rate.
- Four 10-hour days may be worked, Monday through Thursday, at straight time, with Friday used as a make-up day for a day lost to inclement weather. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half the hourly rate.

RECOGNIZED HOLIDAYS: New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday. Veterans Day may be substituted for the day after Thanksgiving. However, in the trading of Veterans Day for the day after Thanksgiving, if overtime is worked on Veterans Day, it shall be paid at double the hourly rate.

**Hazardous Waste Work:**

- where Level A, B, or C protection is required: + \$5.00/hr
- other Hazardous Waste site: + \$1.00/hr

**Effective Dates:**

	03/21/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
49.30	37.33	86.63	90.08	93.33

**CLASSIFICATIONS:**

basic, landscape, or railroad track laborer; utility meter installer; flagman; salamander tender; pitman; dumpman; rakers or tampers on cold patch work; wrappers or coaters of pipe; waterproofers; tree cutter, timberman

**Effective Dates:**

	03/21/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
49.30	37.33	86.63	90.08	93.33

**CLASSIFICATIONS:**

wagon drill or drill master helper; powder carrier; magazine tender; signal man

**HEAVY & GENERAL LABORERS - SOUTH**      **Rates Expiration Date :**

**Effective Dates:**

<b>03/21/2024</b>			<b>03/01/2025</b>	<b>03/01/2026</b>
Rate	Fringe	Total	Total	Total
50.00	37.33	87.33	90.78	94.03

**CLASSIFICATIONS:**

pipe layer; laser man; conduit or duct line layer; operator of jack hammer, chipping hammer, pavement breaker, concrete cutter, asphalt cutter, sheet hammer, or walk-behind saw cutter; sandblaster; acetylene cutting or burning

**Effective Dates:**

<b>03/21/2024</b>			<b>03/01/2025</b>	<b>03/01/2026</b>
Rate	Fringe	Total	Total	Total
50.00	37.33	87.33	90.78	94.03

**CLASSIFICATIONS:**

wagon or directional drill operator; drill master

**Effective Dates:**

<b>03/21/2024</b>			<b>03/01/2025</b>	<b>03/01/2026</b>
Rate	Fringe	Total	Total	Total
53.80	37.33	91.13	94.58	97.83

**CLASSIFICATIONS:**

blaster

**Effective Dates:**

<b>03/21/2024</b>			<b>03/01/2025</b>	<b>03/01/2026</b>
Rate	Fringe	Total	Total	Total
53.55	37.33	90.88	94.33	97.58

**CLASSIFICATIONS:**

labor foreman, drill foreman, pipe foreman, grade foreman, finisher foreman, concrete foreman

**Effective Dates:**

<b>03/21/2024</b>			<b>03/01/2025</b>	<b>03/01/2026</b>
Rate	Fringe	Total	Total	Total
54.55	37.33	91.88	95.33	98.58

**CLASSIFICATIONS:**

general foreman

TERRITORY  
ENTIRE STATE

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION

**HEAVY & GENERAL LABORERS - SOUTH**      **Rates Expiration Date :**

**Effective Dates:**

<b>03/21/2024</b>			<b>03/01/2025</b>	<b>03/01/2026</b>
Rate	Fringe	Total	Total	Total
50.25	37.33	87.58	91.03	94.28

**CLASSIFICATIONS:**

concrete finisher; setter of brick or stone pavers; stone cutter; form setter; manhole, catch basin, or inlet builder; rammer; gunite nozzle man

PIPELINE - MAINLINE TRANSMISSION     Rates Expiration Date :

These rates apply to the following: welding on Transportation Mainline pipe lines (cross-country pipe lines, or any segments thereof, transporting coal, gas, oil, water or other transportable materials, vapors or liquids, including portions of such pipe lines within private property boundaries up to the final metering station or connection - the point where a valve, consumer connection, or town border station divides mainline transmission lines or higher pressure lateral and branch lines from lower pressure distribution systems).

PER DIEM PAYMENT:

In addition to the total wage rate paid for each craft, the following per diem (per day) amounts must also be paid - Pipeline Journeyman: \$80.50; Pipeline Journeyman Welder: \$140.50; and Pipeline Helper: \$64.50. Note: in order to receive the per diem payment an employee must work a minimum of 8 hours in a 24 hour period.

NOTES:

- Journeymen employed as "stringer bead" welders and journeymen who are regularly employed as "hot-pass" welders shall receive \$1.00 per hour more than other journeymen.
- Welders running "stringer bead" or "hot-pass" on "cutouts" or "tie-ins" on a production basis shall be paid \$1.00 per hour above the journeymen rate.
- Whenever a welder helper is employed using a power buffer or power grinder immediately behind the stringer bead and/or hot-pass welders, and the pipe gang is set on a production basis, the helper shall be paid \$2.00 per hour above the helper rate.
- If back welding is performed inside a pipe under either or both of the following conditions, the welder engaged in the welding will receive \$3.00 per hour above the regular rate for the job only for the days on which such back welding is performed:
  - The employer elects, as a regular procedure, to back weld each line-up. This condition is not intended to apply to occasional back welding performed by the pipe gang to repair a bead, to rectify a "high-lo" condition or wall thickness, etc.
  - A welder is required to back weld a completed weld behind the firing line.
- If the welder helper is required to go inside the pipe for the purpose of brushing, buffing and grinding the weld, they shall receive a wage rate \$1.00 per hour above the regular helper rate for the days involved.
- Welders working on "hot work" shall be paid \$2.00 per hour above the regular rate for each day engaged in such work. "Hot work" is defined as work on lines in service where there is the danger of fire or explosion.

The regular workday shall be 8 hours, between 8:00 AM and 4:30 PM.

OVERTIME:

Hours in excess of 8 per day, and all hours on Sundays shall be paid at time and one-half the regular rate, inclusive of benefits. All hours on holidays shall be paid at double the regular rate, inclusive of benefits.

RECOGNIZED HOLIDAYS: New Year's Day, July 4th, Labor Day, Thanksgiving Day, and Christmas Day. Sunday holidays observed the following Monday.

**Effective Dates:**

**06/13/2024**

Rate	Fringe	Total
57.34	35.90	93.24

**CLASSIFICATIONS:**

Pipeline Journeyman Welder

TERRITORY  
ENTIRE STATE

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION

PIPELINE - MAINLINE TRANSMISSION      Rates Expiration Date :

Effective Dates:

**06/13/2024**

Rate	Fringe	Total
57.34	35.90	93.24

**CLASSIFICATIONS:**

Pipeline Journeyman

Effective Dates:

**06/13/2024**

Rate	Fringe	Total
33.84	25.02	58.86

**CLASSIFICATIONS:**

Pipeline Helper

**PIPELINE - GAS DISTRIBUTION**     **Rates Expiration Date :**

These rates apply to the following: welding on gas line distribution systems (that portion of the gas distribution system placed in streets, roads, subways, tunnels, viaducts, highways and easements which serves the users of gas).

**SHIFT DIFFERENTIALS:**

An "irregular" shift may start any time from 5:00 PM to 12:00 AM, Monday through Friday, and shall receive an additional 15% of the regular rate per hour, inclusive of benefits.

**OVERTIME:**

Hours in excess of forty per week, and all hours on Saturdays shall be paid at time and one-half the regular rate, inclusive of benefits. All hours on Sundays and holidays shall be paid at double the regular rate, inclusive of benefits.

**RECOGNIZED HOLIDAYS:** New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day, and Christmas Day. Sunday holidays observed the following Monday.

**Effective Dates:**

**11/04/2024**

Rate	Fringe	Total
64.70	34.74	99.44

**CLASSIFICATIONS:**

Pipeline Journeyman Welder

**Effective Dates:**

**11/04/2024**

Rate	Fringe	Total
64.70	34.74	99.44

**CLASSIFICATIONS:**

Pipeline Journeyman

**Effective Dates:**

**11/04/2024**

Rate	Fringe	Total
41.73	24.77	66.50

**CLASSIFICATIONS:**

Pipeline Helper



**ASPHALT LABORERS- NORTH**    **Rates Expiration Date :**

THESE RATES APPLY IN THE FOLLOWING COUNTIES ONLY:

Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Passaic, Somerset, Sussex, Union, Warren

{For apprentice rates refer to "Laborer - Heavy & General" apprentice rates in any county rate package}

The regular workday consists of 8 hours, starting at 7:00 AM or 8:00 AM.

**SHIFT DIFFERENTIALS:**

- Shifts must start at 3:00 PM, 4:00 PM, 12:00 AM, or 1:00 AM, to be considered shift work, except when the project owner mandates special hours of work in the job specifications, in which case those hours may be considered shift work.
- When such hours are mandated by the project owner, a shift that begins before midnight on Friday and ends on Saturday morning, or that begins at or after 8:00 PM on Sunday and ends on Monday morning may be paid at the shift differential rate.
- Shifts shall receive an additional \$3.00 per hour.

**OVERTIME:**

- Hours in excess of 8 per day, Monday through Friday, or outside of the regular workday that are not shift work, and all hours on Saturdays, shall be paid at time and one-half the hourly rate. All hours on Sundays and holidays shall be paid at double the hourly rate.
- Four 10-hour days may be worked, Monday through Thursday, at straight time, with Friday used as a make-up day for a day lost to inclement weather. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half the hourly rate.

**RECOGNIZED HOLIDAYS:** New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday. Veterans Day may be substituted for the day after Thanksgiving. However, in the trading of Veterans Day for the day after Thanksgiving, if overtime is worked on Veterans Day, it shall be paid at double the hourly rate.

**Hazardous Waste Work:**

- where Level A, B, or C protection is required: + \$5.00/hr
- other Hazardous Waste site: + \$1.00/hr

**FOR TIDE WORK** (pertains to tidal water): A contractor can start their job according to tide schedules (tide schedules are the various high and low tides related to this work) providing the eight (8) hour shift is completed between the hours of 5:00 AM and 6:30 PM.

**Effective Dates:**

11/20/2024			03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
53.55	37.33	90.88	94.33	97.58

**CLASSIFICATIONS:**

Asphalt Foreman

**Effective Dates:**

11/20/2024			03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
50.25	37.33	87.58	91.03	94.28

**CLASSIFICATIONS:**

Asphalt Screedman

**Effective Dates:**

11/20/2024			03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
50.00	37.33	87.33	90.78	94.03

**CLASSIFICATIONS:**

Asphalt Raker or Lute Man

TERRITORY  
ENTIRE STATE

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION

ASPHALT LABORERS- NORTH      Rates Expiration Date :

Effective Dates:

11/20/2024			03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
49.30	37.33	86.63	90.08	93.33

**CLASSIFICATIONS:**

Asphalt Laborer

Effective Dates:

11/20/2024			03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
54.05	37.33	91.38	95.83	100.08

**CLASSIFICATIONS:**

Certified Asphalt Foreman

**ELECTRICIAN- UTILITY WORK (NORTH)**     **Rates Expiration Date :**

Electrician-Utility Work (North)

(For apprentice rates refer to Electrician-Utility Work (North) in any county rate package).

These rates apply to work contracted for by the following utility companies:

Public Service Electric & Gas Co. of NJ, GPU Energy, Borough of Madison Electric Department, Sussex Rural Electric Cooperative, Rockland Utilities, and Butler Municipal Electric Co.

These rates do not apply to work on substations or switching stations.

For Utility work contracted for by a utility company other than those listed above or those listed under "Electrician-Utility Work (South), see the "Outside Commercial Rates" for the county in which the jobsite is located.

\* FOR OUTSIDE COMMERCIAL RATES PLEASE SEE COUNTY RATES

The regular workday is 8 hours, between 6:00 AM and 6:00 PM.

FOR EMERGENCY WORK ONLY: (emergency work is defined as work caused by storm, catastrophe, act of god, and circumstances beyond the control of the employer)-all hours of work shall be paid at double the hourly rate.

**SHIFT DIFFERENTIALS:**

Shift work must run for a minimum of 5 consecutive workdays.

2nd shift (between the hours of 4:30 PM and 1:00 AM): 8 hours of work + 17.3% of the regular rate, inclusive of benefits.

3rd shift (between the hours of 12:30 AM and 9:00 AM): 8 hours of work + 31.4% of the regular rate per hour, inclusive of benefits.

**OVERTIME:**

Hours in excess of 8 per day, or before or after the regular workday Monday through Friday, that is not shift work, and all hours on Saturday shall be paid at time and one-half the regular rate, inclusive of benefits. All hours on Sundays and holidays shall be paid at double the hourly rate, inclusive of benefits.

Four 10-hour days may worked, at straight time, between 6:00 AM and 6:00 PM, Monday through Thursday.

**RECOGNIZED HOLIDAYS:**

New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day and Christmas Day, or day on which they are legally observed.

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
64.83	44.73	109.56

**CLASSIFICATIONS:**

Chief Lineman

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
61.16	42.20	103.36

**CLASSIFICATIONS:**

Journeyman Lineman

**ELECTRICIAN- UTILITY WORK (NORTH)**      **Rates Expiration Date :**

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
61.16	42.20	103.36

**CLASSIFICATIONS:**

Special License Operator

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
60.55	41.77	102.32

**CLASSIFICATIONS:**

Transit Man

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
58.71	40.50	99.21

**CLASSIFICATIONS:**

Line Equipment Operator

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
51.37	35.44	86.81

**CLASSIFICATIONS:**

Dynamite Man

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
76.45	52.75	129.20

**CLASSIFICATIONS:**

General Foreman

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
70.33	48.52	118.85

**CLASSIFICATIONS:**

Assistant General Foreman

**ELECTRICIAN- UTILITY WORK (NORTH)**      **Rates Expiration Date :**

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
68.50	47.26	115.76

**CLASSIFICATIONS:**

Line Foreman

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
49.54	34.18	83.72

**CLASSIFICATIONS:**

Street Light Mechanical Leader

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
47.09	32.49	79.58

**CLASSIFICATIONS:**

Groundman Winch Operator

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
47.09	32.49	79.58

**CLASSIFICATIONS:**

Groundman Truck Operator

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
46.48	32.07	78.55

**CLASSIFICATIONS:**

Street Light Mechanic

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
46.48	32.07	78.55

**CLASSIFICATIONS:**

Line Equipment Mechanic

TERRITORY  
ENTIRE STATE

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION

ELECTRICIAN- UTILITY WORK (NORTH)      Rates Expiration Date :

Effective Dates:

12/01/2024

Rate	Fringe	Total
39.75	27.42	67.17

**CLASSIFICATIONS:**

Groundman 2nd Year

Effective Dates:

12/01/2024

Rate	Fringe	Total
36.70	25.32	62.02

**CLASSIFICATIONS:**

Groundman 1st Year

Effective Dates:

12/01/2024

Rate	Fringe	Total
60.55	41.77	102.32

**CLASSIFICATIONS:**

Line Equipment Foreman

**ELECTRICIAN- UTILITY WORK (SOUTH)**    **Rates Expiration Date :**

Electrician-Utility Work (South)

(For apprentice rates refer to Electrician-Utility Work (South) in any county rate package).

These rates apply to work contracted for by the following utility company:

Atlantic City Electric.

These rates do not apply to work on substations or switching stations.

For utility work contracted for by a utility company other than the one listed above or those listed under "Electrician-Utility Work (North), see the "Outside Commercial Rates" for the county in which the jobsite is located.

\* FOR OUTSIDE COMMERCIAL RATES PLEASE SEE COUNTY RATES

The regular workday is 8 hours, between 7:00 AM and 4:30 PM.

FOR EMERGENCY WORK ONLY: (emergency work is defined as work caused by storm, catastrophe, act of god, and circumstances beyond the control of the employer)- all hours of work shall be paid at double the hourly rate.

**SHIFT DIFFERENTIALS:**

Shift work must run for a minimum of 5 consecutive workdays.

When two (2) or three (3) shifts are worked the following shall apply:

1st shift (between the hours of 8:00 AM and 4:30 PM)

2nd shift (between the hours of 4:30 PM and 12:30 AM): 8 hours of work + 10% of the regular rate of pay for 7.5 hours worked.

3rd shift (between the hours of 12:30 AM and 8:00 AM): 8 hours of work + 15% of the regular rate of pay for 7 hours worked.

**OVERTIME:**

Hours in excess of 8 per day, or before or after the regular workday Monday through Friday, that is not shift work, and all hours on Saturday shall be paid at time and one-half the regular rate. All hours on Sundays and Holidays shall be paid double the hourly rate.

Four 10-hour days may be worked, at straight time, between 6:00 AM and 6:00 PM, Monday through Thursday with Friday used as a make-up day.

**RECOGNIZED HOLIDAYS:**

New Year's Day, Memorial Day, July 4th, Labor Day, Veterans' Day, Thanksgiving Day and Christmas Day or on days celebrated.

**WORKING RULES:**

There shall be a Foreman in charge of each work crew. No crews are to exceed twelve (12) men, including Foremen.

There shall be a General Foreman designated for transmission work when three (3) or more crews are on the same job and for distribution work where there are more than twenty (20) employees on site.

A small job crew shall consist of five (5) or less employees, one (1) of the Journeyman Linemen in the crew shall be designated as a Small Job Foreman.

Work performed from ladders and/or mechanical lift equipment shall be the work of Linemen and/or Apprentices.

On new construction, fitting and framing poles, towers or structures may be done by Journeymen and/or Apprentices. Groundmen may assist, but may not perform any work which would be performed by Linemen if assembled in the air.

There shall be a Journeyman Lineman in each pole setting, erection, grounding, wire and cable-pulling crew of more than three (3) men.

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
71.87	59.12	130.99

**CLASSIFICATIONS:**

General Foreman

**ELECTRICIAN- UTILITY WORK (SOUTH)**      **Rates Expiration Date :**

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
64.01	54.22	118.23

**CLASSIFICATIONS:**

Foreman

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
60.64	52.12	112.76

**CLASSIFICATIONS:**

Small Job Foreman

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
56.15	49.33	105.48

**CLASSIFICATIONS:**

Heavy Equipment Operator

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
56.15	49.33	105.48

**CLASSIFICATIONS:**

Cable Splicer

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
56.15	49.33	105.48

**CLASSIFICATIONS:**

Journeyman Lineman

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
56.15	49.33	105.48

**CLASSIFICATIONS:**

Journeyman Welder



**ELECTRICIAN- UTILITY WORK (SOUTH)**      **Rates Expiration Date :**

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
56.15	49.33	105.48

**CLASSIFICATIONS:**

Journeyman Painter

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
44.92	42.36	87.28

**CLASSIFICATIONS:**

Light Equipment Operator

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
39.31	38.86	78.17

**CLASSIFICATIONS:**

Groundman Truck Driver

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
36.50	37.12	73.62

**CLASSIFICATIONS:**

Groundman 3rd Year

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
33.69	35.37	69.06

**CLASSIFICATIONS:**

Groundman 2nd Year

**Effective Dates:**

**12/01/2024**

Rate	Fringe	Total
30.88	33.62	64.50

**CLASSIFICATIONS:**

Groundman 1st Year

TERRITORY  
ENTIRE STATE

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION

ELECTRICIAN- UTILITY WORK (SOUTH)     Rates Expiration Date :

Effective Dates:

12/01/2024

Rate	Fringe	Total
24.71	29.80	54.51

**CLASSIFICATIONS:**

Flagman

HEAVY & GENERAL LABORERS- NEW TRANS HUDSON TUNNELS      Rates Expiration Date :

**\*\*THESE RATES APPLY TO CONSTRUCTION ON NEW TRANS HUDSON TUNNELS ONLY\*\***

{For apprentice rates refer to "Laborer - Heavy & General" apprentice rates in any county rate package}

The regular workday consists of 8 hours, starting at 7:00 AM or 8:00 AM.

**SHIFT DIFFERENTIALS:**

- Shifts must start at 3:00 PM, 4:00 PM, 12:00 AM, or 1:00 AM, to be considered shift work, except when the project owner mandates special hours of work in the job specifications, in which case those hours may be considered shift work.
- When such hours are mandated by the project owner, a shift that begins before midnight on Friday and ends on Saturday morning, or that begins at or after 8:00 PM on Sunday and ends on Monday morning may be paid at the shift differential rate.
- Shifts shall receive an additional \$3.00 per hour.

**OVERTIME:**

- Hours in excess of 8 per day, Monday through Friday, or outside of the regular workday that are not shift work, and all hours on Saturdays, shall be paid at time and one-half the hourly rate. All hours on Sundays and holidays shall be paid at double the hourly rate.
- Four 10-hour days may be worked, Monday through Thursday, at straight time, with Friday used as a make-up day for a day lost to inclement weather. If Friday is not a make-up day, all hours on Friday shall be paid at time and one-half the hourly rate.

**RECOGNIZED HOLIDAYS:** New Year's Day, Presidents' Day, Memorial Day, July 4th, Labor Day, Presidential Election Day, Veterans' Day, Thanksgiving Day, Christmas Day. Sunday holidays observed the following Monday. Veterans Day may be substituted for the day after Thanksgiving. However, in the trading of Veterans Day for the day after Thanksgiving, if overtime is worked on Veterans Day, it shall be paid at double the hourly rate.

**Hazardous Waste Work:**

- where Level A, B, or C protection is required: + \$5.00/hr
- other Hazardous Waste site: + \$1.00/hr

**Traffic Control Coordinator:** When either of the work classifications found below are working as a Traffic Control Coordinator they are to receive \$.75 above their current rate of pay.

**Effective Dates:**

	04/17/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
78.08	37.33	115.41	119.68	123.81

**CLASSIFICATIONS:**

Walking Boss & Superintendent

**Effective Dates:**

	04/17/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
77.63	37.33	114.96	119.23	123.36

**CLASSIFICATIONS:**

Heading Foreman, Shaft Foreman, Rod Foreman, Electrical Foreman, Rigging Foreman

**HEAVY & GENERAL LABORERS- NEW TRANS HUDSON TUNNELS**      **Rates Expiration Date :**

**Effective Dates:**

	04/17/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
76.88	37.33	114.21	118.48	122.61

**CLASSIFICATIONS:**

Iron Foreman, Caulking Foreman, Form Foreman, Cement Finishing Foreman, Concrete Foreman, Track Foreman, Clean-up Foreman, Grout Foreman

**Effective Dates:**

	04/17/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
80.63	37.33	117.96	122.23	126.36

**CLASSIFICATIONS:**

Blaster

**Effective Dates:**

	04/17/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
76.05	37.33	113.38	117.66	121.78

**CLASSIFICATIONS:**

Top Labor Foreman

**Effective Dates:**

	04/17/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
75.53	37.33	112.86	117.13	121.26

**CLASSIFICATIONS:**

Skilled Men (including Caulker, Powder Carrier, all other skilled men)

Skilled Men (including Miner, Drill Runner, Iron Man, Conveyor Man, Maintenance Man, Safety Miner, Rigger, Block Layer, Cement Finisher, Rod Man)

**Effective Dates:**

	04/17/2024		03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
75.30	37.33	112.63	116.91	121.03

**CLASSIFICATIONS:**

Semi-Skilled Men (including Bell or Signal Man top or bottom, Form Worker & Mover, Concrete Worker, Shaft Man, Tunnel Laborer, Caulker's Helper, all other semi-skilled)

Semi-Skilled Men (including Miner's Helper, Chuck Tender, Track Man, Nipper, Brake Man, Derail Man, Cable Man, Hose Man, Gravel Man, Form Man)

TERRITORY  
ENTIRE STATE

NEW JERSEY DEPARTMENT OF LABOR AND WORKFORCE DEVELOPMENT  
PREVAILING WAGE RATE DETERMINATION

HEAVY & GENERAL LABORERS- NEW TRANS HUDSON TUNNELS     Rates Expiration Date :

Effective Dates:

04/17/2024			03/01/2025	03/01/2026
Rate	Fringe	Total	Total	Total
74.70	37.33	112.03	116.31	120.43

**CLASSIFICATIONS:**

All others (including Powder Watchman, Change House Attendant, Top Laborer, Job Steward)

**EXHIBIT NO. 2**

**LIST OF DEBARRED CONTRACTORS AND SUBCONTRACTORS**

NO TEXT ON THIS PAGE

**New Jersey Prevailing Wage Debarment List**

PURSUANT TO N.J.S.A. 34:11-56.37 AND 34:11-56.38 OF THE PREVAILING WAGE ACT NO PUBLIC WORKS CONTRACT MAY BE AWARDED TO ANY OF THE FOLLOWING CONTRACTORS AND SUBCONTRACTORS OR TO ANY FIRM, CORPORATION OR PARTNERSHIP IN WHICH THEY HAVE AN INTEREST UNTIL THE EXPIRATION DATE GIVEN

Trade Name: Wage & Hour Division and Contract Compliance -List of Debarred Contractors and Subcontractors

<div style="display: flex; justify-content: space-between; align-items: center;"> <span style="border: 1px solid black; padding: 2px 5px;">Back to report</span> <span>WAGE &amp; HOUR DIVISION AND CONTRACT COMPLIANCE - LIST OF DEBARRED CONTRACTORS ...</span> </div>									
Contractor Trade Name	Certificate #	Expiration Date	Address	Address 2	County	City	State	Zip	Debar Type
5 Star Reinforcement GA, LLC	733435	05/24/2025	320 Bledsoe Street			Carrollton	GA	30117	Debarred
A & J Flooring LLC.	738387	11/25/2027	51 Poplar Place		Union	Fanwood	NJ	07023	Debarred
A.L.C. Landscaping & ConstructionALC Contracting LLC	732114	08/01/2025	47 Prospect Ave		Union	Hackensack	NJ	07601	Debarred
AAJ Construction, Inc	729009	11/14/2025	84 Walters Mill Rd			Providence	NC	27315	Debarred
Abraham General Construction, LLC	706177	06/05/2026	39 Condit Terrace		Essex	West Orange	NJ	07052	Debarred
A-Class Construction Corporation	740906	10/17/2027	94 Wright Street		Essex	Newark	NJ	07114	Debarred
AJV Construction Services LLC	736842	08/07/2026	345 Ampere Pkwy		Essex	Bloomfield	NJ	07003	Debarred
All Set Construction Corp	735039	01/30/2026	49 Bisset Drive		Passaic	West Milford	NJ	07480	Debarred
Amazing Millwork LLCAmazing Millwork LLC	733705	05/23/2026	109 Meeker Ave		Brevard	Newark	NJ	07114	Debarred
American Asphalt & Milling Services LLC	704558	06/04/2026	24 Murray Street		Essex	West Orange	NJ	07052	Debarred
Ariel Drywall Corp.Ariel Drywall Corp.	737837	11/05/2027	227 Morris St.			Plainfield	NJ	07063	Debarred
Askari Construction, Inc.	692275	06/10/2027	476 James Way		Bergen	Wyckoff	NJ	07481	Debarred
B&T Contracting LLC	739460	09/15/2027	63 Chester Ave.			Irvington	NJ	07111	Debarred
BDK Contracting LLCBDK Contracting LLC	726214	07/25/2025	1 Fountain View Ave.		Middlesex	Jackson	NJ	08527	Debarred
Blue Contractor Corp.Blue Contractor Corp.	737599	11/05/2027	829 N. Cleveland Ave.		Union	Elizabeth	NJ	07208	Debarred
Bruno Ceramic Tile LLC	737080	12/02/2027	26 Dudley St.	Apt B	Monmouth	Long Branch	NJ	07740	Debarred
Bud Concrete Inc	611154	05/31/2025	200 South Black Horse Pik		Camden	Runnemede	NJ	08078	Debarred
BWK Construction, LLC.	733010	07/27/2025	10 Hallberh Ave			Bergenfield	NJ	07621	Debarred
C. Restoration, Inc.	713970	01/24/2026	790 Bloomfield Avenue	D-1	Passaic	Clifton	NJ	07012	Debarred
Caio Roca LLC	729757	11/23/2024	25 Fairmount Terrace			West Orange	NJ	07052	Debarred
Carpe Diem Trim Work LLC	740894	09/23/2027	208 Tappan St. Suite 2			Kearny	NJ	07032	Debarred
CCC20, LLC	729756	12/06/2025	208 N 9th			Newark	NJ	07107-3720	Debarred
CH ServicesChristophersen Holdings LLC	713269	04/04/2026	PO Box 564		Bergen	Saddle Brook	NJ	07663	Debarred
Charleston Tile and Stone Corp.	739893	03/24/2027	100 Madisonville Road		Morris	Basking Ridge	NJ	07920	Debarred
Charza Contractors, Inc.	727062	05/16/2026	457 Riverside Ave		Bergen	Lyndhurst	NJ	07071	Debarred
Concrete Rising, LLC	732776	03/19/2027	499 Wall Street		Monmouth	Eatontown	NJ	07724	Debarred
Concrete Solutions NJ LLCConcrete Solutions NJ LLC	732269	03/12/2027	176 Central Ave		Essex	West Caldwell	NJ	07006	Debarred
Conrow Construction Co. Inc.Conrow Construction Co. Inc.	606364	11/22/2024	1164 Pompton Avenue		Essex	Cedar Grove	NJ	07009	Debarred
Custok General Construction LLC	730105	12/19/2024	126 Riverside Ave # 2			North Arlington	NJ	07031	Debarred
D & A Drywall , Inc.	733013	11/14/2025	233 Jefferson Avenue			North Plainfield	NJ	07060	Debarred
D&K Construction Company	607381	10/17/2025	155 Union Ave		Middlesex	Middlesex	NJ	08846-0884	Debarred
D. S. Rodrigues Construction LLC	723314	06/23/2025	729 W Shore Trail		Sussex	Sparta	NJ	07871	Debarred
DAA HVAC LLC	733931	11/22/2025	151 West 4th St.		Monmouth	Howell	NJ	07731	Debarred
Damar Construction CoDamar Construction Co	726876	11/16/2024	125 Brighton Ave.		Essex	East Orange	NJ	07017	Debarred
Daniel Rivera	688296	10/24/2025	827 West 6th Street		Union	Plainfield	NJ	07063	Debarred
D-B Golden Hands, LLC	626533	09/17/2026	6005 Marshall Ave		Atlantic	Ventnor	NJ	08406	Debarred
DCLARKE RESOURCES INC	736158	05/17/2026	1 MAIDEN LANE	5TH FLOOR		New York	NY	10038	Debarred
DeSapio Development, Inc	667381	05/19/2027	317 Ridge Road			Baptistown	NJ	08803	Debarred
DFN Contracting LLC	742145	04/17/2027	60 Cuttermill Rd	Suite 409	Nassau	Great Neck	NY	11021	Debarred
DH Flooring, LLC DH Flooring LLC	732563	08/02/2025	50 Sternberger Ave	Apartment 11	Monmouth	Long Branch	NJ	07740	Debarred
DIMENSION CONTRACTORS LLC	735828	06/19/2026	110 Jabez Street, Apt 320		Essex	Newark	NJ	07105	Debarred
DJ Moving and Installation, LLC	704340	03/08/2026	10 Gravatt Cir		Monmouth	Clarksburg	NJ	08510	Debarred
DI Drywall Company	739553	08/20/2027	452 Handing Place Apt. 7a			Fairview	NJ	07022	Debarred
Don Brennan, Jr. Mason Contractor	651924	11/01/2025	444 Cable Avenue		Ocean	Beachwood	NJ	08722	Debarred
Donald Drywall, LLC	695334	03/14/2026	646 Cross Street	Bldg. B Unit 26	Ocean	Lakewood	NJ	08701	Debarred
Drywall Builders Corp.Drywall Builders Corp.	733068	03/13/2025	23 Emma Street		Warren	Plainfield	NJ	07063	Debarred
Drywall Express, LLC Drywall Express, LLC	737832	11/06/2027	340 Valleyscent Avenue		Union	Scotch Plains	NJ	07060	Debarred
EC Abatement, Inc. EC Abatement, Inc.	734924	04/04/2026	21948 141st Ave		Ocean	Springfield Gardens	NY	11413-2901	Debarred



Electrical Mechanical Services Inc.-aka EMSElectrical Mechanical Services Inc.-aka EMS	615173	03/15/2025	12 Crosswood Way		Somerset	Warren	NJ	07060	Debarred
ET Construction	740412	06/25/2027	25 Kearny Street 3rd Fl			Newark	NJ	07104	Debarred
Fairmont Builders LLCFairmont Builders LLC	723413	07/02/2027	226 Louis Street		Bergen	Hackensack	NJ	07601	Debarred
Five Star Contractors Builders And Remodelers LLC	740770	10/09/2027	146 Liberty Avenue		Essex	Belleville	NJ	07109	Debarred
Fortis ContractorsFortis Contractors	731023	04/10/2026	3805 10th Ave		Sussex	New York	NY	10034	Debarred
Frankoski Construction Co., Inc	606939	07/14/2027	314 Dodd Street		Essex	East Orange	NJ	07017	Debarred
Galo Contractors Group, LLC	731000	05/10/2025	124 Whitehead Avenue		Middlesex	South River	NJ	08882	Debarred
Garden State Roofing & Sheet Metal	720358	05/20/2027	293 Route 79 N		Monmouth	Morganville	NJ	07751	Debarred
General Construction Pro1, LLC	733001	09/06/2025	108 Stevens Place	Apt. 2	Essex	North Arlington	NJ	07031	Debarred
Green Master Contractor Corp.Green Master Contractor Corp.	737833	11/06/2027	57 Joyce Kilmer Ave.	Suite 2		New Brunswick	NJ	08901	Debarred
Hernandez Woodwork, LLC	733181	04/04/2026	201 Joyce Kilmer Ave			New Brunswick	NJ	08901	Debarred
Jaione Electric IncJaione Electric Inc	693258	05/31/2026	211 Park Avenue		Union	Scotch Plains	NJ	07076	Debarred
ILG Construction LLCILG Construction LLC	739128	11/13/2027	103 Gweenedd Ct.			Pleasant Gap	PA	16823	Debarred
J.A.G. Contracting, LLC	740001	07/01/2027	1046 Riverton Street		Middlesex	North Brunswick	NJ	08902	Debarred
Jalisco Concrete Corp.	735684	02/13/2026	442 Westfield Ave		Union	Elizabeth	NJ	07208	Debarred
JC Mechanical Contractors LLC	733299	08/15/2025	35 Ann St.			Newark	NJ	07105	Debarred
JMR Construction, LLCJMR Construction, LLC	737598	11/05/2027	1632 Taylor Dr		Monmouth	North Brunswick	NJ	08902	Debarred
Joey Domenico Inc	706527	12/02/2027	336 North Street		Atlantic	Hammonton	NJ	08037	Debarred
John Butler And Sons LLC	738494	10/29/2027	407 Cedar Swamp Rd			Jackson	NJ	08527	Debarred
Jordan and Danae Painting	741026	06/24/2027	angelicacontrerasmedin a0	@gmail.co m					Debarred
JTLS Concrete Corp	738988	12/27/2026	275 Chestnut Street	Suite 152	Union	Newark	NJ	07105	Debarred
K&O Landscaping	730683	05/07/2026	335 Somerset St.		Middlesex	New Brunswick	NJ	08901	Debarred
Kico Construction LLC	733691	05/24/2025	1841 Catawba Circle	Apartment H		Kissimmee	FL	34741	Debarred
KISS ELECTRIC LLC	669322	04/17/2026	5921 Bristol - Emilie Rd.		Bucks	Levittown	PA	19057	Debarred
L & S Drywall Experts Corporation	739784	07/01/2027	1200 West Front Street		Union	Plainfield	NJ	07060	Debarred
Latz Inc	629570	05/04/2025	65 Piermont Rd		Bergen	Tenaflly	NJ	07670	Debarred
Leone Leone CompanyLeone Leone Company	732408	06/03/2027	436 Main St	2nd Floor	Bergen	Lodi	NJ	07644	Debarred
Lomeli Windows, LLC.Lomeli Windows, LLC	734065	08/15/2025	24 Willow Street		Bergen	Elmwood Park	NJ	07407	Debarred
Luis RC Construction LLC	733929	05/11/2025	719 Bridgeboro St.		Burlington	Riverside	NJ	08075	Debarred
Lutz Construction, Inc.	726199	10/24/2025	920 Sewall Avenue		Monmouth	Asbury Park	NJ	07712	Debarred
LV Drywall, Inc.	736860	11/05/2027	122 Lafayette Place		Union	Plainfield	NJ	07060	Debarred
M & J Domenico Excavating Inc.	724173	12/02/2027	344 North St.		Atlantic	Hammonton	NJ	08037	Debarred
M & M Contractors 1, LLC	739034	08/26/2027	5339 Charles Street			Philadelphia	PA	19124	Debarred
Maestro Contracting, Inc.	732350	12/11/2025	447 N 13th Street		Gloucester	Newark	NJ	07107	Debarred
Marcal Construction Group, Inc.Marcal Construction Group Corporation	727261		364 Keene Street		Middlesex	Perth Amboy	NJ	08861	Suspended
Maya Concrete, LLC.	735777	05/23/2026	15901 Pedlar Mills Road		Middlesex	Charlotte	NC	28278	Debarred
MD Scaffolding Inc.	736075	07/18/2026	1280 Croton Loop, Apt 15H			Brooklyn	NY	11239	Debarred
Medina Construction Inc	729767	08/23/2026	974 E 24th St			Paterson	NJ	07513	Debarred
Miketen Contractors LLCMiketen Contractors LLC	722069	07/02/2027	201 Mountainview Road		Somerset	Warren	NJ	07059	Debarred
Monteiro Concrete, LLC	737304	02/13/2027	575 N Tropic Ln	Apt C		Vero Beach	FL	32960	Debarred
Montes General Contractor LLC	724908	12/03/2026	10 Whistler Place	1st Floor	Morris	Haskell	NJ	07420	Debarred
Monty Carpentry LLC	737003	10/07/2027	84 N Cedar Ave		Morris	Bellmawr	NJ	08031	Debarred
Monty Mason Contracting, LLC	723394	04/25/2025	958 State Rt 208		Passaic	Hawthorne	NJ	07506	Debarred
Mosteiros Construction LLCMosteiros Construction LLC	716065	07/12/2026	815 Garden St.		Union	Elizabeth	NJ	07202	Debarred
MRF Global Corp.	729763	12/20/2024	1194 Belmont Ave.		Passaic	North Haledon	NJ	07508	Debarred
New Bridge Contracting, Inc.	737814	11/13/2026	2650 Mill Rd			Brooklyn	NY	11214	Debarred
New Jersey Clean Energy Solutions	702024	08/27/2027	420 Chandler Road		Ocean	Jackson Township	NJ	08527	Debarred
NJ West Construction, Inc.	710178	06/16/2027	1113 Van Arsdale Dr.,		Somerset	Neshanic Station	NJ	08853	Debarred
Northstone Construction, LLC	729213	05/17/2026	1033 Route 46 East	Suite A-204	Passaic	Clifton	NJ	07013	Debarred
Premier Fence & Iron Works, Inc	722301	12/28/2024	5856 Penn Street		Philadelphia	Philadelphia	PA	19154	Debarred
Premier Steel, Inc	729008	06/04/2026	1010 Abada Ct, NE	Apt 109	Brevard	Palm Bay	FL	32905	Debarred
R F Contractors, LLC	727894	11/21/2025	19 Partch Place			Edison	NJ	08817	Debarred
Raw Construction II	725414	03/01/2025	7718 Pipers Swan St.		Hudson	San Antonio	TX	78251	Debarred
Reliant ITZenani IT, LLC	735403	03/25/2027	PO Box 1254		Delaware	Southeastern	PA	19399-1254	Debarred
Renovations Plus LLC	735204	07/16/2027	1 Mills Lane			Jackson	NJ	08527	Debarred
Restore Electric LLC	729079	08/27/2027	420 Chandler Rd.		Ocean	Jackson	NJ	08527	Debarred
Rider Contractor LLCRIDERS CONTRACTORS LIMITED LIABILITY COMPANY	734560	10/30/2025	951 Rodman Way		Gloucester	Baltimore	MD	21205	Debarred

RIS Construction Corp	RIS Construction Corp	699866	07/17/2025	143 N Fullerton Ave	1st Floor	Essex	Montclair	NJ	07042	Debarred
Road Contractor Corp.		739549	07/01/2027	647 Broadway	Suite 215	Monmouth	Long Branch	NJ	07740	Debarred
Roger Diaz Construction dba Z Express Construction		710486	11/19/2027	94 Sanford Street		Middlesex	New Brunswick	NJ	08901	Debarred
Rookwood Construction, LLC		740689	10/16/2027	600 G Street			Millville	NJ	08332	Debarred
Saint Joseph Trim & Cabinet Co.	St. Joseph Inc. Cabinet Making and Millwork	709175	10/04/2025	421 Bunting Avenue		Mercer	Hamilton	NJ	08611	Debarred
Service Painting, Inc.		698323	12/15/2024	200 Price Street		Delaware	Trainer	PA	19061	Debarred
Sharp General Contractors LLC		728713	07/19/2025	100 A Grove Street			Elmwood Park	NJ	07407	Debarred
Silva Brothers Construction Carpentry Inc.	Silva Brothers Construction Carpentry Inc.	727341	06/14/2025	239 Progress Street			Riverside	NJ	08075	Debarred
Soft Contractor Corp.	Soft Contractor Corp.	737836	11/06/2027	115 Nichol Ave.		Middlesex	North Brunswick	NJ	08901	Debarred
Super JJ Fire Sprinkler Subcontractor LP		725413	10/25/2025	16 Turnburry Road		Gloucester	Washington Township	NJ	07882	Debarred
SUPER, LLC		695643	04/30/2027	203 Belmont Ave		Passaic	Haledon	NJ	07508	Debarred
Surfside Roofing And Contracting	8181 LLC	737084	01/01/2027	7351 Driftwood Lane		Atlantic	Mays Landing	NJ	08330	Debarred
Synergy Systems - Light, Sound & Video, Inc.		609707	03/13/2026	23 Van Brackle Road		Monmouth	Holmdel	NJ	07733	Debarred
The BJ United Electric Inc	The BJ United Electric Inc.	729897	02/14/2027	1071 Linden Ave		Bergen	Ridgefield	NJ	07657	Debarred
The Kadex Ceiling Team, Inc.		732994	02/23/2025	248 Insee Place		Union	Elizabeth	NJ	07206	Debarred
Tim's Electric, Inc.		742056	03/18/2027	34 Monterey Dr		Monmouth	Hazlet	NJ	07730	Debarred
Tink Construction Services LLC		732414	05/16/2026	P.O. Box 10367		Mercer	Trenton	NJ	08650	Debarred
True Steel Construction LLC	True Steel Construction LLC	709526	05/07/2026	248 Thomas Street		Essex	Newark	NJ	07114	Debarred
Unlimited Installation Services, LLC		734884	06/29/2026	141 Lanza Ave			Garfield	NJ	07026	Debarred
Valle Hermoso Construction Corporation		698919	12/12/2025	2222 Bosworth Ave.		Camden	Lindenwold	NJ	08021	Debarred
VikXs Services LLC		732668	07/24/2026	4 Avery Dr.			Old Bridge	NJ	08857	Debarred
Wallace General Contracting LLC		726851	12/18/2025	3525 Quakerbridge Rd.	Suite 903-V	Mercer	Hamilton	NJ	08619	Debarred
Walls Systems Corp.		735685	02/13/2026	18 Sumo Village		Essex	Newark	NJ	07114	Debarred
Wisetech Inc.		729507	10/20/2025	361 West Dewey Ave	Unit 9	Morris	Wharton	NJ	07806	Debarred
Yolo Construction Corp.		743660	11/12/2027	1110 61st Street			North Bergen	NJ	07047	Debarred
Zafir Construction Corp.		734088	07/25/2025	30 Austin Street Apt. 206		Essex	Newark	NJ	07114	Debarred

The preceding list of debarred contractors as of **December 16, 2024** was determined by the New Jersey Department of Labor and Workforce Development pursuant to NJSA 34:11-56.37 and 34:11-56.38 of the Prevailing Wage Act. The most current listing can be accessed from the following link:

[https://nj.gov/labor/wagehour/wagerate/prevailing\\_wage\\_debarment\\_list.html](https://nj.gov/labor/wagehour/wagerate/prevailing_wage_debarment_list.html)

**EXHIBIT NO. 3**

**DAVIS BACON ACT – LABOR STANDARDS PROVISIONS FOR FEDERALLY  
ASSISTED CONSTRUCTION CONTRACTS  
(EPA FORM 5720-4)**

**AND**

**USEPA ATTACHMENT 6 – REQUIREMENTS FOR  
SUBRECIPIENTS THAT ARE GOVERNMENT ENTITIES**

NO TEXT ON THIS PAGE

"General Decision Number: NJ20240052 11/01/2024

Superseded General Decision Number: NJ20230052

State: New Jersey

Construction Type: Heavy

County: Essex County in New Jersey.

HEAVY CONSTRUCTION PROJECTS

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	<ul style="list-style-type: none"><li>. Executive Order 14026 generally applies to the contract.</li><li>. The contractor must pay all covered workers at least \$17.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2024.</li></ul>
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	<ul style="list-style-type: none"><li>. Executive Order 13658 generally applies to the contract.</li><li>. The contractor must pay all covered workers at least \$12.90 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2024.</li></ul>

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the

Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number	Publication Date
0	01/05/2024
1	01/26/2024
2	03/08/2024
3	04/05/2024
4	07/12/2024
5	09/06/2024
6	09/06/2024
7	11/01/2024

BRNJ0004-001 11/01/2022

	Rates	Fringes
CEMENT MASON.....	\$ 46.90	34.31

CARP0006-009 05/01/2024

	Rates	Fringes
CARPENTER (Scaffold Builder).....	\$ 56.01	59.25%+\$0.14

The first sixty feet at the regular rate, 10% per hour additional for each additional fifty feet thereafter.

CARP0006-013 05/01/2024

	Rates	Fringes
CARPENTER (Including Form Work).....	\$ 56.01	59.25%+\$0.14

The first sixty feet at the regular rate, 10% per hour additional for each additional fifty feet thereafter.

CARP0715-007 05/01/2020

	Rates	Fringes
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Millwright.....\$ 51.58                   58%+0.25

Work of erection and dismantling of elevators and towers, such as concrete conveyors and temporary material elevators, scaffolding or other structures to be used as scaffolding inside or outside of buildings: the first sixty feet at the regular rate, 10% per hour additional for each additional fifty feet thereafter.

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ELEC0164-008 06/03/2024

	Rates	Fringes
ELECTRICIAN		
Cable splicer.....	\$ 73.59	62.5%
Electrician.....	\$ 62.90	62.5%

Work on line voltage of 440 or 480 volts: 10% per hour additional.

Work from trusses, scaffolds, frames, ladders and poles, 40 ft. or more above the ground or floor (does not include work from a manlift): 20% per hour additional.

Work on radio towers, transmission towers and smokestacks: 21% per hour additional.

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\* ENGI0825-021 07/01/2024

	Rates	Fringes
Power equipment operators:		
GROUP 1.....	\$ 60.47	36.25
GROUP 2.....	\$ 58.88	36.25
GROUP 3.....	\$ 56.97	36.25
GROUP 4.....	\$ 55.34	36.25
GROUP 5.....	\$ 51.63	36.25

Hazardous waste removal work:  
Work on a state or federally designated hazardous waste site, where the worker is in direct contact with hazardous material, and when personal protective equipment is required for respiratory, skin and eye protection: 20% per hour additional.

PAID HOLIDAYS:

New Year's Day, Washington's Birthday observed, Memorial Day, Independence Day, Labor Day, Presidential Election Day, Veteran's Day, Thanksgiving Day and Christmas Day; provided 1) that the worker works three of the preceding five work days before the holiday; or, the work day before the holiday and the work day after the holiday; and, 2) that the worker works the work day before and the work day after the holiday.

DEFINITION OF GROUPS:

GROUP 1:

Backhoe, Including Backhoe Track; Boom; Concrete Paving Machine; Crane (all types, including overhead and straddle traveling type); Drill (down-the-hole drill, rotary drill, self-propelled hydraulic drill, self-powered drill); Elevating Grader; Excavator; Front End Loader (5 cu. yd. and over); Piledriver (length of boom, including length of leads, shall determine premium rate applicable)

GROUP 2:

Backhoe Loader Combo; Concrete Pumper; Grader/Blade (Finish); Hoist; Hydraulic Crane, 10 Tons and under; Front End Loader (2 cu. yd. but less than 5 cu. yd.); Scraper; Side Boom

GROUP 3:

Asphalt Spreader; Bulldozer; Compressor(2 or 3) (in Battery) (within 100 ft.); Crusher; Forklift; Front End Loader (1 cu. yd. and over but less than 2 cu. yd.); Lull; Mechanic; Paver, Asphalt; Roller, Blacktop; Tractor;

GROUP 4:

Broom; Compressor (Single); Farm Tractor; Front End Loader (under 1 cu. yd.); Roller, Grade; Pump

GROUP 5:

Oiler

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 IRON0011-012 07/01/2023

	Rates	Fringes
Ironworkers:		
Reinforcing.....	\$ 46.89	48.17
Structural, Ornamental.....	\$ 49.19	48.17

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 LAB0077-008 07/01/2012



	Rates	Fringes
LABORER		
MASON TENDER:		
Cement/Concrete.....	\$ 29.35	23.07

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LABO0172-009 03/01/2021

	Rates	Fringes
Laborers:		
Common or General Laborer; Landscape Laborer, Power Tool Operator.....	\$ 43.50	32.35
Pipelayer.....	\$ 44.20	32.35

Hazardous waste removal work:

Work on a state or federally designated hazardous waste site, where the worker is required to wear Level A, B or C personal protection: \$3.00 per hour additional.

Work on a state or federally designated hazardous waste site, where the worker is not required to wear Level A, B, or C personal protection: \$1.00 per hour additional.

PAID HOLIDAYS:

New Year's Day, President's Day, Memorial Day, Independence Day, Labor Day, Presidential Election Day, Veteran's Day, Thanksgiving Day and Christmas Day; provided that the worker works three days for the same employer within a period of ten working days consisting of five working days before and five working days after the day upon which the holiday falls or is observed.

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PAIN0711-023 05/01/2023

	Rates	Fringes
Painters:		
Work on bridges (Major Bridges Designed for Commercial Navigation).....	\$ 58.28	33.85

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PAIN0711-024 05/01/2017

Rates	Fringes
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Painters:

New Construction		
Brush and roller.....	\$ 40.19	22.72
Repaint work, on projects on which no major alterations occur.		
Brush and roller.....	\$ 29.05	18.91

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PLUM0475-020 05/01/2023

	Rates	Fringes
PIPEFITTER.....	\$ 54.43	46.26

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TEAM0408-003 05/01/2024

	Rates	Fringes
TRUCK DRIVER		
Dump Truck.....	\$ 45.41	30.82
Off the Road Truck, Flatbed Truck, Pickup Truck, Vacuum Truck.....	\$ 45.51	30.82

a. Employer contributes \$2026.49 per month per worker for health and welfare.

Hazardous waste removal work, where the worker is in direct contact with hazardous material, and when personal protective equipment is required for respiratory, skin and eye protection: \$3.00 per hour additional.

Hazardous waste removal work, where the worker is working in a hazardous waste site, in a zone requiring Level A personal protection for any of the workers: \$3.00 per hour additional.

Hazardous waste removal work, where the worker is not working in a zone requiring Level A, B or C personal protection: \$1.00 per hour additional.

PAID HOLIDAYS:

New Year's Day, President's Day, Decoration Day, Independence Day, Labor Day, Presidential Election Day, Veteran's Day, Thanksgiving Day and Christmas Day; provided that the worker has been assigned to work, or, ""shapes"", one day of the calendar week during which the holiday occurs.

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

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

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

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

#### Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were

prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

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

#### Survey Rate Identifiers

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

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

#### Union Average Rate Identifiers

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

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

based.

#### State Adopted Rate Identifiers

Classifications listed under the "SA" identifier indicate that the prevailing wage rate set by a state (or local) government was adopted under 29 C.F.R. §1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 01/03/2024 reflects the date on which the classifications and rates under the "SA" identifier took effect under state law in the state from which the rates were adopted.

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#### WAGE DETERMINATION APPEALS PROCESS

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

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

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

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

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

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

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

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

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

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

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

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END OF GENERAL DECISION"

## Attachment 2

### **Wage Rate Requirements under The Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6)**

#### **Preamble**

With respect to the Clean Water and Safe Drinking Water State Revolving Funds, EPA provides capitalization grants to each State which in turn provides subgrants or loans to eligible entities within the State.

Typically, the subrecipients are municipal or other local governmental entities that manage the funds. For these types of recipients, the provisions set forth under **Roman Numeral I**, below, shall apply. Although EPA and the State remain responsible for ensuring subrecipients' compliance with the wage rate requirements set forth herein, those subrecipients shall have the primary responsibility to maintain payroll records as described in **Section 3(ii)(A)**, below and for compliance as described in **Section 1-5**.

Occasionally, the subrecipient may be a private for profit or not for profit entity. For these types of recipients, the provisions set forth in **Roman Numeral II**, below, shall apply. Although EPA and the State remain responsible for ensuring subrecipients' compliance with the wage rate requirements set forth herein, those subrecipients shall have the primary responsibility to maintain payroll records as described in **Section II-3(ii)(A)**, below and for compliance as described in **Section 11-5**.

#### **I. Requirements Under The Consolidated and Further Continuing Appropriations Act, 2013 (P.L.113-6) For Subrecipients That Are Governmental Entities:**

The following terms and conditions specify how recipients will assist EPA in meeting its Davis-Bacon (DB) responsibilities when DB applies to EPA awards of financial assistance under the FY 2013 Continuing Resolution with respect to State recipients and subrecipients that are governmental entities. If a subrecipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient. If a State recipient needs guidance, the recipient may contact Lorraine Fleury at fleury.lorraine@epa.gov or at 215-814-2341 of EPA, Region III Grants and Audit Management Branch for guidance. The recipient or subrecipient may also obtain additional guidance from DOL's web site at <http://www.dol.gov/whd/>

## **1. Applicability of the Davis- Bacon (DB) prevailing wage requirements.**

Under the FY 2013 Continuing Resolution, DB prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution control revolving fund and to any construction project carried out in whole or in part by assistance made available by a drinking water treatment revolving loan fund. If a subrecipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the subrecipient must discuss the situation with the recipient State before authorizing work on that site.

## **2. Obtaining Wage Determinations.**

(a) Subrecipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes or other methods for soliciting contracts (solicitation) for activities subject to DB. These wage determinations shall be incorporated into solicitations and any subsequent contracts. Prime contracts must contain a provision requiring that subcontractors follow the wage determination incorporated into the prime contract.

- (i) While the solicitation remains open, the subrecipient shall monitor [www.wdol.gov](http://www.wdol.gov) weekly to ensure that the wage determination contained in the solicitation remains current. The subrecipients shall amend the solicitation if DOL issues a modification more than 10 days prior to the closing date (i.e. bid opening) for the solicitation. If DOL modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the subrecipients may request a finding from the State recipient that there is not a reasonable time to notify interested contractors of the modification of the wage determination. The State recipient will provide a report of its findings to the subrecipient.
- (ii) If the subrecipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes DOL makes to the wage determination contained in the solicitation shall be effective unless the State recipient, at the request of the subrecipient, obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv). The subrecipient shall monitor [www.wdol.gov](http://www.wdol.gov) on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

(b) If the subrecipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the subrecipient shall insert the appropriate DOL wage determination from [www.wdol.gov](http://www.wdol.gov) into the ordering instrument.

(c) Subrecipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

(d) As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a subrecipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the subrecipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the



subrecipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering instrument by change order. The subrecipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

### **3. Contract and Subcontract provisions.**

(a) The Recipient shall insure that the subrecipient(s) shall insert in full in any contract in excess of \$2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the FY 2013 Continuing Resolution, the following clauses:

#### **(1) Minimum wages.**

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

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

**Subrecipients may obtain wage determinations from the U.S. Department of Labor's web site, [www.dol.gov](http://www.dol.gov).**

(ii)(A) The subrecipient(s), on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request

for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

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

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

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

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the subrecipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the subrecipient (s) to the State award official. The State award official will transmit the request, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

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

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

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

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

## **(2) Withholding.**

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

## **(3) Payrolls and basic records.**

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

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the subrecipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the subrecipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or

the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

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

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

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

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

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

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

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

#### **(4) Apprentices and trainees.**

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State

Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

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

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

**(5) Compliance with Copeland Act requirements.**

The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

**(6) Subcontracts.**

The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.S(a)(1) through (10) and such other clauses as the EPA determines may be appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

**(7) Contract termination; debarment.**

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

**(8) Compliance with Davis-Bacon and Related Act requirements.**

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

**(9) Disputes concerning labor standards.**

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

**(10) Certification of eligibility.**

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

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

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

**4. Contract Provision for Contracts in Excess of \$100,000.**

**(a) Contract Work Hours and Safety Standards Act.** The subrecipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act.

These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

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

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

**(3) Withholding for unpaid wages and liquidated damages.** The subrecipient, upon written request of the EPA Award Official or an authorized representative of the Department of labor, shall withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

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

**(b)** In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Subrecipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions *made*, and actual wages paid. Further, the Subrecipient shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

## **5. Compliance Verification.**

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

**(b)** The subrecipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. Subrecipients must conduct more frequent interviews if the initial interviews or other information indicated that there is a risk that the contractor or subcontractor is not complying with DB. Subrecipients shall immediately conduct interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.

**(c)** The subrecipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The subrecipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable, the subrecipient should spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract. Subrecipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. In addition, during the examinations the subrecipient shall verify evidence of fringe benefit plans and payments there under by contractors and subcontractors who claim credit for fringe benefit contributions.

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

**(e)** Subrecipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at <http://ljwww.dol.gov/contacts/whd/america2.htm>.



## ATTACHMENT 6

### **Wage Rate Requirements Under FY 2012 Full-Year Continuing Appropriation**

#### **Preamble**

With respect to the Clean Water and Safe Drinking Water State revolving Funds, EPA provides capitalization grants to each State which in turn provides subgrants or loans to eligible entities within the State.

**Typically, the subrecipients are municipal or other local governmental entities that manage the funds.**

**For these types of recipients, the provisions set forth under Roman Numeral I, below, shall apply.**

Although EPA and the State remain responsible for ensuring subrecipients' compliance with the wage rate requirements set forth herein, **those subrecipients shall have the primary responsibility to maintain payroll records as described in Section 3(ii)(A), below and for compliance as described in Section I-5.**

**Occasionally, the subrecipient may be a private for profit or not for profit entity.**

**For these types of recipients, the provisions set forth in Roman Numeral II, shall apply.**

Although EPA and the State remain responsible for ensuring subrecipients' compliance with the wage rate requirements set forth herein, **those subrecipients shall have the primary responsibility to maintain payroll records as described in Section II-3(ii)(A), and for compliance as described in Section II-5.**

## **I. Requirements for Subrecipients that are Governmental Entities:**

The following terms and conditions specify how recipients will assist EPA in meeting its Davis-Bacon (DB) responsibilities when DB applies to EPA awards of financial assistance under the FY 2012 Full-Year Continuing Appropriation with respect to State recipients and **subrecipients that are governmental entities. If a subrecipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient.** The recipient or subrecipient may also obtain additional guidance from DOL's web site at <http://www.dol.gov/esa/whd/recovery/>

### **1. Applicability of the Davis- Bacon (DB) prevailing wage requirements.**

Under the FY 2012 Full-Year Continuing Appropriation, DB prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution control revolving fund and to any construction project carried out in whole or in part by assistance made available by a drinking water treatment revolving loan fund. If a subrecipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the subrecipient must discuss the situation with the recipient State before authorizing work on that site.

### **2. Obtaining Wage Determinations.**

(a) Subrecipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes or other methods for soliciting contracts (solicitation) for activities subject to DB. These wage determinations shall be incorporated into solicitations and any subsequent contracts. Prime contracts must contain a provision requiring that subcontractors follow the wage determination incorporated into the prime contract.

- (i) While the solicitation remains open, the subrecipient shall monitor [www.wdol.gov](http://www.wdol.gov) weekly to ensure that the wage determination contained in the solicitation remains current. The subrecipients shall amend the solicitation if DOL issues a modification more than 10 days prior to the closing date (i.e. bid opening) for the solicitation. If DOL modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the subrecipients may request a finding from the State recipient that there is not a reasonable time to notify interested contractors of the modification of the wage determination. The State recipient will provide a report of its findings to the subrecipient.
- (ii) If the subrecipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes DOL makes to the wage determination contained in the solicitation shall be effective unless the State recipient, at the request of the subrecipient, obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv). The subrecipient shall

monitor [www.wdol.gov](http://www.wdol.gov) on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

(b) If the subrecipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the subrecipient shall insert the appropriate DOL wage determination from [www.wdol.gov](http://www.wdol.gov) into the ordering instrument.

(c) Subrecipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

(d) As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a subrecipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the subrecipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the subrecipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering instrument by change order. The subrecipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

### **3. Contract and Subcontract provisions.**

(a) **The subrecipient(s) shall insert in full in any contract in excess of \$2,000** which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the FY 2012 Full-Year Continuing Appropriation, **the following clauses:**

#### **(1) Minimum wages.**

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

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section;

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

Subrecipients may obtain wage determinations from the U.S. Department of Labor's web site, [www.dol.gov](http://www.dol.gov).

**(ii)(A)** The subrecipient(s), on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

- (1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
- (2) The classification is utilized in the area by the construction industry; and
- (3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

**(B)** If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the subrecipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the subrecipient (s) to the State award official. The State award official will transmit the request, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

**(C)** In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the subrecipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator

for determination. The request shall be sent to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

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

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

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

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

**(3) Payrolls and basic records.**

**(i)** Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing

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

**(ii)(A)** The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the subrecipient, that is, the entity that receives the subgrant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the subrecipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

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

**(1)** That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

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

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

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

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

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

#### **(4) Apprentices and trainees--**

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

fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

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

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

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

**(6) Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may be appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.



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

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

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

**(10) Certification of eligibility.**

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

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

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

**4. Contract Provision for Contracts in Excess of \$100,000.**

**(a) Contract Work Hours and Safety Standards Act.** The subrecipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

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

**(2) Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in paragraph (a)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for

the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (a)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a)(1) of this section.

**(3) Withholding for unpaid wages and liquidated damages.** The subrecipient, upon written request of the EPA Award Official or an authorized representative of the Department of Labor, shall withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (a)(2) of this section.

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

**(b)** In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Subrecipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Subrecipient shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

## **5. Compliance Verification.**

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

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

**(c)** The subrecipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The subrecipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable, the subrecipient should spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract. Subrecipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. In addition, during the examinations the subrecipient shall verify evidence of fringe benefit plans and payments thereunder by contractors and subcontractors who claim credit for fringe benefit contributions.

**(d)** The subrecipient shall periodically review contractors and subcontractors use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.

**(e)** Subrecipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at <http://www.dol.gov/esa/contacts/whd/america2.htm>.



**EXHIBIT NO. 4**

**CONTRACT MODIFICATION PROPOSAL AND ACCEPTANCE FORM**

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**Use of the Change Order Form entitled “Contract Modification Proposal and Acceptance”**

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- When the Loanee wishes to issue a change to the contract, the attached “Contract Modification Proposal and Acceptance” form should be used as a request for proposal. Upon final settlement of the change, this same form is then completed and serves as the contract modification.
- The Loanee in requesting a proposal for a change would execute items 1 thru 8 (exclusive of the revised contract price and duration data) and 9 thru 12. Pages 1 and 2 of this form are then forwarded to the contractor, specifying scope of work and requesting the contractor’s proposal.
- The contractor should execute page 2 of the form. He then submits pages 1 and 2 of the form as his proposal, attaching additional sheets as necessary to provide his detailed breakdown of costs.
- Upon negotiation of a final settlement, the Loanee completes page 1 of the form, and all concerned parties authorized contractor representative, engineer ( P.E.), owner (authorized individual\*) sign this document as the contract modification. Note governing body approval process for change orders shall be in accordance with NJAC 5:30-11.5 and evidence of that procedure shall be provided with the change order.
- Page 3 of the form is executed by the Loanee for documentation of the change, and to provide the necessary details for review by the Regulatory Agencies.
- Submit a minimum of two original copies with raised engineer’s seal. It is suggested that one original be kept for your records.
- \*must be authorized to sign with supporting resolution

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**Detailed Instructions for Executing “Contract Modification Proposal and Acceptance” Form**

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Item 1. Enter the name of the Loanee.

Item 2. Enter State Project number.

Item 3. Enter the contract number or designation.

Item 4. Enter the number identifying this modification.

Item 5. Enter the name of the Contractor.

Item 6. Enter the project title and location.

Item 7. Requests a proposal for the specified change order work, but does not direct contractor to proceed. The owner or his authorized representative must execute this statement by signature with date and title blocks entered.

Item 8. Provide a clear description of the scope of work for this change. Upon final settlement of the modification costs, enter cost data by line item for unit priced items or by sum; and state total cost of this modification – net increase, net decrease, or no change in contract price – inclusive of all claims for home-office and other overhead and profit. Enter appropriate information for any change in contract time, including number of calendar days involved. The modification is executed when all appropriate signatures are included.

Items 9 – 12. Same as items 1 – 4.

Item 13. Executed by the contractor, stating net effect of change in appropriate box for money and time. A detailed breakdown must be provided in this item; and appropriate signature of authorized representative of contractor included.

Item 14. Enter the Loanee’s name and State Project number.

Item 15. Enter the contract number or designation.

Item 16. Enter number identifying this modification.

Item 17. Enter appropriate financial data. Include a detailed engineer’s estimate of the work to be performed. This estimate will serve as the basis for determining the compensation to be paid by the owner (loanee) to the contractor.

Item 18 Explain and justify the necessity for the change order. Clearly designate the category the change falls under, i.e., changed condition, errors/omissions in plans and specs, design change, etc.

CCS-002A

Item 19. Explain all other impacts resulting from this change with estimate of costs involved. This should include impact on other contractors and the Consulting Engineers.

Item 20. Document that negotiations were held as required by the regulations and explain the events leading to the final settlement in price and time. This statement should include, at a minimum, date and location of negotiations, persons attending, summary of negotiations leading to final price and time settlements, and a statement that the agreed-to price is "fair and reasonable". Engineer's independent estimate should be prepared at the time of change order directive and provided with the submitted change order. This estimate along with other factors will be used to determine the reasonableness of the change order costs.





**CONTRACT MODIFICATION PROPOSAL AND ACCEPTANCE**

9. ISSUING OFFICE	10. PROJECT NO.	11. CONTRACT NO. B-355	12. MODIFICATION NO.
13. CONTRACTOR'S PROPOSAL - CHANGE IN CONTRACT PRICE (Detailed breakdown of all additional work and payment proposed, attach additional sheets as necessary)			
(Proposed)			
TOTAL NET INCREASE \$ _____	TOTAL NET DECREASE \$ _____	CALENDAR DAYS INCREASE _____ DAYS	
DATE:	TYPE CONTRACTOR'S REPRESENTATIVE'S NAME AND TITLE:	SIGNATURE:	

**CONTRACT MODIFICATION PROPOSAL AND ACCEPTANCE**

14. ISSUING OFFICE & PROJECT NO.	15. CONTRACT NO. B-355	16. MODIFICATION NO.
17. ORIGINAL CONTRACT BID PRICE..... \$ _____ TOTAL OF PREVIOUS CHANGE ORDERS..... \$ _____ TOTAL CONTRACT COST INCLUDING PREVIOUS CHANGE ORDERS.... \$ _____		
18. NECESSITY FOR CHANGE AND REASON FOR OMISSION FROM PLANS AND SPECIFICATIONS:		
19. ALL OTHER IMPACTS RESULTANT OF THIS CHANGE:		
20. RESUME OF NEGOTIATIONS OR RECOMMENDATIONS (Loanee's Representative):		
DATE:	TYPE NAME AND TITLE OF LOANEE'S REPRESENTATIVE:	SIGNATURE:



**EXHIBIT NO. 5**

**NJAC 7:22-9 AND  
NJAC 7:22-10.11, 12**

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**NJAC 7:22-9**





The rule below includes the amendments adopted to this subchapter on January 3, 2006.

**Subchapter 9. Awarding Contracts for State Assisted Projects to Small Business Concerns Owned and Controlled by Socially and Economically Disadvantaged Individuals**

**7:22-9.1 Scope and purpose**

(a) This subchapter establishes procedures for providing opportunities for socially and economically disadvantaged ("SED") contractors and vendors to supply materials and services under State financed construction contracts for environmental infrastructure facilities. To implement the policies established in N.J.S.A. 58:11B-26, 40:11A-41 et seq., and 52:32-17 et seq., this subchapter applies to environmental infrastructure projects receiving financial assistance from the Department and the Trust pursuant to N.J.A.C. 7:22-3, 4 and 6 and 7:22A-6 and 7. Under the provisions of N.J.A.C. 7:22-3, 4 and 6 and 7:22A-6 and 7, the Department and the Trust require recipients of Trust and Fund loans and other assistance to establish such programs for socially and economically disadvantaged small business concerns, to designate a project compliance officer, and to submit to the Department and Trust procurement plans for implementing the SED program. In addition, N.J.A.C. 7:22-3.17(a)24, 4.17(a)24, 6.17(a)24 and 7:22A-2.4(a) provide that a goal of not less than 10 percent be established for the award of contracts to small business concerns owned and controlled by one or more socially and economically disadvantaged individuals. The goal of 10 percent applies to the total amount of all contracts for building, materials and equipment, or services (including planning, design and building related activities) for a construction project. Where a local government unit has a SED participation goal which exceeds 10 percent of the total amount of all contracts, the local government unit must comply with both the Department's rules and the local minority and women-owned business ordinances.

(b) This subchapter also establishes the standards and procedures that will apply to the contracting agencies of grant or loan recipients in the awarding and making of contracts under their SED programs.

**7:22-9.2 Definitions**

The following words and terms, as used in this subchapter, will have the following meanings unless the content clearly indicates otherwise.

"Building" means the acquisition, erection, alteration, remodeling, improvement or extension of an environmental infrastructure facility.

"Construction" includes, but is not limited to:

1. The preliminary planning to determine the economic and engineering feasibility of environmental infrastructure facilities, the engineering, architectural, legal, fiscal, and economic investigations and studies, surveys, design, plans, working drawings, specifications, procedures, and other action necessary for the construction of environmental infrastructure facilities;

2. The building of, or purchase of land for, environmental infrastructure facilities; and

3. The inspection and supervision of the building of environmental infrastructure facilities.

"Contract" means any written agreement with a professional service or construction contractor related to the construction of an environmental infrastructure project.

"Contracting agency" means:

1. The governing body of a local government unit or any department, branch, board, commission, committee, authority, agency or officer of such local government unit possessing the authority to award and make contracts; or

2. The owner(s) or authorized representative(s) of a private entity.

"Contractor" means any party entering into a contract to provide or offering to provide building, materials and equipment, or services to a project sponsor for the construction of environmental infrastructure facilities. This includes, but is not limited to, planning and design, as well as building related services such as engineering, inspection and accounting.

"Contractor's plan" means the SED utilization plan submitted by the contractor to the project sponsor and to the Department establishing subcontracting opportunities that will fulfill the requirements of this subchapter.

"Department" means the New Jersey Department of Environmental Protection and its successors and assigns.

"Environmental infrastructure facilities" means wastewater treatment facilities, stormwater management facilities or water supply facilities.

"Financial agreement" means the legal instrument, including a grant agreement or loan agreement, executed between either the State of New Jersey or the Trust and the project sponsor for the construction of environmental infrastructure facilities.

"Local government unit" means a county, municipality, municipal or county sewerage or utility authority, municipal sewerage district, joint meeting, improvement authority or other political subdivision of the State authorized to construct, operate and maintain wastewater treatment or stormwater management facilities, or a State authority, district water supply commission, county, municipality, municipal or county utilities authority, municipal water district, joint meeting or any other political subdivision of the State authorized pursuant to law to operate or maintain a public water supply system or to construct, rehabilitate, operate or maintain water supply facilities or otherwise provide water for human consumption.

"New Jersey environmental infrastructure financing program" means the program for providing financing to project sponsors pursuant to N.J.A.C. 7:22-3, 4 and 6, and 7:22A-6 and 7.

"Office" means the Office of Equal Opportunity and Public Contract Assistance or other program of the Department of Environmental Protection with the responsibility for administration of this subchapter.

"Private entity" means the owner(s) of a nongovernmental community water system or a nonprofit noncommunity water system.

"Project" means the defined services for the construction of specified operable environmental infrastructure facilities as approved by the Department or the Trust in the project sponsor's financial agreement.

"Project compliance officer" means an officer or employee of the project sponsor who is designated by the project sponsor to monitor and enforce compliance with the affirmative action and SED requirements of the applicable program rules and this subchapter.

"Project plan" means the proposal submitted at the time of application by the project sponsor to the Department establishing the SED utilization plan and its requirements.

"Project sponsor" means any local government unit or private entity that seeks a loan or grant pursuant to N.J.A.C. 7:22-3, 4 and 6 and 7:22A-6 and 7.

"SED utilization plan" means a written document outlining the entire project work, the estimated length of time it will take to complete the project, each significant segment of the project on which SEDs will or may participate, and a description of how SEDs will be contacted.

"Socially and economically disadvantaged small business concern" or "SED" means any small business concern:

1. Which is at least 51 percent owned by one or more socially and economically disadvantaged individuals; or, in the case of a publicly owned business, at least 51 percent of the stock of which is owned by one or more socially and economically disadvantaged individuals; or, in the case of a joint venture, at least 51 percent of the beneficial ownership interests are legitimately held by a SED; and

2. Whose management and daily business operations are controlled by one or more socially and economically disadvantaged individuals; and

3. Which is a full participation subcontractor in that the SED is responsible for the execution of a distinct element of work and carries out the work responsibility by actually performing, managing and supervising the task involved. Any deviation from this definition will automatically classify the SED as a broker, middleman or passive conduit. These three functions are contrary to the spirit of the Trust Act and will not qualify a SED enterprise for State of New Jersey certification; and

4. Which has been certified pursuant to the New Jersey Uniform Certification Act (N.J.S.A. 52:27H-1 et seq.) or pursuant to the provisions of 49 CFR Part 23 by the New Jersey Commerce and Economic Growth Commission, the New Jersey Department of Transportation, the Port Authority of New York and New Jersey, the New Jersey Transit or other agencies deemed appropriate by the Office, as an eligible minority business or female business.

i. "Socially disadvantaged individuals" means those individuals who have been subjected to racial or ethnic prejudice or cultural bias because of their identity as a member of a group without regard to their individual qualities.

ii. "Economically disadvantaged individuals" means those socially disadvantaged individuals whose ability to compete in the free enterprise system has been impaired due to diminished capital and credit opportunities as compared to others in the same business area who are not socially disadvantaged.

iii. "Socially and economically disadvantaged individuals" shall include women, Black Americans, Hispanic Americans, Native Americans, Asian Americans, and members of other groups, or other individuals, found to be socially and economically disadvantaged by the Small Business Administration under Section 8(a) of the Small Business Act, as amended (15 USC 637(a)). Black Americans, Hispanic Americans, Native Americans and Asian Americans shall be defined as follows:

(1) "Black American" means a person having origins in any of the black racial groups in Africa;

(2) "Hispanic American" means a person of Spanish or Portuguese culture, with origins in Mexico, South or Central America, or the Caribbean Islands, regardless of race;

(3) "Asian American" means a person having origins in any of the original peoples of the Far East, Southeast Asia, Indian Subcontinent, Hawaii, or the Pacific Islands;

(4) "Native American" means a person having origins in any of the original peoples of North America.

"Small business concern" means a business which is independently owned and operated and which is not dominant in its field of operation. A business is independently owned and operated if the management which controls the business is responsible for both its daily and long term operations.

"Subcontract" means an agreement to perform a portion of a contract.

"Subcontractor" means a third party that is engaged by the contractor to perform part of the work under a subcontract.

"10 percent SED utilization," "10 percent goal" and "10 percent" means SED business concern participation, which includes 7 percent for minority-owned SED business concerns and 3 percent for women-owned SED business concerns.

"Trust" means the New Jersey Environmental Infrastructure Trust established pursuant to the Trust Act.

"Trust Act" means the New Jersey Environmental Infrastructure Trust Act (N.J.S.A. 58:11B-1 et seq.), as amended and/or supplemented.

### **7:22-9.3 SED utilization requirements for projects**

(a) A goal of not less than 10 percent (or a higher percentage as may be required by Federal law) of the total amount of all contracts for building, materials and equipment, or services for a project funded by a New Jersey environmental infrastructure facilities financing program must be awarded to SEDs.

(b) The 10 percent SED utilization requirement shall be accomplished by the following:

1. Bids shall be solicited on an unrestricted basis. The bid documents, however, shall include a statement to the effect that the successful bidder must fulfill the SED utilization requirements by subcontracting portions or the work to SEDs; or

2. Contractors also have the option of establishing unrestricted bidding procedures to fulfill the 10 percent SED utilization requirement for the project.

### **7:22-9.4 Requirement to develop SED Utilization Plan**

(a) Each project sponsor shall develop, in consultation with the Office, a plan for achieving its SED utilization requirements (the "project plan"). Development of a plan shall be completed before the Department and, when relevant, the Trust may approve an application pursuant to the applicable program rules

(b) The project plan shall identify those contracts proposed to be bid on an unrestricted basis. For each unrestricted contract, the project plan shall also identify the SED utilization requirements that the successful bidder shall meet.

(c) All contractors, including SED contractors, shall submit their own SED utilization plan ("contractor's plan"), for the aspects of the project covered by the contract, to the project sponsor and to the Office within 30 days of the awarding of a contract. The Contractor's Plan shall contain provisions to meet the specific SED utilization requirements imposed upon the contractor by the project sponsor as well as to meet the general SED utilization requirements for the project pursuant to this subchapter.

(d) If the contractor does not comply with the requirements of the contractor's plan and the project sponsor does not take steps to otherwise comply with N.J.A.C. 7:22-9.3(a), the Department and, in the case of a Trust loan, the Trust, may take any of the actions or combinations thereof specified in N.J.A.C. 7:22-3.40 through 3.44, 7:22-4.40 through 4.44, 7:22-6.40 through 6.44 and 7:22A-1.8 through 1.13.

### **7:22-9.5 (Reserved)**

### **7:22-9.6 Notice of SED utilization opportunities**

(a) All project sponsors, at least 30 days prior to public advertisement for bids, shall notify the agencies specified in N.J.A.C. 7:22-9.13(a)8, of the availability of opportunities for SEDs to provide

services, to bid on unrestricted contracts or subcontracts, or to provide any other necessary purchase or procurement. The notice shall include a description of the type and scope of the services involved.

(b) All notices shall include a statement to the effect that the project or contract is funded in part by New Jersey wastewater treatment financing programs and the successful bidder must comply with all the provisions of N.J.A.C. 7:22-9.1 et seq. for the participation of small business enterprises owned and controlled by socially and economically disadvantaged individuals.

**7:22-9.7 Advertisements for SED utilization**

(a) All advertisements for bids shall include a statement to the effect that the project or contract is funded in part by New Jersey environmental infrastructure financing programs and the successful bidder must comply with the provisions of N.J.A.C. 7:22-9 for the participation of small business enterprises owned and controlled by socially and economically disadvantaged individuals.

(b) The advertisement for bids shall indicate that:

1. Awards will be made only to socially and economically disadvantaged business concerns that are certified by the New Jersey Commerce, Economic Growth and Tourism Commission, the New Jersey Department of Transportation, the Port Authority of New York and New Jersey, New Jersey Transit or other agencies deemed appropriate by the Office as eligible minority businesses or female businesses; or

2. The invitation to bid is on an unrestricted basis whereby the successful bidder must fulfill the SED utilization requirements. The agencies specified in N.J.A.C. 7:22-9.13(a)8 will have a list of eligible SED firms and shall, upon request, provide them to the project sponsor. The project sponsor shall, during the advertisement phase, provide copies of the list to all contractors on unrestricted contracts.

(c) The advertisement for bids shall be in such newspaper or newspapers and other periodicals identified by the agencies specified in N.J.A.C. 7:22-9.13 as will best give notice thereof to appropriate bidders and shall be sufficiently in advance of the purchase or contract to promote competitive bidding. In no case shall the advertisement for bids be published less than 30 days prior to the date fixed for receiving bids on the purchase or contract.

(d) In the case of a set aside contract, the newspaper or newspapers in which the advertisement for bids appears shall be selected by the contracting agency in consultation with the Office.

(e) If there are no responses to the bid solicitation from SEDs or if the successful bidder's proposal does not meet the SED utilization requirements, the successful bidder shall advertise and continue the search for SED participants for a minimum of 30 days after the contract is awarded. The contract shall include a provision to this effect.

**7:22-9.8 (Reserved)**

**7:22-9.9 (Reserved)**

**7:22-9.10 Lowest bid resulting in payment of unreasonable price**

(a) If the contracting agency determines that the acceptance of the lowest responsible bid will result either in the payment of an unreasonable price or in a contract otherwise unacceptable pursuant to the statutes and rules governing public contracts, the contracting agency shall reject all bids.

(b) Bidders and the office shall be notified of the rejection of all bids, the reasons for the rejection, and the contracting agency's intent to solicit bids for a second time.

(c) If the contracting agency determines a second time that the acceptance of the lowest responsible bid will result either in the payment of an unreasonable price or in a contract otherwise unacceptable pursuant to the statutes and rules governing public contracts, the contracting agency shall reject all bids and notify the Office and, after receipt of the Office's approval, shall amend the project plan accordingly.

(d) Bidders shall be notified of the cancellation, the reasons for the cancellation and the contracting agency's intent to resolicit bids on an unrestricted basis. SEDs may participate in the bidding on an unrestricted basis.

#### **7:22-9.11 Project compliance officer**

(a) Each project sponsor shall designate an officer or employee to serve as its project compliance officer.

(b) The project compliance officer shall be responsible for coordinating SED utilization efforts on the project and for monitoring and enforcing compliance with the affirmative action and SED requirements of the applicable program rules.

(c) SED utilization requirements shall be an agenda item at all contract award meetings and, wherever applicable, at preconstruction conference meetings regardless of whether a loan or grant agreement has been executed or not. Each project sponsor shall be responsible for notifying the Office of the time and place of such meetings.

(d) The project compliance officer shall attend all monthly construction progress meetings.

#### **7:22-9.12 Reports**

(a) The contracting agency shall submit its planning and design SED utilization report to the Office at the time of filing of its grant/loan application.

(b) Each project compliance officer shall submit the contracting agency's monthly progress reports to the Office. Once all SED contractors have been obtained, submittal of this report will no longer be required.

(c) Each project compliance officer shall submit a periodic report on behalf of the project sponsor to the Office according to a schedule announced by the Office. At a minimum, this construction report shall be submitted quarterly; that is, January, April, July and October. Where appropriate, the Office may approve a variation in the frequency of reporting requirements specified in (b) through (d) of this section. This report shall include the following information:

1. The value of each contract and subcontract awarded to SEDs and the total dollar value and number of contracts and subcontracts awarded to SEDs;
2. The percentage of SED utilization in comparison to the cost of each contract, as well as the total percentage of SED utilization (including set aside contracts) in comparison to overall project costs;
3. The types and sizes of the participating SEDs and the nature of goods and services being provided; and
4. The efforts made to publicize and promote the project sponsor's SED utilization plan.

(d) Contractors shall submit a quarterly construction report to the project sponsor and to the Office. The project compliance officer may be contacted for assistance if needed.

(e) The report forms required by (a) through (d) above shall be obtained from the Office.

(f) The project compliance officer shall submit reports or information in addition to what is required by (a) through (c) above when requested to do so by the Office.

(g) Failure to comply with the reporting requirements of (a) through (d) and (f) above may subject the project sponsor to the remedies for noncompliance with State and Trust loan or grant conditions specified in the applicable program rules.

#### **7:22-9.13 Assessment of compliance**

(a) Where the Office determines that a project sponsor has failed or is failing to meet the 10 percent SED utilization requirement, the project sponsor shall, upon the written request of the Office, submit the following:

1. Advertisements;
2. Signed contracts and subcontracts;
3. Documentation of solicitations of bids from SEDs;
4. Copies of Requests for Proposals;
5. Records of telephone quotations;
6. (Reserved);
7. Adequate and timely notice for encouraging SED participation; and
8. Proof that the assistance of State Agencies was solicited, including:

Office of Equal Opportunity and Public Contract Assistance  
New Jersey Department of Environmental Protection  
PO Box 402  
Trenton, New Jersey 08625-0402

Division for the Development of Small Businesses and Women Businesses and Minority  
Businesses  
New Jersey Commerce and Economic Growth Commission  
PO Box 835  
1 West State Street  
Trenton, New Jersey 08625-0835

(b) Where the project sponsor determines that a contractor has failed or is failing to meet the 10 percent SED utilization requirement, the contractor shall, upon the written request of the project sponsor, submit the documents specified in (a) above.

(c) The Office shall summarize in writing its evaluation of the reason given for noncompliance and the efforts made by the project sponsor or contractor to comply with its plan for achieving the 10 percent SED utilization requirement. The Office shall take into consideration good faith efforts made by the project sponsor or contractor to meet the goal to achieve the ten percent SED utilization requirement. These findings shall be submitted to the Department and, in the case of a Trust loan, to the Trust who, in conjunction with the Office, shall determine the nature and extent of the project sponsor's or contractor's noncompliance.

#### **7:22-9.14 Penalties**

Whenever a project sponsor or a contractor has failed to comply with the requirements of this subchapter, including the 10 percent requirement for SED utilization, the Department, or the Department and the Trust, in the case of a Trust loan recipient, may withhold all of the loan or grant money, or a portion thereof, and may take any of the other actions or combinations thereof specified in N.J.A.C. 7:22-3.40 through 3.44, 7:22-4.40 through 4.44, 7:22-6.40 through 6.44 and 7:22A-1.8 through 1.13 which are remedies for noncompliance with any of the conditions of a loan or grant.

#### **7:22-9.15 Administrative hearings**

(a) The Department and, in the case of a Trust loan, the Trust, shall make a determination regarding all disputes arising under this subchapter. The project sponsor shall specifically detail in writing the basis for its dispute. The Department and/or the Trust shall produce a decision in writing and mail or otherwise furnish a copy thereof to the project sponsor.

(b) A project sponsor may request an administrative hearing within 20 days of receipt of a decision by the Department and/or the Trust. The request for a hearing shall be sent to the Office of Legal Affairs, ATTENTION: Adjudicatory Hearing Requests, Department of Environmental Protection, PO Box 402, Trenton, New Jersey 08625-0402. The request for an administrative hearing shall specify in detail the basis for the appeal. Administrative hearings shall be conducted in accordance with the requirements of the Administrative Procedure Act, N.J.S.A. 52:14B-1 et seq. and the Uniform Administrative Procedure Rules, N.J.A.C. 1:1.

(c) Following receipt of a request for a hearing pursuant to (b) above, the Department and/or the Trust may attempt to settle the dispute by conducting such proceedings, meetings and conferences as deemed appropriate.

#### **7:22-9.16 Severability**

If any of the provisions of this subchapter are found to be invalid, the remainder of the provisions of this subchapter shall not be affected thereby.



**NJAC 7:22-10.11**  
**Design Requirements**

**NJ 7:22 – 10-12**  
**Construction Phase Requirements**



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(c) A mailing list shall be developed by the Department for each project, for use by the Department to inform the public and other interested parties of its decisions regarding the project. The mailing list shall include elected officials, Federal, State and local government agencies, environmental groups, and other interested groups and individuals appropriate to the planning area for the proposed project.

(d) In addition to the public hearing, the Department may require supplemental measures to inform and solicit comments from the public under the following conditions:

1. Where factors, such as delays in project implementation or errors in cost estimation, result in significant increases in the user cost burden prior to the award of financial assistance, the project sponsor may be required to place a retail or display advertisement in the body of a newspaper of general circulation in the planning area which describes the proposed project and the revised costs, including user cost, and which establishes a comment period of 30 days. A summary of any public comment received during the comment period shall be submitted by the project sponsor to the Department. Based on the response of the public to the advertisement, the Department will determine if further project evaluation is required.

2. Where, as a result of the re-evaluation of the environmental review conducted in accordance with N.J.A.C. 7:22-10.7, the Department determines that significant changes in the project or project impact have occurred, which warrant public input, the Department may determine that a supplemental public advertisement as in (d)1 above or a public hearing as in (b) above is required prior to award of financial assistance.

3. Where notice of the public hearing does not comply with the requirements of (b) above or where significant project issues including costs or impacts were not disclosed, the Department may determine that a supplemental public advertisement as in (d)1 above or a public hearing as in (b) above is required prior to award of financial assistance.

#### 7:22-10.11 Design requirements

(a) The project sponsor shall prepare design plans and specifications which conform to the project alternative selected and approved in planning pursuant to the provisions of N.J.A.C. 7:22-10.4, 10.5 or 10.6 and which include mitigating measures developed during planning and incorporated in the approved planning documentation. In addition, the design plans and specifications shall conform to the minimum standards for each area of concern which is applicable to the proposed project as set forth below. All activities which are a part of the comprehensive environmental infrastructure project(s) for the planning area must conform to the requirements of this section, regardless of the eligibility of individual components of the project.

1. Any design revisions of the project which differ from the project as approved during planning shall be specifically identified.

2. Where any on-going environmental protection measures will be the responsibility of the project sponsor, the project sponsor shall submit a letter prior to loan award specifying that it will adhere to the scope of work approved by the Department.

(b) The contract documents shall be prepared to clearly identify environmental and cultural resources protection measures and shall conform to the following:

1. The format of the contract documents shall consolidate environmental and cultural resource protection/restoration measures in a single section of the design specifications as well as on appropriate sheets of the design plans. The specifications which spell out the environmental and cultural resource protection/restoration measures shall be identified in the specifications as having precedence over other potentially contradictory language contained elsewhere in the design contract documents. The specifications shall clearly state that, in instances where the provisions of a Department-issued permit contradict a provision of the specifications (including those identified in this subchapter), the environmental resources protection and/or restoration and cultural resource mitigation measures identified in the Department-issued permit shall govern.

2. Environmental resources protection and/or restoration measures, and cultural resource mitigation measures should generally include the following subject areas:

- i. General;
- ii. Clearing;
- iii. Erosion and sedimentation control;
- iv. Protection of environmentally critical areas;
- v. Stockpiling and waste disposal;
- vi. Prohibited construction procedures;

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- vii. Dust control;
- viii. Noise control;
- ix. Cultural resources;
- x. Dewatering;
- xi. Restoration;
- xii. Environmental maintenance bond; and
- xiii. Inspection.

3. The method of payment for environmental and cultural resource protection/restoration measures shall be specified in the applicable section of the contract documents. Where restoration and maintenance of environmental quality are necessary outside of the designated construction area or when measures for maintenance of environmental quality are required after the date of completion and acceptance of the environmental infrastructure facilities, the project sponsor shall clearly state the contractor's responsibilities in the specifications. The Department may require the project sponsor to include separate unit bid items for environmental and cultural resource restoration and/or mitigation.

4. Where construction will occur within or adjacent to environmentally critical areas, as approved by the Department, those areas shall be identified on design plans.

(c) Every effort shall be made to prevent and correct problems associated with erosion and sedimentation which could occur during and after project construction. At a minimum, design specifications shall incorporate the following erosion and sedimentation control measures:

1. All erosion and sedimentation control measures shall be in place prior to any grading operations or construction of proposed facilities and shall be maintained until construction is complete and the construction area is stabilized. After restoration is complete, temporary control measures shall be removed and disposed of properly.

2. All erosion and sedimentation control measures shall be constructed and maintained in accordance with the "Standards for Soil Erosion and Sediment Control in New Jersey," prepared by the New Jersey State Soil Conservation Committee, 1999, incorporated herein by reference, as amended and supplemented. Copies of the "Standards for Soil Erosion and Sedimentation Control in New Jersey" are available for a fee from the New Jersey Department of Agriculture, Soil Conservation Committee, or from the office of any of the 16 local conservation districts.

3. Disturbed areas that will be exposed in excess of 10 days shall be temporarily seeded and/or mulched, until proper weather conditions exist for establishment of permanent vegetative cover.

(d) Site and access clearing must be confined to approved construction areas. Protection of existing vegetation must be practiced wherever possible. At a minimum, the project sponsor shall include provisions in the contract documents which conform to the following:

1. Temporary and permanent easement widths must be reduced to the minimum feasible for the proposed construction. Unless specifically approved by the Department, permanent access roads must not be more than eight feet wide and there shall be no permanent access roads in environmentally critical areas. Access roads may be paved only where absolutely necessary, as determined by the Department.

2. Only those portions of the site which are absolutely necessary and essential for construction shall be cleared. Whenever possible, excavation shall include the removal and storage of topsoil from the site for future use. The length of time of ground disturbance shall be reduced to the minimum practicable, especially in environmentally critical areas. Ground disturbance shall be avoided until immediately preceding construction to minimize exposure of soils.

3. Trees and shrubs within construction easements, which are not required to be removed to permit construction, shall be protected to the drip line with appropriate protection measures such as snow fencing or batter boards. Trees and shrubs whose removal is necessary to facilitate construction shall either be replanted at the same location or replaced with nursery stock of the same kind. Trees of greater than 12 inches in diameter should be preserved whenever possible by implementing slight shifts in alignment or tunneling under tree roots. Specimen trees, as identified in "New Jersey's Big Trees" (1998) published by the Department's Division of Parks and Forestry listing specimen trees in the State, shall be preserved.

4. Except in heavily wooded areas, the plans shall designate trees and shrubs which are to be protected as well as trees and shrubs which are to be removed. In addition, plans shall provide details which depict methods of protection to the drip line.

5. In heavily wooded areas, every effort shall be made to avoid the destruction of common native trees and shrubs so as not to unduly disturb the ecological balance or environmental quality of the area. Trees of 12 inch

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diameter or greater should be preserved whenever possible and protected to the drip line. Where practical, common native trees and shrubs, of one through three inch caliper, which must be cleared from the construction area shall be stockpiled for use in restoration. Straggling roots shall be pruned. Trees which must be pruned to facilitate construction shall be cut cleanly and painted with tree paint. If a tree not intended to be removed is damaged, the wood shall be repaired according to common nursery practice and painted with tree paint.

(e) Restoration measures to be identified and designated on the environmental plans and specifications include the following: ground preparation, topsoiling, fertilizing, liming, reseeding, and replanting/replacement of trees and shrubs with native species. The aim of restoration is to restore the disturbed area to a condition as nearly equal to pre-disturbance condition as possible. The environmental specifications shall set forth the procedure for accomplishing these restoration measures. The plans shall include the location of various types of restoration and shall include details depicting typical methods to accomplish restoration. The provisions shall include the following, when applicable:

1. Final restoration shall be undertaken as soon as an area is no longer needed for construction, stockpiling or access. Excavated material unsuitable for backfill as set forth at N.J.A.C. 7:14-2.13 and considered to be solid waste pursuant to N.J.A.C. 7:26-1.6 shall be removed from the construction site and disposed of at a sanitary landfill approved and licensed by the Department. Excess excavated material which is not considered to be solid waste pursuant to N.J.A.C. 7:26-1.6 shall be graded or removed in accordance with (1)3 below. When access roads are no longer needed, road fill shall be removed and the access area shall be restored to pre-disturbance conditions. Care should be taken to avoid damage to adjacent vegetation and to prevent the formation of depressions that would serve as mosquito pools.

2. Topsoil shall be replaced with adequate amounts of topsoil material to restore the disturbed area to its original, pre-disturbance grade and depth of topsoil.

3. Rates and types of fertilization, liming, and seeding shall be as recommended by the local Soil Conservation District based on soil tests and local conditions. Seed mixtures shall be selected that are best suited for the particular site conditions. Seed selection shall provide for a quickly germinating initial growth, to prevent erosion, and for a secondary growth that will survive without continuing maintenance. Mulching shall occur immediately after seeding, and in no case shall more than five days elapse between seeding and mulching.

4. In wooded areas, for a 50-foot wide construction easement, generally 10 trees should be planted for every 100 feet of length of the easement. More trees would be required in wider easements or densely wooded areas. Plans shall include a restoration schedule specifying the quantity, common and botanic names, sizes, and spacing of trees to be planted and the type of seed mixtures to be used from station to station. Trees to be replaced should be trees native to New Jersey suitable for the particular site and generally should conform to the list of trees found in the "Standards for Soil Erosion and Sediment Control in New Jersey," prepared by the New Jersey State Soil Conservation Committee, 1999, incorporated herein by reference, as amended and supplemented.

5. In landscaped areas, environmental features shall be replaced or restored to pre-disturbance condition or better. This includes sodding, replacement of trees and shrubs, fences, drives, and other landscape features in kind.

(f) A listing of prohibited construction procedures shall be incorporated into the specifications. These procedures include, but are not limited to, the following:

1. Dumping of spoil material into any stream corridor, any wetlands, any vernal habitats, any surface waters, any sites listed or eligible for listing on the New Jersey or National Registers of Historic Places, or at unspecified locations;

2. Indiscriminate, arbitrary or capricious operation of equipment in any stream corridors, wetlands, vernal habitats, or surface waters;

3. Pumping of silt-laden water from trenches or other excavations into any surface waters, stream corridors, wetlands or vernal habitats;

4. Damaging vegetation adjacent to or outside of the access road or the right-of-way;

5. Disposal of trees, brush and other debris in any stream corridors, wetlands, vernal habitats, surface waters or at unspecified locations;

6. Permanent or unspecified alteration of the flow line of any stream;

7. Open burning of project debris;

8. Use of calcium chloride, petroleum products, or other chemicals for dust control;

9. Use of asphaltic mulch binder; and

10. Any unpermitted discharge of sewage.

(g) Construction in wetlands shall conform to the requirements of the New Jersey Freshwater Wetlands

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Protection Act, N.J.S.A. 13:9B-1 et seq., and N.J.A.C. 7:7A.

(h) Stream crossings shall conform to the requirements of the Flood Hazard Area Control Act, N.J.S.A. 58:16A-50 et seq., and N.J.A.C. 7:13.

(i) Slopes exceeding 15 percent require special treatment. Specifications shall call for measures such as water diversion berms, sodding, or the use of jute or excelsior blankets. Hay bales shall be placed at the base of the slope prior to ground disturbance. Steep slopes that have been disturbed, if not sodded, shall be seeded and mulched immediately after construction is complete. Slope boards or other measures necessary to prevent slumping of the disturbed slope shall be incorporated, where appropriate.

(j) If there is the possibility of encountering acid-producing deposits in the course of construction, as identified during the planning process, special requirements and conditions will apply and shall be incorporated in the specifications as follows:

1. In vegetated areas, the top two feet of soil shall be stripped and stockpiled separately from the material to be excavated. A soils specialist, to be provided by the project sponsor, shall monitor the stripping operation. If any acid-producing deposits are identified, this material and any contaminated soil shall be disposed of on the same day. The presence of acid-producing deposits is detected by the use of the following tests:

i. Determining the pH of the soil when suspended in 0.5 Molar calcium chloride solution (of neutral pH). A pH value below 3.0 indicates presence of ferrous sulfate and presence of acid-producing deposits is strongly suspected.

ii. Test for sulfate by adding a drop of 10 percent barium chloride solution to a water extract of the material. If voluminous flocks of barium sulfate form immediately the presence of acid-producing deposits is strongly suspected.

2. The disposal site shall be approved by the Department. Any soil of this type disposed of shall be covered with a minimum of two feet of cover to prevent rapid oxidation and subsequent acid formation.

3. In both vegetated and paved areas, when acid-producing deposits are encountered, as determined by the soil specialist, excavated trench material shall be returned to the trench as follows:

i. Lower material first, followed by upper material.

ii. The top one to two inches of soil on which the deeper soil was stockpiled shall be scraped and placed below a depth of two feet.

iii. For pipeline construction, the quantity of material to be displaced by bedding and pipe, as well as soil scraped from the stockpile area, shall be subtracted from the deeper, excavated material and this quantity of deeper material removed to an approved disposal site and covered as described in (e)3 above.

iv. After backfilling the deeper soil, one ton of limestone per 2,000 square feet shall be spread over the deeper soil in the trench. This liming requirement is applicable in areas of well drained, nonsaturated soils, as determined by the soil specialist.

v. In vegetated areas, the top two feet of soil, stockpiled for this purpose, shall then be replaced. If the top two feet of soil was also contaminated, clean backfill material similar to the native topsoil shall be used in place of the contaminated material.

4. The excavated acid-producing deposits shall not be exposed for a period longer than eight hours. When acid-producing deposits are encountered, the trench opened in any construction day shall be backfilled and the areas cleaned up by the close of the day. Where this is impracticable, such as in the construction of pumping stations and treatment plants, exposed acid-producing deposits shall be covered with limestone screenings at a rate of 100 tons per acre and then covered with six inches of compacted soil within one week of exposure or before the exposed soil drops to pH 3, whichever occurs first. The pH shall be monitored daily under this procedure.

5. Temporary restoration of vegetated areas shall consist of mulching and shall be put in place at the end of each day's construction. Permanent restoration of the area shall begin as soon as construction is complete and after the results of incubation tests, where necessary, are available.

6. Prior to restoring vegetated areas, the soil specialist shall perform pH tests on the in-situ soil after the construction is completed. If the pH is below 4, intensive liming shall be required in order to make the soil suitable for plant survival.

7. Lime requirement tests shall be performed by the soil specialist to determine the lime application rates. This will require an incubation test in which the sample is oxidized for a period of six weeks, as follows:

i. The sample shall be air dried and ground so that the whole sample passes a 0.5 millimeter sieve.

ii. The lime requirement to reach pH 6.5 shall be determined initially, and again at two week intervals for six weeks, using standard soil testing techniques.

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iii. The total lime requirement determined by this method can be extrapolated to the area under consideration.

8. A minimum of 30 tons of limestone per acre or the amount of lime required according to the incubation test result shall be applied prior to seeding and planting where the pH is less than 4. Where the pH is greater than 4, liming and fertilizing requirements set out in the planting and environmental specifications shall apply.

9. The spreading and mixing of the subsoil and any topsoil contaminated with acid-producing deposits around the site and beyond the site is prohibited. Areas used for stockpiling acid-producing deposits shall be minimized. Equipment used for excavation and backfilling shall be cleaned, to the extent practicable, at the end of each day's operation and the soil removed shall be placed in the trench below a depth of two feet. No construction shall take place during significant rainstorms or while the area is saturated to avoid smearing or spreading of the acid-producing deposits over the area.

(k) When dewatering will occur and a dewatering permit is not required, the contractor shall monitor for adverse effects to structures or wells due to dewatering and shall be responsible to remedy same to the satisfaction of the Department. Discharges from dewatering activities which contain silt are subject to the following controls:

1. All discharges from dewatering activities to surface waters, wetlands, vernal habitats, or storm sewers shall be free of sediment. Care shall be taken not to damage or kill vegetation by excessive watering or by damaging silt accumulation in the discharge area. If discharges are sediment laden, techniques shall be employed to remove sediment prior to discharge. A sedimentation basin shall be constructed and used as specified, where necessary, to protect vegetation and to achieve environmental objectives.

2. Sewer inlets within construction areas shall be provided with perimeter hay bales or other appropriate siltation control measures.

(l) Contract requirements with regard to the location and control of stockpile, storage and disposal areas whether provided by the project sponsor or the contractor, must conform to the following:

1. Only environmentally suitable stockpile sites may be used for the purposes of staging or storing materials, equipment and suitable trench backfill material. Environmentally suitable sites must be level, and devoid of mature stands of natural vegetation. Drainage facilities and features, wetlands, vernal habitats, and stream corridors are not environmentally suitable sites.

2. The boundary of the stockpile area shall be clearly marked by hay bales, silt fencing or another appropriate method. Where fill is to be stored in excess of 10 days, a suitable means of protecting excavated material from wind and water erosion shall be employed. Erosion control methods may include one or more of the following: mulching, sprinkling, silt fencing, haybaling and stone covering.

3. Excess excavated material which is not considered to be solid waste pursuant to N.J.A.C. 7:26-1.6 shall be graded on-site only to the extent needed to achieve preconstruction grade, unless otherwise specifically approved by the Department. The project sponsor shall ensure that the contractor removes the remainder from the site and disposes of it at a site approved by the project sponsor in accordance with the following:

i. Disposal sites selected by the contractor shall be evaluated and approved by the project sponsor prior to their use. Disposal sites may also be selected by the project sponsor. The project sponsor shall conduct periodic inspection of disposal sites to ensure compliance with the requirements of this subsection during the off-site disposal operation.

ii. The disposal of excess excavated material in wetlands, vernal habitats, stream corridors and floodplains is strictly prohibited, even if the permission of the property owner is obtained. The contractor shall be responsible to remove any fill improperly placed by the contractor at the contractor's expense and restore the area impacted.

iii. If excess excavated material is placed on private property, a hold harmless release in favor of the project sponsor and the Department shall be obtained from the property owner; and

iv. Prior to approval of a site for excess excavated material disposal, where the site exceeds 5,000 square feet, the project sponsor shall obtain, or shall ensure that the contractor or property owner has obtained, the appropriate certification of the soil erosion and sediment control plan in accordance with the State's standards for soil conservation (N.J.S.A. 4:24-1 et seq., also referred to as Chapter 251). Where the site is less than 5,000 square feet, the project sponsor shall advise the property owner of the need for erosion and sediment control and obtain a statement that the property owner accepts complete responsibility for implementation of appropriate methods to prevent erosion and sedimentation.

(m) In order to control dust, as often as required during each working day, and particularly prior to the conclusion of each working day, areas under immediate construction (including access roads and other areas

This is a courtesy copy of this rule. All of the Department's rules are compiled in Title 7 of the New Jersey Administrative Code. The rule below includes the amendments adopted to this subchapter on January 3, 2006.

affected thereby) shall be swept and wet down with water sufficiently to lay dust. In addition, these areas shall be wet down during nonworking hours (including weekends) as often as required to keep the dust under control. The use of calcium chloride or petroleum products or other chemicals for dust control is prohibited.

(n) In order to limit noise impacts in the vicinity of sensitive receptors, construction operations and activities shall be limited as follows: Monday through Friday between the hours of 7:00 A.M. and 6:00 P.M. unless variances to these times are granted in times of emergency. No driving, pulling, or other operations entailing the use of vibratory hammers or compactors shall be permitted, other than between the hours of 8:00 A.M. and 5:00 P.M. The number of machines in operation at a given time shall be limited to the minimum practicable. All engine generators or pumps must have mufflers and be enclosed within a temporary structure.

(o) Provisions regarding the contractor's responsibility for cultural resource protection shall be included in contract documents that provide for the following:

1. If a cultural resource is encountered during the course of construction, the contractor is directed to halt all construction activities in that area. The contractor shall immediately contact the project sponsor who shall contact the Department. The Department will determine and require initiation of the appropriate actions in conformance with N.J.A.C. 7:22-10.8. .

2. The contractor shall not dispose of excess excavated material at, stockpile construction materials at, or obtain borrow material from, properties which are listed or eligible for listing on the New Jersey or National Registers of Historic Places.

(p) The project sponsor shall require that the contractor supply an environmental maintenance bond in the amount of \$25,000 or 50 percent of the price bid for the materials needed to fulfill the environmental specifications, whichever is greater. The environmental maintenance bond shall provide that the contractor shall remedy, without cost, any defects which result from faulty workmanship or from failure to comply with the specifications and which develop during the period of one year from the expiration of the performance bond required pursuant to N.J.S.A. 40A:11-22.

(q) The project sponsor shall obtain photographs of existing conditions prior to the start of site and access clearing and construction. At a minimum, one eight inch by 10 inch color glossy print photograph shall be obtained for each 100 feet of the construction area. Special attention shall be given to environmentally critical areas and areas outside of the public right-of-way. Photographs shall be labeled by station so that upon completion of the construction, or during construction if necessary, subsequent photographs can be taken from the same control points. The project sponsor shall file copies of the above photographs with the Department. As a supplement to the required photographs, video documentation may be submitted to the Department, and is encouraged as a way of documenting site conditions.

#### 7:22-10.12 Construction phase requirements

(a) The project sponsor must employ one, or more if warranted by the scope of the project, environmental inspector(s) to ensure that the requirements of the specifications relating to environmental and cultural resource protection and restoration are effectively carried out. Individuals designated as environmental inspectors by the project sponsor must possess, at a minimum, the education/experience qualifications of an Environmental Specialist employed with the Department. The Department will also conduct environmental inspections to oversee the conduct of the protection/restoration measures. Responsibilities of the project sponsor's environmental inspector(s) include the following:

1. Daily inspections of active work areas and periodic inspection of maintenance or restoration areas sufficient to ensure performance of protection measures in accordance with contract documents.

2. The maintenance of a daily job diary in which they shall record the progress of the work and of any problems encountered. The environmental inspectors shall notify the contractor in writing immediately upon noticing that environmental specifications are not being met.

3. At frequent intervals during construction, the recipient, the resident engineer, the environmental inspectors and the Department inspectors shall meet to review progress and to resolve difficulties that might result in unnecessary delays in the work. The Department shall notify the recipient if deficiencies are not immediately corrected. The recipient shall then direct compliance with environmental requirements.

(b) After award of a contract and before construction commences, a pre-construction conference shall be held. The recipient, the resident engineer, the environmental inspectors, the Department inspectors and the contractor should reach general agreement upon procedures to be followed to comply with the plans and



This is a courtesy copy of this rule. All of the Department's rules are compiled in Title 7 of the New Jersey Administrative Code. The rule below includes the amendments adopted to this subchapter on January 3, 2006.

specifications intended to provide environmental and cultural resource protection and restoration that have been approved by the Department.

(c) A final inspection shall be required following completion of all construction and restoration work encompassed by each contract. The final inspection shall be conducted as follows:

1. Upon completion of all construction and restoration work of each contract of a project, the recipient shall submit a letter to the Department stating that the project (or contract) is ready for final inspection. No final inspection can be scheduled until formal notification is received.

2. The final inspection shall be a joint inspection with the recipient and/or the resident engineer, the environmental inspector, the contractor and representatives from the Department in attendance.

(d) The Department shall make periodic determinations and, following the final inspection, make a final determination regarding the adequacy of the contractor's performance of the specifications relative to environmental and cultural resource protection and restoration. If the performance is not acceptable, this finding and the procedures and schedules needed to effect acceptable performance will be conveyed in writing to the project sponsor. Failure of the project sponsor to comply with the Department's requirements may subject the project sponsor to the noncompliance provisions of N.J.A.C. 7:22-3.40, 4.40 and 6.40 and N.J.A.C. 7:22A-1.8.



**EXHIBIT NO. 6**

**SED PARTICIPATION BUILDING PHASE QUARTERLY REPORT  
(FORM OEO-002)**

NO TEXT ON THIS PAGE

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**OFFICE OF EQUAL OPPORTUNITY  
AND  
PUBLIC CONTRACT ASSISTANCE**

---

**MUNICIPAL FINANCE  
AND  
CONSTRUCTION ELEMENT**

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**SED PARTICIPATION  
BUILDING PHASE  
QUARTERLY REPORTING FORM  
FOR  
CONTRACTING AGENCIES & CONTRACTORS**

(OEO-002)

**New Jersey Department of Environmental Protection**

## **REPORTING REQUIREMENTS ON SOCIALLY AND ECONOMICALLY DISADVANTAGED (SED) BUSINESS UTILIZATION**

These instructions apply to reporting on the utilization of Socially and Economically Disadvantaged Businesses (MBEs/WBEs/SEDs) under the New Jersey Department of Environmental Protection and the New Jersey Environmental Infrastructure Financing Programs. They are intended to provide guidance to Project Sponsors and Contractors in filling out the Building Phase (SED) Utilization Form. The reporting requirements apply to all Contracting Agencies and Contractors pursuing New Jersey Financing Assistance through programs administered by the New Jersey Department of Environmental Protection and the New Jersey Environmental Infrastructure Trust pursuant to N.J.A.C. 7:22-3.; N.J.A.C. 7:22-4.; N.J.A.C. 7:22-6; N.J.A.C. 7:22A-6; N.J.A.C. 7:22-7.

Each Project Sponsor and Contractor must submit this building SED Report (Form OEO-002) quarterly on MBE/WBE utilization for each contract for which a Project Sponsor or its Contractor(s) awards a subagreement. The form must be submitted to the New Jersey Department of Environmental Protection (NJDEP), Office of Equal Opportunity, Public Contract Assistance within 15 days following the close of each fiscal year quarter (i.e., January 15, April 15, July 15, and October 15).

### **INSTRUCTIONS FOR FILLING OUT SED UTILIZATION REPORT**

1. Read instructions carefully before completing form, and refer to N.J.A.C. 7:22-9.1 et seq. for further guidance.
- 2a. The name and address of Project Sponsor participating in the grant/loan programs for environmental infrastructure facilities.
- 2b. Name of the Project Compliance Officer responsible for submitting periodic reports.
3. Name and address of party contracting directly with the Project Sponsor.
4. Self-explanatory.
- 5a. The grant/loan project number for the agreement between the State of New Jersey and the Project Sponsor.
- 5b. The grant/loan project number for the contract between the Project Sponsor and its contractor(s).
6. Include brief description of project.
7. Self-explanatory.
- 8a. The county in which the Project Sponsor is located.
- 8b. The municipality in which the Project Sponsor is located.
9. The date of the agreement between the State of New Jersey and the Project Sponsor.
- 10a. The date of agreement between the Project Sponsor and the contractor.
- 10b. Self-explanatory.
11. Indicate MBE and WBE goals based upon project plan for SED utilization developed in consultation with the Office. These goals may vary depending upon local law. Where a Project Sponsor has a SED participation goal which exceeds ten percent, the Project Sponsor's goal shall take precedence.
12. Enter the name, address and telephone number of each SED participating in the building phase as a subcontractor under agreement with the construction management firm or the Project Sponsor. Check applicable MBE or WBE status of each listed SED. Explain type of service rendered and list the total dollar amount of the subcontract. Each entry must be accompanied by a copy of the signed subcontract.

**Restricted** - Bids may be solicited on a restricted basis by setting aside a contract for building, materials and equipment, or services which is designated as a contract for which bids are invited and accepted only from SEDs.

**Unrestricted** - Bids may be solicited on an unrestricted basis and not designated for a set-aside contract, but the contract document shall include a statement to the effect that the successful bidder must fulfill the SED utilization requirements.

- 13. See instructions for Item 12. This section is designated for SEDs participating in the building phase of a project as a subcontractor under agreement with building contractor(s).
- 14. Person signing must be the designated Project Compliance Officer of the Project Sponsor. The contractor(s) or the authorized presentative of the contractor(s).
- 15. Additional comments or explanations. Refer to the specific item number on the form, if applicable.

OEO-002

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION  
 NEW JERSEY MUNICIPAL FINANCE & CONSTRUCTION ELEMENT  
 OFFICE OF EQUAL OPPORTUNITY & PUBLIC CONTRACT ASSISTANCE

**CONSTRUCTION REPORT**

SOCIALLY AND ECONOMICALLY DISADVANTAGED (SED) BUSINESS UTILIZATION

1. ***Read Instructions Before Completing Form.***

2a. Project Sponsor

Name

-----

Address

-----

2b. Project Compliance Officer \_\_\_\_\_

3. Contractor

Name

-----

Address

-----

4. Financing Program (check applicable program(s))

\_\_\_\_ a. Wastewater Treatment Fund    \_\_\_\_ b. Wastewater Treatment Trust    \_\_\_\_ c. Pinelands Infrastructure Trust

\_\_\_\_ d. Stormwater Management    \_\_\_\_ e. Water Supply

5a. Project Number \_\_\_\_\_

5b. Contract Number

-----

6. Project

Name \_\_\_\_\_

7. Contract Amount \$ \_\_\_\_\_

8a. County \_\_\_\_\_

8b. Municipality

-----

9. Date of Grant/Loan Agreement \_\_\_\_\_

10a. Date of Contract Award \_\_\_\_\_ 10b. Duration of Contract: Mo. \_\_\_\_\_ Days \_\_\_\_\_

11. STATE GOAL OR OTHER STANDARDS (IF ANY)

Contracting Agency=s Requirement

	<u>DOLLAR AMOUNT</u>	<u>PERCENTAGE OF CONTRACT AMOUNT</u>
MBE	\$ _____	_____ %
WBE	\$ _____	_____ %
TOTAL SED	\$ _____	_____ %



12. A/E and Other Professional Service Subcontracts Awarded During the Building Phase

Name, Address and Telephone No. WBE	MBE/	Type of Service Rendered	Amount	Dollar Number Amount Award	Subcontract (R/U)	Subcontract	Date of Subcontract	Type of Award*
1. _____ _____ _____	_____	_____	_____	_____	_____	_____	_____	_____
Number of Full-time Employees	_____							
2. _____ _____ _____	_____	_____	_____	_____	_____	_____	_____	_____
Number of Full-time Employees	_____							
3. _____ _____ _____	_____	_____	_____	_____	_____	_____	_____	_____
Number of Full-time Employees	_____							
4. _____ _____ _____	_____	_____	_____	_____	_____	_____	_____	_____
Number of Full-time Employees	_____							
5. _____ _____ _____	_____	_____	_____	_____	_____	_____	_____	_____
Number of Full-time Employees	_____							
6. _____ _____ _____	_____	_____	_____	_____	_____	_____	_____	_____
Number of Full-time Employees	_____							

\* *Restricted/Unrestricted*

13. Other Subcontract Awards Made Under the Building Phase

Name, Address and Telephone No. WBE	MBE/	Type of Service Rendered	Amount	Dollar Number Amount Award	Subcontract (R/U)	Subcontract	Date of Subcontract	Type of Award*
1. _____ _____ _____	_____	_____	_____	_____	_____	_____	_____	_____
Number of Full-time Employees	_____							
2. _____ _____ _____	_____	_____	_____	_____	_____	_____	_____	_____
Number of Full-time Employees	_____							
3. _____ _____ _____	_____	_____	_____	_____	_____	_____	_____	_____
Number of Full-time Employees	_____							
4. _____ _____ _____	_____	_____	_____	_____	_____	_____	_____	_____
Number of Full-time Employees	_____							
5. _____ _____ _____	_____	_____	_____	_____	_____	_____	_____	_____
Number of Full-time Employees	_____							
6. _____ _____ _____	_____	_____	_____	_____	_____	_____	_____	_____
Number of Full-time Employees	_____							

\* *Restricted/Unrestricted*

14.

\_\_\_\_\_  
*(Signature of Project Compliance Officer)*

\_\_\_\_\_  
*(Signature of Contractor)*

\_\_\_\_\_  
*(Title)*

\_\_\_\_\_  
*(Title)*

\_\_\_\_\_  
*(Date)*

\_\_\_\_\_  
*(Date)*

15. Space Provided for Additional Comments or Explanations



**EXHIBIT NO. 7**

**SED PARTICIPATION MONTHLY PROGRESS REPORT  
(FORM OEO-003)**

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**OFFICE OF EQUAL OPPORTUNITY  
AND  
PUBLIC CONTRACT ASSISTANCE**

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**MUNICIPAL FINANCE  
AND  
CONSTRUCTION ELEMENT**

---

**SED PARTICIPATION**

**MONTHLY PROGRESS REPORT**  
(OEO-003)

# NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION SED UTILIZATION IN ENVIRONMENTAL INFRASTRUCTURE FINANCING PROGRAM

## MONTHLY PROGRESS REPORT

Contractor \_\_\_\_\_

Project Number \_\_\_\_\_

Project Name \_\_\_\_\_

Contract Amount \_\_\_\_\_

Report Month/Year \_\_\_\_\_

The following information is required in order to assist the Project Compliance Officer and the New Jersey Department of Environmental Protection in monitoring the SED (small business enterprises owned and controlled by socially and economically disadvantaged individuals) Utilization progress and activity in the Environmental Infrastructure Financing Program. Each contractor shall respond to each of the listed items. Whenever evidence of completion of each item is available, copies of itemized documents are to be submitted to the Project Compliance Officer.

Over the past month has any action on any item taken place? Please explain each.

- |    |   |       |     |       |    |
|----|---|-------|-----|-------|----|
| 1. | Copies of Solicitation to SED=s                       | _____ | Yes | _____ | No |
| 2. | Advertisement of bidding or procurement opportunities | _____ | Yes | _____ | No |
| 3. | Evidence of negotiation with SEDs                     | _____ | Yes | _____ | No |
| 4. | Copies of telephone quotes/negotiations               | _____ | Yes | _____ | No |
| 5. | Copies of signed subagreements                        | _____ | Yes | _____ | No |
| 6. | Have any subcontracts been awarded in the past month  | _____ | Yes | _____ | No |

Please provide an explanation for Questions 1 through 6.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
*Signature of Contractor*

\_\_\_\_\_  
*Signature of Project Compliance Officer*

\_\_\_\_\_  
*Date*

\_\_\_\_\_  
*Date*



**EXHIBIT NO. 8**

**PVSC SED UTILIZATION PLAN**

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**State of New Jersey**

**DEPARTMENT OF ENVIRONMENTAL PROTECTION**

Division of Water Quality  
Municipal Finance and Construction  
PO Box 420  
Trenton, New Jersey 08625-0420

PHILIP D. MURPHY  
*Governor*

SHEILA Y. OLIVER  
*Lt. Governor*

SHAWN M. LATOURETTE  
*Commissioner*

March 6, 2024

Thomas A. Laustsen, P.E., BCEE, PMP  
Chief Operating Officer  
Passaic Valley Sewerage Commission  
600 Wilson Avenue  
Newark, New Jersey 07105

Re: Passaic Valley Sewerage Commission  
Essex County, New Jersey  
Oxygen Production Facility Equipment Procurement  
No. S340689-63  
Contract No. 1  
(SED Waiver- Procurement Contract)

Dear Mr. Lausten:

On behalf of the Office of Equal Opportunity and Public contract Assistance, this Office has reviewed the above referenced correspondence and based upon the nature of the project; it has been determined that an SED Waiver is hereby granted. This waiver exempts the contractor from the solicitation requirement for socially and economically disadvantaged businesses related to procurement for: Purchase of Granular Activated Carbon Systems

Should there be any additional questions or concerns, please feel free to contact Karla Martin of my staff at (609) 292-3114.

Paul Hauch, P.E., Bureau Chief

A handwritten signature in black ink, appearing to read "Paul Hauch", enclosed within a large, stylized circular flourish.

Bureau of Construction, Payments and Administration  
Municipal Finance & Construction Element  
Division of Water Quality

Km:km  
Enclosure

C. D. Zimmer, I-Bank  
C. Jenkins, MFCE  
P. Hauch, MFCE  
R. Ghandi, OEO & PCA  
File

## **Passaic Valley Sewerage Commission (PVSC)**

### **Socially and Economically Disadvantaged Utilization Plan**

#### **Introduction**

It is the policy of the PVSC to promote award of contracts to Socially and Economically Disadvantaged (SED) small business enterprises by stipulating specific requirements for involving such businesses in contracting. The failure of the Contractor to demonstrate a good faith effort to achieve the goals set forth herein by utilizing best efforts to implement the SED utilization plan will constitute an event of default of the Agreement. PVSC shall designate a compliance officer who shall be responsible for coordinating SED utilization efforts for the Agreement and for monitoring compliance with the plan. PVSC reserves the right to audit the Contractor's SED records to insure compliance with this provision. Socially and economically disadvantaged businesses definitions and associated terms are defined in the NJAC 7:22-9.2.

#### **SED's Scope and Purpose**

The goal is established at 10% SED (combined MBE/WBE) participation. Fulfillment of the goal can be achieved through lower tier agreements with SEDs for services, supplies or construction necessary to complete the project. The Contractor must endeavor to meet the goal specified in the previous paragraph by taking and documenting the following affirmative steps to ensure that the SED businesses are used as sources of services, supplies or construction whenever possible by:

1. Placing SEDs on solicitation lists.
2. Assuring SED solicitation whenever they are potential sources.
3. Encouraging SED participation through the division of total requirements, when economically feasible, into smaller tasks or quantities.
4. Encouraging SED participation through the establishment of delivery schedules, where the work requirement permits.
5. Using the services and assistance of the Small Business Administration, the Minority Business Development Agency of the U.S. Department of Commerce, and the N.J. Department of Commerce and Economic Development, Division of Development for Businesses and Women and Minority Businesses.

When soliciting services from subcontractors, the Contractor must include the 10% goal in its Proposals. Contract work cannot commence until the PVSC has approved the Contractor's SED Utilization Plan.

#### **Definitions**

Definitions are incorporated herein by reference and can be found at N.J.A.C 7:22-9.2.

### **In-House Procedures**

The Project Compliance Officer, or his designee, shall be responsible for coordinating' SED utilization efforts on the project, for monitoring and enforcing compliance with the affirmative action and the SED requirement.

SED utilization requirements shall be an agenda item at all contract award meetings and, wherever applicable, at preconstruction conference meetings regardless of whether a loan or grant agreement has been executed or not. Each project sponsor shall be responsible for notifying the Office of the time and place of such meetings.

The project compliance officer, or his designee, shall attend all monthly construction progress meetings. .

### **State of New Jersey SED Certification Requirement**

Any SED firm proposed by the Contractor must be certified by a certifying agency in the State of New Jersey or be certifiable and pending certification, as verified by PVSC, in order to qualify toward the firm's fair share goals. Other certifications may be deemed acceptable, as approved by PVSC on a case by case basis.

For information purposes only, the State of New Jersey Department of Commerce and Economic Development Division of Development and Small Business and Women Minority Businesses Set Aside and Certification office maintains a state wide Certification Directory containing a list of SEDs who are accepted as such by the State of New Jersey and who might be interested in becoming suppliers or subcontractors for this contract.

### **SED Utilization Plan Requirements**

Thirty (30) days after Notice of Award, the contractor must submit an approvable SED Utilization Plan to the PVSC. To be approvable, the SED Utilization Plan for subcontractors, suppliers and construction, must detail the steps taken or to be taken by the Contractor to provide for SED utilization for the total fair share percentage established by the Agreement. It must further provide documentation to evidence the Contractor's efforts to date and planned efforts toward achieving the goal.

### **SED Utilization Plan Revisions**

If a SED supply, service, or subcontract in the approved plan will not be procured, the Contractor must amend the plan. The Contractor must demonstrate a good faith effort to comply with the fair share percentage established in the Agreement by submitting documentation outlining the SED affirmative steps taken and the reasons for not engaging the SED. The Contractor must further revise the SED plan to detail the additional steps to be taken to reach the SED participation goal set forth herein as part of the required SED Utilization Plan Revision.

**EXHIBIT NO. 9**

**NJAC 7:14-2**

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N.J.A.C. 7:14

## **WATER POLLUTION CONTROL ACT**

Statutory authority: N.J.S.A. 13:1B-3 et seq., 13:1D-1 et seq., 13:1E-1 et seq., 58:10-23.11 et seq., 58:10A-1 et seq., 58:11-49 et seq., 58:11A-1 et seq. and 58:12A-1 et seq.

Date last amended: October 5, 2010

For regulatory history and effective dates, see the New Jersey Administrative Code

### **Table of Contents**

#### **SUBCHAPTER 1. (RESERVED)**

#### **SUBCHAPTER 2. CONSTRUCTION OF WASTEWATER TREATMENT FACILITIES**

7:14-2.1	Construction procedures
7:14-2.2	Record drawings; collector sewers, interceptor sewers and force mains
7:14-2.3	Permits
7:14-2.4	Easements/rights-of-way
7:14-2.5	Field layout (baseline and monuments)
7:14-2.6	Engineer design activities: plan scale and plan updating
7:14-2.7	Construction, overhead and profit factors for Extra Work compensation
7:14-2.8	Payments to contractors
7:14-2.9	Mobilization: unit price contracts for sewer construction
7:14-2.10	Bid items for sewer pipe installation
7:14-2.11	Reasonable minimum unit prices
7:14-2.12	Payment widths, trench backfill and roadway paving for Federally funded sewer projects
7:14-2.13	Excavation material unacceptable or conditionally acceptable for reuse as trench backfill
7:14-2.14	Construction equipment costs compensation for extra work
7:14-2.15	Substantial and final completion of pipe projects; contractor's guarantees

#### **SUBCHAPTERS 3 THROUGH 7. (RESERVED)**

#### **SUBCHAPTER 8. CIVIL ADMINISTRATIVE PENALTIES AND REQUESTS FOR ADJUDICATORY HEARINGS**

7:14-8.1	Authority and purpose
7:14-8.2	Definitions
7:14-8.3	Procedures for assessment, payment and settlement of civil administrative penalties, and affirmative defenses
7:14-8.3A	Public comment on interim enforcement limits
7:14-8.4	Procedures to request an adjudicatory hearing to contest an administrative order, a notice of civil administrative penalty assessment or a notice of civil administrative cost assessment; procedures for conducting adjudicatory hearings
7:14-8.4A	Grace period applicability; procedures
7:14-8.5	Civil administrative penalty determination
7:14-8.6	Civil administrative penalty for submitting inaccurate or false information
7:14-8.7	Civil administrative penalty for failure to allow lawful entry and inspection
7:14-8.8	Civil administrative penalty for conducting unapproved activities
7:14-8.9	Civil administrative penalty for failure to properly conduct monitoring or sampling under the Water Pollution Control Act
7:14-8.10	Civil administrative penalty for failure to pay a fee
7:14-8.11	(Reserved)

THIS IS A COURTESY COPY OF THIS RULE. ALL OF THE DEPARTMENT'S RULES ARE COMPILED IN TITLE 7 OF THE NEW JERSEY ADMINISTRATIVE CODE.

- 7:14-8.12 Civil administrative penalty for violation of whole effluent toxicity limitations
- 7:14-8.13 Civil administrative penalty for economic benefit
- 7:14-8.14 Civil administrative penalty for failing to comply with an information request or administrative subpoena, and the destruction of records
- 7:14-8.15 (Reserved)
- 7:14-8.16 Civil administrative penalty determination for indirect dischargers
- 7:14-8.17 Enforcement actions for failure to implement an approved industrial pretreatment program
- 7:14-8.18 Tables of minor and non-minor violations; grace periods
- 7:14-8.19 Severability

#### **APPENDIX A. WORDING OF FINANCIAL ASSURANCE DOCUMENTS**

**APPENDIX A-1 THROUGH B-2 (RESERVED)**

**APPENDIX B-3. POLLUTANTS THAT ARE INHIBITORY TO BIOLOGICAL TREATMENT PROCESSES**

**APPENDIX C THROUGH D (RESERVED)**

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#### **SUBCHAPTER 1. (RESERVED)**

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#### **SUBCHAPTER 2. CONSTRUCTION OF WASTEWATER TREATMENT FACILITIES**

##### 7:14-2.1 Construction procedures

The Department shall require and adhere to the procedures identified in this subchapter. Actions or procedures by owners, permittees, consultants, contractors, or other persons affected by this subchapter which are not in accordance with this subchapter shall not be acceptable to the Department. Where applicable, the Department may grant a waiver from any requirement of this subchapter upon presentation of written justification by the owner, permittee, consultant or contractor.

##### 7:14-2.2 Record drawings; collector sewers, interceptor sewers and force mains

(a) The owner shall be responsible for the preparation of all record drawings required for sewer lines. This responsibility may be delegated to the owner's representative with adequate compensation for this service.

(b) This responsibility shall not be delegated or transferred to the contractor. The contractor shall assist the owner/engineer, by providing record information, when requested, during the progress of the work.

##### 7:14-2.3 Permits

(a) Federal, State, county and municipal permits required as a result of the construction activity within the delineated site shall be obtained by the owner and associated fees shall be paid by the owner. In addition, permits required for construction activities on railroad properties shall be obtained by the owner.

(b) Exceptions to this section shall be a permit to use explosives for rock excavation and such other permits which by law are required to be obtained by the contractor.

(c) The owner shall make every reasonable effort to identify permits and fees and costs required as a result of the construction activity in effect 60 days prior to the receipt of construction bids. This responsibility may be delegated to the owner's engineer with adequate compensation for this service. The engineer shall be held harmless from any pen-

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alty or action resulting from the failure to obtain a permit where every reasonable effort has been made by the engineer to obtain such permits. Conditions made a part of any permit shall be imposed upon the contractor as described in the contract or bid documents. Additional costs associated with a permit resulting from the construction activity which is beyond that stipulated in the contract shall be the responsibility of the contractor.

(d) Whenever necessary or appropriate the contractor shall assist the owner in the acquisition of permits.

(e) The Department may intercede and assist in the resolution of any problems resulting from the acquisition of any permits.

#### 7:14-2.4 Easements/rights-of-way

An interruption of construction or an extension of contract time may be a basis for a claim by a contractor for additional cost when such interruption or extension is caused by the owner's inability to obtain an easement/right-of-way. Claims shall include any reasonable cost incurred by the contractor and shall be reviewed and approved by the owner prior to submission to the Department. The Department may approve all, any portion, or deny the cost for eligibility for projects funded under the Grant Program.

#### 7:14-2.5 Field layout (baseline and monuments)

The owner shall be responsible to establish and confirm field controls prior to start of construction. The contractor shall not be liable to check the accuracy of field controls (baseline and monuments) for sewer pipe installation. However, the contractor's layout must be based on a minimum of two field control points. Whenever the contractor detects an error in the field controls during pipe installation, the contractor shall immediately notify the owner and the owner's engineer of such error with sufficient documentation. The contractor shall be held responsible for all corrective measures and associated costs for failure to notify the owner of such error.

#### 7:14-2.6 Engineer design activities: plan scale and plan updating

(a) On occasion, projects do not go to construction within a reasonable time after the bid advertisement. During this period, utilities may be relocated or installed, as well as other changes which can take place that are unknown to the contractor. Because of this, problems can take place during construction and result in numerous change orders and increases in the cost of the project.

(b) The horizontal scale for construction plans for sewerage facilities shall not be less than one inch equals 100 feet. A larger horizontal scale shall be used where appropriate to show sufficient detail to construct the project. The vertical scale for construction plans for sewerage facilities shall be not less than one inch equals 10 feet. Based upon the best information available, the location of underground utilities and support structures for overhead utilities shall be shown on the plans.

(c) Construction plans for sewerage facilities shall be updated whenever the bid advertisement date exceeds one year after approval by the responsible State or Federal regulatory agency. The engineer shall receive adequate compensation for updating plans and specifications. All such revisions shall be noted and dated on the plans prior to bid.

#### 7:14-2.7 Construction, overhead and profit factors for Extra Work compensation

(a) The contractor is entitled to all identifiable direct job costs associated with Extra Work excluding subcontractor's costs. For Extra Work not in excess of \$ 10,000 the contractors may add up to 10 percent overhead factor to their identifiable direct job costs, but excluding the cost of any subcontracting, plus up to a 10 percent profit factor to their identifiable direct costs plus overhead amount.

(b) As general policy, these overhead and profit factors may be accepted by owners as reasonable in lieu of requiring the submission of additional supporting data. However, the owner must reserve its right to review any cost or profit element on a case-by-case basis, where the submission for overhead and profit is in excess of the 10 percent overhead and 10 percent profit indicated above.

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(c) Cost increase in subcontracted work may be similarly handled and a prime contractor may add up to 10 percent to the total cost (including overhead and profit factors) incurred by the subcontractor. In such cases, the same reservations for rights shall apply.

(d) For Extra Work in the amount of \$ 10,000 to \$ 100,000, the above factors may be included initially for equitable adjustments but will be subject to negotiation, cost and pricing data, and owner review requirements. Federally funded projects will be governed by Federal regulations.

#### 7:14-2.8 Payments to contractors

(a) At least 20 days before each monthly progress payment falls due for approval (but not more often than once per month), the contractor will submit to the engineer a partial payment estimate filled out and signed by the contractor covering the work performed during the period covered by the partial payment estimate and supported by such data as the engineer may reasonably require. Where any specific item(s) in the partial payment estimate is in dispute, the engineer may delete those costs from the estimate and approve the acceptable portion of the payment request. Payment requested for stored materials and/or equipment shall be subject to the following conditions being met or satisfied:

1. The materials and/or equipment shall be received in a condition satisfactory for incorporation in the work.
2. The materials and/or equipment shall be stored in such manner that they will not be damaged due to weather, construction operations or any other cause.
3. An invoice from the supplier shall be furnished for each item on which payment is requested.
4. The contractor shall furnish written proof from the supplier of 90 percent payment for the materials and/or equipment no later than 30 days after receipt of payment for same from the owner. The owner shall have the right to deduct from the next payment estimate an amount equal to the payment for said material and/or equipment if reasonable and adequate proof is not submitted.

(b) The contractor warrants and guarantees that title to all work, materials, and equipment covered by an Application for Payment, whether incorporated in the project or not, will pass to the owner upon the receipt of such payment by the contractor free and clear of all lien, claims, security interests or encumbrances (except 10 percent retention which may be withheld from suppliers and subcontractors to guarantee completion and performance). The engineer will after receipt of each partial payment estimate either indicate in writing his approval of payment and present the partial payment estimate to the owner, or return the partial payment estimate to the contractor indicating in writing his reasons for refusing to approve payment. In the latter case, the contractor may make the necessary corrections and resubmit the partial payment estimate. The owner shall review the partial payment estimate at its next regularly scheduled meeting and, if approved, payment shall be made available to the contractor within five days. The owner shall retain not more than two percent of the amount of each payment claimed. In accordance with EPA regulations, prime contractors are also required to make prompt payment to subcontractors and suppliers for eligible construction, material, and equipment costs. Generally, payments of all valid subcontractor and supplier requests for payment should be satisfied prior to the next succeeding request for progress payment by the prime contractor.

(c) When the work is substantially complete (Operational or Beneficial Occupancy), the withheld amount shall be further reduced below two percent but not less than twice the current market value of the work yet to be completed. On completion and acceptance of a part of the work on which the price is stated separately in the Contract Documents, payment shall be made in full including retained percentages, less authorized deductions. The contractor or owner may request assistance and guidance from the Department on disputes regarding retainage.

(d) "Substantial completion" as used in the context of this section shall mean satisfactory completion of major portions of the contract work, including inspection and testing, so that the facility may be turned over to the owner for its intended use or occupancy. The engineer shall certify the date of substantial completion and that date shall establish the beginning date of the warranty/guarantee period unless a prior date has been established.

#### 7:14-2.9 Mobilization: unit price contracts for sewer construction

(a) Mobilization shall consist of the cost of initiating the contract. Payment for mobilization will be made at the lump sum price bid for this item in the proposal, which price shall include the cost of initiating the contract. The provisions for payment for the item mobilization supersede any provisions elsewhere in the specifications for including the costs of

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these initial services and facilities in the prices bid for the various items scheduled in the proposal. The lump sum price bid for mobilization shall be payable to the contractor whenever he shall have completed 10 percent of the work of the contract. For the purposes of this item, 10 percent of the work shall be considered completed when the total of payments earned, exclusive of the amount bid for this item, shown on the monthly certificates of the approximate quantities of work done, shall exceed 10 percent of the total price bid for the contract.

(b) The lump sum price bid for mobilization is limited to the following maximum amounts:

From More Than	To and Including	Original Contract Amount (including Mobilization)	Maximum Amount for Item of Mobilization
\$ 0	\$ 100,000		\$ 3,000
100,000	500,000		15,000
500,000	1,000,000		30,000
1,000,000	2,000,000		60,000
2,000,000	3,000,000		90,000
3,000,000	4,000,000		120,000
4,000,000	5,000,000		125,000
5,000,000	6,000,000		150,000
6,000,000	7,000,000		175,000
7,000,000	10,000,000		200,000
10,000,000	--		2.5% of Amount Bid

7:14-2.10 Bid items for sewer pipe installation

(a) This section establishes bid items which shall be included in unit price contracts for sewer pipe installation where applicable.

Description	Unit of Measure
1. Test Pits	Cubic Yard
2. Stone Foundation (bedding)	Cubic Yard
3. Select Material (below and above pipe grade)	Cubic Yard
4. Rock Excavation (including removal and disposal of boulders)	Cubic Yard
5. Wood Sheeting (install and remove where shown on plans)	Square Feet or 1000 Board Feet
6. Wood Sheeting (left in place where shown on plans)	Square Feet or 1000 Board Feet
7. Steel Sheeting (install and remove where shown on plans)	Square Feet or Tons
8. Steel Sheeting (left in place where shown on plans)	Square Feet or Tons
9. Permanent Pavement Gravel	Square Yard
10. Pavement	
i. Municipal:	
(1) Temporary which shall be removed (where applicable)	Square Yard
(2) Base	Square Yard
(3) Top	Square Yard
ii. County:	
(1) Temporary which shall be removed (where applicable)	Square Yard
(2) Base	Square Yard
(3) Top	Square Yard
iii. State:	
(1) Temporary which shall be removed (where applicable)	Square Yard

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	(2)	Base		Square Yard
	(3)	Top		Square Yard
11.		Testing	Linear Feet	
12.		Concrete Cradle or Encasement (to be identified where applicable)	Cubic Yard	

7:14-2.11 Reasonable minimum unit prices

(a) This section establishes reasonable minimum unit prices for indeterminate items, where applicable, for sewer pipe installation. Indeterminate items are those items which may be anticipated and for which quantities cannot be determined.

(b) The reasonable minimum unit prices are to be established by the owner/engineer for the following items:

1. Stone Foundation;
2. Select Material;
3. Concrete Cradle or Encasement--Nonreinforced;
4. Concrete Cradle or Encasement--Reinforced;
5. Test Pits;
6. Rock Excavation;
7. Wood Sheeting (install and remove)--square feet or 1000 board feet;
8. Wood Sheeting (left in place)--square feet or 1000 board feet;
9. Steel Sheeting (install and remove)--square feet or tons;
10. Steel Sheeting (left in place)--square feet or tons.

7:14-2.12 Payment widths, trench backfill and roadway paving for Federally funded sewer projects

(a) This section establishes eligible payment widths for select fill used for trench backfill and roadway pavement for federally funded sewer projects.

(b) Select trench backfill payment width:

1. Select trench backfill will be eligible for grant funding when the excavated material is totally or partially unacceptable for reuse as trench backfill. When the unacceptable material must be replaced with approved select backfill in a trench with a depth of 10 feet or less from the top of the pipe, the eligible payment width shall be  $B_d$  as shown below. For trenches of a greater depth the maximum eligible payment width shall be  $B_d$  plus  $H$  for the depth of unsuitable material as measured at the time of excavation.

2. When trench width is less than  $B_d$  plus  $H$ , the actual width shall control the payment.



3.  $B_d$  equals Maximum trench width (measured at the top of the pipe) allowed by the engineer for the type and strength class of pipe being installed.

4. The owner/engineer must make every effort to minimize the use of select fill. Marginal backfill material (material which is not acceptable for use in the pipe envelope or as a subbase for roadways) will be limited to the midzone of the trench. The midzone is defined as that portion of the trench beginning two feet above the top of the pipe, after compaction of the pipe envelope, to a point two feet below the final road or easement elevation. The owner/engineer must make all final decisions concerning the above.

(c) Paving:

1. Maximum eligible payment width shall be the disturbed width plus two feet. In no case shall the maximum eligible payment width be greater than  $Bd$  plus  $H$ ;



2. Maximum Eligible Pay Width equals  $Bd$  plus  $H$ ;

3. Special considerations:

i. Pavement replacement shall, in all instances, be "like kind" replacement except where the replacement of the original thickness of roadway material will not yield a structurally stable surface over the disturbed trench area, or where the requirements of the responsible governmental jurisdiction specify roadway materials other than the original disturbed pavement. In these instances, the engineer should specify the minimum thickness necessary to obtain a structurally sound surface or to comply with established local, county or State road opening permit requirements. Such requirements shall be contained in the contract documents.

ii. Roadways where the original total pavement thickness is less than two inches and the pavement cannot be boxed and maintained during construction, will be eligible for "like kind" replacement outside of the eligible trench pavement width.

iii. Any deviation from the above should be submitted during the design phase (Step II) for approval if possible. In all instances, approvals must be obtained prior to soliciting bids.

iv. Reducing the pavement thickness specified by the engineer and spreading it across a wider area of the street will not be approved unless extenuating circumstances justify the need to pave a wider area. These situations will be considered on a case by case basis and must be submitted as a Change Order and receive approval prior to implementing such a change.

(d) Application of this section is mandatory for all Federal Grants awarded to projects, pursuant to the provisions of the Federal Clean Water Act (33 U.S.C. §§ 1251 et seq.) as amended, before October 1, 1998. For all Federal Grants awarded after October 1, 1998, the allowable costs shall be determined in accordance with the applicable provisions of the Financial Assistance Programs for Environmental Infrastructure Facilities rules at N.J.A.C. 7:22-5, Determination of Allowable Costs: Fund and Trust.

#### 7:14-2.13 Excavation material unacceptable or conditionally acceptable for reuse as trench backfill

(a) The following trench excavation materials are unacceptable as trench backfill:

1. Any excavation materials that will cause damage to the piping systems;
2. Any excavation material that cannot be compacted or consolidated to yield the desired density as specified in the contract specifications;
3. Trees, stumps and foreign material.

(b) The following excavation materials are conditionally acceptable as trench backfill only if provided for in the contract specifications and the trench is located in a right-of-way, an easement, a roadway or an unimproved area:

1. Clay, organics and silt determined to be suitable in accordance with soil tests required by the owner/engineer.
2. Hard materials, such as blacktop, concrete, stone and rock.
  - i. The hard materials shall only be placed in the midzone of the trench beginning two feet above the top of the pipe, after compaction of the pipe envelope, to a point two feet below the final road or ground surface.
  - ii. Placement of the hard materials shall not create a potential hazard to the pipe or create voids that will cause adverse settlement.
  - iii. The maximum overall size of any piece of hard material shall be 12 inches.

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(c) The Department may require that all trench backfill material not conforming to this subsection and contract specifications be removed and spoiled to a spoil site approved by the Department in accordance with the requirements of N.J.A.C. 7:26-1, for solid or hazardous wastes.

7:14-2.14 Construction equipment costs compensation for extra work

(a) The contractor is entitled to all identifiable direct job equipment costs associated with extra work. The compensable cost for construction equipment shall be based upon the most current costs established in "Rental Rates for Construction Equipment" and "Rental Rates for Older Construction Equipment" (Blue Book), Dataquest Incorporated, A.C. Nielsen Company, San Jose, CA, 1983.

(b) Overhead and profits factors allowed in N.J.A.C. 7:14-2.7, shall only be applied to the rates charged for rental equipment used by the contractor for extra work.

7:14-2.15 Substantial and final completion of pipe projects; contractor's guarantees

(a) The contractor shall notify the owner/engineer in writing when the contract work is substantially complete as defined by N.J.A.C. 7:14-2.8(d). Within a reasonable time, the owner/engineer shall inspect the work.

(b) If the owner/engineer considers the work to be substantially complete, and before the Certificate of Substantial Completion is issued, the contractor shall:

1. Submit a construction schedule for the remaining work to be completed, and

2. Warrant and guarantee, for a period of one year or for a period as otherwise specified, from the date of Substantial Completion, that the completed work is free from defects due to faulty materials, equipment or workmanship. The Performance Bond shall remain in effect through the guarantee period.

(c) If the owner/engineer does not consider the work to be substantially complete, the engineer shall notify the contractor in writing, listing the items to be completed or corrected.

1. The contractor shall correct or complete items identified in writing within a reasonable time as specified in the contract documents, including repairs of any damage resulting from such defects to other work completed under the contract.

2. If the contractor fails to make such corrections within a reasonable time as specified in the contract documents, the owner may do so and charge the costs incurred, including direct and indirect costs, to the contractor.

(e) Before the Contractor has received notification of substantial completion, the owner/engineer may submit a request to the contractor to use a functional portion of the work if:

1. Such use does not significantly interfere with construction on any portion of remaining work to be completed, and

2. The conditions of such use shall be identified in the Certificate of Substantial Completion when issued by the owner/engineer.

(f) Final completion shall be that point at which the contract is completed, defective work corrected and clean up work accomplished. Unless a Certificate of Substantial Completion has been issued, the guarantee period shall begin upon certification of final completion by the engineer.

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**Subchapters 3 through 7. (RESERVED)**

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**EXHIBIT NO. 10**

**NJSA 2A:44-143, 144**

NO TEXT ON THIS PAGE

(UPDATED THROUGH P.L. 2010, ch. 18, and JR 16 of P.L.2009)

TITLE 2A ADMINISTRATION OF CIVIL AND CRIMINAL JUSTICE

2A:44-143. Additional bond for payment of claims for labor, material, etc.; waiver, surety's obligation

**2A:44-143. Additional bond for payment of claims for labor, material, etc.; waiver, surety's obligation**

2A:44-143. a. (1) When public buildings or other public works or improvements are about to be constructed, erected, altered or repaired under contract, at the expense of the State or any contracting unit, as defined in section 2 of P.L.1971, c.198 (C.40A:11-2), or school district, the board, officer or agent contracting on behalf of the State, contracting unit or school district, shall require delivery of the payment and performance bond issued in accordance with N.J.S.2A:44-147 and otherwise, as provided for by law, with an obligation for the performance of the contract and for the payment by the contractor for all labor performed or materials, provisions, provender or other supplies, teams, fuels, oils, implements or machinery used or consumed in, upon, for or about the construction, erection, alteration or repair of such buildings, works or improvements provided by subcontractors or material suppliers in contract with the contractor, or subcontractors or material suppliers in contract with a subcontractor to the contractor, which class of persons shall be the beneficiaries of the payment and performance bond. The board, officer or agent shall also require that all payment and performance bonds be issued by a surety which meets the following standards:

(a) The surety shall have the minimum surplus and capital stock or net cash assets required by R.S.17:17-6 or R.S.17:17-7, whichever is appropriate, at the time the invitation to bid is issued; and

(b) With respect to all payment and performance bonds in the amount of \$850,000 or more, (i) if the amount of the bond is at least \$850,000 but not more than \$3.5 million, the surety shall hold a current certificate of authority, issued by the United States Secretary of the Treasury pursuant to 31 U.S.C. 9305, that is valid in the State of New Jersey as listed annually in the United States Treasury Circular 570, except that if the surety has been operational for a period in excess of five years, the surety shall be deemed to meet the requirements of this subsubparagraph if it is rated in one of the three highest categories by an independent, nationally recognized United States rating company that determines the financial stability of insurance companies, which rating company or companies shall be determined pursuant to standards promulgated by the Commissioner of Insurance by regulation adopted pursuant to the "Administrative Procedure Act," P.L.1968, c.410 (C.52:14B-1 et seq.), and (ii) if the amount of the bond is more than \$3.5 million, then the surety shall hold a current certificate of authority, issued by the United States Secretary of the Treasury pursuant to 31 U.S.C. 9305, that is valid in the State of New Jersey as listed annually in the United States Treasury Circular 570 and, if the surety has been operational for a period in excess of five years, shall be rated in one of the three highest categories by an independent, nationally recognized United States rating company that determines the financial stability of insurance companies, which rating company or companies shall be determined pursuant to standards promulgated by the Commissioner of Insurance by regulation adopted pursuant to the "Administrative Procedure Act," P.L.1968, c.410 (C.52:14B-1 et seq.). A surety subject to the provisions of subsubparagraph (ii) of this subparagraph which does not hold a certificate of authority issued by the United States Secretary of the Treasury shall be exempt from the requirement to hold such a certificate if the surety meets an equivalent set of standards developed by the Commissioner of Insurance through regulation which at least equal, and may exceed, the general criteria required for issuance of a certificate of authority by the United States Secretary of the Treasury pursuant to 31 U.S.C. 9305. A surety company seeking such an exemption shall, not later than the 180th day following the effective date of P.L.1995, c.384, certify to the appropriate contracting unit that it meets that equivalent set of standards set forth by the commissioner as promulgated.

(2) When such contract is to be performed at the expense of the State and is entered into by the Director of the Division of Building and Construction or State departments designated by the Director of the Division of Building and Construction, the director or the State departments may: (a) establish for that contract the amount of the bond at any percentage, not exceeding 100%, of the amount bid, based upon the director's or department's assessment of the risk presented to the State by the type of contract, and other relevant factors, and (b) waive the bond requirement of this section entirely if the contract is for a sum not exceeding \$200,000.

(3) When such a contract is to be performed at the expense of a contracting unit or school district, the board, officer or agent contracting on behalf of the contracting unit or school district may: (a) establish for that contract the amount of the bond at any percentage, not exceeding 100%, of the amount bid, based upon the board's, officer's or agent's assessment of the risk presented to the contracting unit or school district by the type of contract and other relevant factors, and (b) waive the bond requirement of this section entirely if the contract is for a sum not exceeding \$100,000.

b. A surety's obligation shall not extend to any claim for damages based upon alleged negligence that resulted in personal injury, wrongful death, or damage to real or personal property, and no bond shall in any way be construed as a liability insurance policy. Nothing herein shall relieve the surety's obligation to guarantee the contractor's performance of all conditions of the contract, including the maintenance of liability insurance if and as required by the contract. Only the obligee named on the bond, and any subcontractor performing labor or any subcontractor or materialman providing materials for the construction, erection, alteration or repair of the public building, work or improvement for which the bond is required pursuant to this section, shall have any claim against the surety under the bond.

c. A board, officer or agent contracting on behalf of the State, contracting unit or school district shall not accept more than one payment and performance bond to cover a single construction contract. The board, officer or agent may accept a single bond executed by more than one surety to cover a single construction contract only if the combined underwriting limitations of all the named sureties, as set forth in the most current annual revision of United States Treasury Circular 570, or as determined by the Commissioner of Insurance pursuant to R.S.17:18-9, meet or exceed the amount of the contract to be performed.

d. A board, officer or agent contracting on behalf of the State, contracting unit or school district shall not accept a payment or performance bond unless there is attached thereto a Surety Disclosure Statement and Certification to which each surety executing the bond shall have subscribed. This statement and certification shall be complete in all respects and duly acknowledged according to law, and shall have substantially the following form:

#### SURETY DISCLOSURE STATEMENT AND CERTIFICATION

....., surety(ies) on the attached bond, hereby certifies(y) the following:

(1) The surety meets the applicable capital and surplus requirements of R.S.17:17-6 or R.S.17:17-7 as of the surety's most current annual filing with the New Jersey Department of Insurance.

(2) The capital (where applicable) and surplus, as determined in accordance with the applicable laws of this State, of the surety(ies) participating in the issuance of the attached bond is (are) in the following amount(s) as of the calendar year ended December 31, ..... (most recent calendar year for which capital and surplus amounts are available), which amounts have been certified as indicated by certified public accountants (indicating separately for each surety that surety's capital and surplus amounts, together with the name and address of the firm of certified public accounts that shall have certified those amounts):

.....

.....

.....

(3) (a) With respect to each surety participating in the issuance of the attached bond that has received from the United States Secretary of the Treasury a certificate of authority pursuant to 31 U.S.C. 9305, the underwriting limitation established therein and the date as of which that limitation was effective is as follows (indicating for each such surety that surety's underwriting limitation and the effective date thereof):

.....

.....

.....

(b) With respect to each surety participating in the issuance of the attached bond that has not received such a certificate of authority from the United States Secretary of the Treasury, the underwriting limitation of that surety as established pursuant to R.S.17:18-9 as of (date on which such limitation was so established) is as follows (indicating for each such surety that surety's underwriting limitation and the date on which that limitation was established):

.....

.....

.....

(4) The amount of the bond to which this statement and certification is attached is \$ ..... .

(5) If, by virtue of one or more contracts of reinsurance, the amount of the bond indicated under item (4) above exceeds the total underwriting limitation of all sureties on the bond as set forth in items (3)(a) or (3)(b) above, or both, then for each such contract of reinsurance:

(a) The name and address of each such reinsurer under that contract and the amount of that reinsurer's participation in the contract is as follows:.....

.....

.....

.....; and

(b) Each surety that is party to any such contract of reinsurance certifies that each reinsurer listed under item (5)(a) satisfies the credit for reinsurance requirement established under P.L.1993, c.243 (C.17:51B-1 et seq.) and any applicable regulations in effect as of the date on which the bond to which this statement and certification is attached shall have been filed with the appropriate public agency.

CERTIFICATE

(to be completed by an authorized certifying agent

for each surety on the bond)

I ..... (name of agent), as ..... (title of agent) for .....  
(name of surety), a corporation/mutual insurance company/other (indicating type of business  
organization) (circle one) domiciled in ..... (state of domicile), DO HEREBY CERTIFY that,  
to the best of my knowledge, the foregoing statements made by me are true, and ACKNOWLEDGE that,  
if any of those statements are false, this bond is VOIDABLE.

.....

(Signature of certifying agent)

.....

(Printed name of certifying agent)

.....

(Title of certifying agent)

L.1951 (1st SS), c.344; amended 1979, c.408; 1989, c.316; 1991, c.454; 1995, c.38, s.2; 1995, c.384,  
s.1; 1996, c.81, s.2.

**2A:44-144. Sureties on and amount of bond; condition for payment of claims; bond deposited,  
held for use of interested parties**

2A:44-144. The bond required by this article shall be executed by the contractor with such sureties  
in accordance with N.J.S.2A:44-147 as shall be approved by the board, officer or agent acting on behalf  
of the State, contracting unit or school district, in an amount equal to 100 per cent of the contract price.  
The payment bond shall be conditioned for the payment by the contractor of all indebtedness which may  
accrue to any person, firm or corporation designated as a "beneficiary" pursuant to N.J.S.2A:44-143, in an  
amount not exceeding the sum specified in the bond, on account of any labor performed or materials,  
provisions, provender or other supplies, or teams, fuels, oils, implements or machinery used or consumed  
in, upon, for or about the construction, erection, alteration or repair of the public building or public work  
or improvement.

The payment bond shall be deposited with and be held by the board, officer or agent acting on behalf  
of the State, contracting unit or school district, for the use of any beneficiary thereof.

L.1951 (1st SS), c.344; amended 1995, c.384, s.2; 1996, c.81, s.3.

**EXHIBIT NO. 11**

**INDEX OF DRAWINGS**

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PASSAIC VALLEY SEWERAGE COMMISSION  
600 WILSON AVENUE  
NEWARK, NEW JERSEY 07105

OXYGEN PRODUCTION FACILITY EQUIPMENT PROCUREMENT

CONTRACT NO. B355

Index of Drawings

<u>Sheet No.</u>	<u>No.</u>	<u>Title</u>
GENERAL		
1	G00	COVER SHEET, VICINITY MAP AND LOCATION PLAN
2	G01	DRAWING INDEX SHEET 1
3	G02	MASTER SITE PLAN EXISTING
4	G03	OXYGEN GENERATION FLOW DIAGRAM 1
CIVIL		
5	C01	SYMBOL LEGEND
6	C02	EXISTING YARD PIPING AND DEMOLITION PLAN
7	C03	EXISTING GRADING AND PAVING DEMOLITION PLAN
8	C04	SITE SPACE ALLOCATION PLAN
CONSTRUCTION SEQUENCING		
9	CS01	CONSTRUCTION SEQUENCING PHASE I AND PHASE II
10	CS02	CONSTRUCTION SEQUENCING PHASE III AND PHASE IV
11	CS03	CONSTRUCTION SEQUENCING PHASE V AND PHASE VI
ELECTRICAL		
12	E01	GENERAL NOTES AND SYMBOLS
13	E02	OVERALL ONE-LINE DIAGRAM
INSTRUMENTATION AND CONTROL		
14	N01	PARTIAL NETWORK DIAGRAM

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**EXHIBIT NO. 12**

**PROMPT PAYMENT CERTIFICATION**

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Passaic Valley Sewerage Commission  
Water Pollution Control Facilities  
Newark, New Jersey

Contract No. [Insert Contract Number]  
Contract Name: [Insert Contract Name]

### **PROMPT PAYMENT CERTIFICATION**

I make this certification on behalf of myself as a representative of the contractor named below ("Contractor") and on behalf of the Contractor. I certify that for each application for payment submitted in connection with this project: (1) the work covered by that application for payment has been completed in accordance with the contract documents; (2) the payment requested is due; and (3) all amounts have been paid by the Contractor for work for which previous payments were issued. No application for payment will be submitted without Contractor having paid all subcontractors and suppliers their share of any funds received by Contractor pursuant to any previous application(s) for payment. I understand and acknowledge that this entire certification will be considered incorporated into every request for payment. I understand and acknowledge that if Contractor submits an application for payment without (1) having completed work in accordance with the contract documents, (2) payment requested being due, and/or (3) having paid all subcontractors and suppliers their share of any funds received by Contractor pursuant to any previous application(s) for payment, then Contractor has submitted a false claim and false certification, subjecting Contractor to liability, damages and penalties under the New Jersey False Claims Act, N.J.S.A. 2A:32C-1 et seq.

If there is some legitimate reason Contractor cannot timely pay a subcontractor or supplier, then Contractor must submit a signed certification or affidavit to the owner/government entity fully explaining the situation, when the situation arose, and when it will be resolved. A failure to submit such an explanatory certification waives any defenses Contractor may later seek to assert in connection with liability under the New Jersey False Claims Act, N.J.S.A. 2A:32C-1 et seq. or any other law, including N.J.A.C. 7:1D et seq.

I further understand and acknowledge that a false certification, whether express or implied, that (1) the work covered by an application for payment has been completed in accordance with the contract documents, (2) the payment requested is due, and/or (3) all amounts have been paid by the Contractor to subcontractors or suppliers for work for which previous payments were issued, is misleading with respect to the goods and services Contractor is providing.

I also understand and acknowledge that the requirements that (1) work has been completed in accordance with the contract documents, (2) the payment requested is due, and (3) all amounts have been paid by the Contractor for work for which previous payments were issued, are material to the State's decision to allocate State funding dollars for this contract, and also material to any local government entity's decision to retain and make payment to the contractor. I understand and acknowledge that if owner/government entity makes payment knowing of such violations, that

does not demonstrate that the requirements are not material, and does not constitute a waiver of liability under the New Jersey False Claims Act, N.J.S.A. 2A:32C-1 et seq.

To the contrary, Contractor recognizes that owner/government entity may decide to continue to pay Contractor due to contractual and/or logistical requirements or considerations.

Additionally, I understand and acknowledge that a false certification, whether express or implied, that (1) the work covered by an application for payment has been completed in accordance with the contract documents, (2) the payment requested is due, and/or (3) all amounts have been paid by the Contractor for work for which previous payments were issued, constitutes legitimate grounds for debarment pursuant to N.J.A.C. 7:1D et seq.

---

(Signature)

(Date)

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(Name and Title of Signer -Please Type)

**EXHIBIT NO. 13**

**USEPA IRON AND STEEL PROVISIONS**

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## **Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014**

P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works if the project is funded through an assistance agreement executed beginning January 17, 2014 (enactment of the Act), through the end of Fiscal Year 2014.

Section 436 also sets forth certain circumstances under which EPA may waive the AIS requirement. Furthermore, the Act specifically exempts projects where engineering specifications and plans were approved by a State agency prior to January 17, 2014.

The approach described below explains how EPA will implement the AIS requirement. The first section is in the form of questions and answers that address the types of projects that must comply with the AIS requirement, the types of products covered by the AIS requirement, and compliance. The second section is a step-by-step process for requesting waivers and the circumstances under which waivers may be granted.

### **Implementation**

The Act states:

Sec. 436. (a)(1) None of the funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j-12) shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States.

(2) In this section, the term “iron and steel products” means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

(b) Subsection (a) shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency (in this section referred to as the “Administrator”) finds that—

(1) applying subsection (a) would be inconsistent with the public interest;

(2) iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or

(3) inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

(c) If the Administrator receives a request for a waiver under this section, the Administrator shall make available to the public on an informal basis a copy of the request and information available to the Administrator concerning the request, and shall allow for informal public input on the request for at least 15 days prior to making a finding based on the request. The Administrator shall make the request and accompanying information available by electronic means, including on the official public Internet Web site of the Environmental Protection Agency.

(d) This section shall be applied in a manner consistent with United States obligations under international agreements.

(e) The Administrator may retain up to 0.25 percent of the funds appropriated in this Act for the Clean and Drinking Water State Revolving Funds for carrying out the provisions described in subsection (a)(1) for management and oversight of the requirements of this section.

(f) This section does not apply with respect to a project if a State agency approves the engineering plans and specifications for the project, in that agency's capacity to approve such plans and specifications prior to a project requesting bids, prior to the date of the enactment of this Act.

The following questions and answers provide guidance for implementing and complying with the AIS requirements:

### **Project Coverage**

#### **What classes of projects are covered by the AIS requirement?**

All treatment works projects funded by a CWSRF assistance agreement, and all public water system projects funded by a DWSRF assistance agreement, from the date of enactment through the end of Fiscal Year 2014. The AIS requirements apply to the entirety of the project, no matter when construction begins or ends. Additionally, the AIS requirements apply to all parts of the project, no matter the source of funding.

#### **Does the AIS requirement apply to nonpoint source projects or national estuary projects?**

No. Congress did not include an AIS requirement for nonpoint source and

national estuary projects unless the project can also be classified as a 'treatment works' as defined by section 212 of the Clean Water Act.

**Are any projects for the construction, alteration, maintenance, or repair of a public water system or treatment works excluded from the AIS requirement?**

Any project, whether a treatment works project or a public water system project, for which engineering plans and specifications were approved by the responsible state agency prior to January 17, 2014, is excluded from the AIS requirements.

**What if the project does not have approved engineering plans and specifications but has signed an assistance agreement with a CWSRF or DWSRF program prior to January 17, 2014?**

The AIS requirements do not apply to any project for which an assistance agreement was signed prior to January 17, 2014.

**What if the assistance agreement that was signed prior to January 17, 2014, only funded a part of the overall project, where the remainder of the project will be funded later with another SRF loan?**

If the original assistance agreement funded any construction of the project, the date of the original assistance agreement counts for purposes of the exemption. If the original assistance agreement was only for planning and design, the date of that assistance agreement will count for purposes of the exemption only if there is a written commitment or expectation on the part of the assistance recipient to fund the remainder of the project with SRF funds.

**What if the assistance agreement that was signed prior to January 17, 2014, funded the first phase of a multi-phase project, where the remaining phases will be funded by SRF assistance in the future?**

In such a case, the phases of the project will be considered a single project if all construction necessary to complete the building or work, regardless of the number of contracts or assistance agreements involved, are closely related in purpose, time and place. However, there are many situations in which major construction activities are clearly undertaken in phases that are distinct in purpose, time, or place. In the case of distinct phases, assistance agreements signed prior to January 17, 2014 would be excluded from AIS requirements while those signed on January 17, 2014, or later would be covered by the AIS requirements.

**What if the project does not have approved engineering plans and specifications, but bids were advertised prior to January 17, 2014 and an assistance agreement was signed after January 17, 2014?**

If the project does not require approved engineering plans and specifications, the

bid advertisement date will count in lieu of the approval date for purposes of the exemption in section 436(f).

### **What about refinancing?**

If a project began construction prior to January 17, 2014, but is financed or refinanced through an assistance agreement executed on or after January 17, 2014 and prior to October 1, 2014, AIS requirements will apply to all construction that occurs on or after January 17, 2014, through completion of construction, unless, as is likely, engineering plans and specifications were approved by a responsible state agency prior to January 17, 2014. There is no retroactive application of the AIS requirements where a refinancing occurs for a project that has completed construction prior to January 17, 2014.

### **Covered Iron and Steel Products**

#### **What is an iron or steel product?**

For purposes of the CWSRF and DWSRF projects that must comply with the AIS requirement, an iron or steel product is one of the following made primarily of iron or steel that is permanently incorporated into the public water system or treatment works:

- Lined or unlined pipes or fittings;
- Manhole Covers;
- Municipal Castings (defined in more detail below);
- Hydrants;
- Tanks;
- Flanges;
- Pipe clamps and restraints;
- Valves;
- Structural steel (defined in more detail below);
- Reinforced precast concrete; and
- Construction materials (defined in more detail below).

#### **What does the term 'primarily iron or steel' mean?**

'Primarily iron or steel' places constraints on the list of products above. For one of the listed products to be considered subject to the AIS requirements, it must be made of greater than 50% iron or steel, measured by cost. If one of the listed products is not made primarily of iron or steel, United States (US) provenance is not required.

**If a product is composed of more than 50% iron or steel, but is not listed in the above list of items, must the item be produced in the US? Alternatively, must the iron or steel in such a product be produced in the US?**

The answer to both question is no. Only items on the above list must be produced in the US. Additionally, the iron or steel in a non-listed item can be sourced from outside the US.

**What is the definition of steel?**

Steel means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements. Often, other metals are added to give steel a particular property, such as chromium and nickel to make it stainless.

**Are other alloys of iron required to be produced in the US?**

No, only iron and steel products as listed above must be produced in the US, even though iron may be the primary constituent of another metal alloy.

**What does 'produced in the United States' mean?**

Production in the United States of the iron or steel products used in the project requires that all manufacturing processes, including application of coatings, must take place in the United States, with the exception of metallurgical processes involving refinement of steel additives. All manufacturing processes includes processes such as melting, refining, forming, rolling, drawing, finishing, fabricating and coating. Further, if a domestic iron and steel product is taken out of the US for any part of the manufacturing process, it becomes foreign source material. However, raw materials such as iron ore, limestone and iron and steel scrap are not covered by the AIS requirement, and the material(s), if any, being applied as a coating are similarly not covered. Non-iron or steel components of an iron and steel product may come from non-US sources. For example, for products such as valves and hydrants, the individual non-iron and steel components do not have to be of domestic origin.

**Are the raw materials used in the production of iron or steel required to come from US sources?**

No, raw materials, such as iron ore, limestone, scrap iron, and scrap steel, can come from non-US sources.

**If an above listed item is primarily made of iron or steel, but is only at the construction site temporarily, must such an item be produced in the US?**

No. Only the above listed products made primarily of iron or steel, permanently incorporated into the project must be produced in the US. For example trench boxes or scaffolding, which are removed from the project site upon completion of the project, are not required to be made of U.S. Iron or Steel.

**What is the definition of 'municipal castings'?**

Municipal castings are cast iron or steel infrastructure products that are melted and cast. They typically provide access, protection, or housing for components incorporated into utility owned drinking water, storm water, wastewater, and surface infrastructure. They are typically made of grey or ductile iron, or steel. Examples of municipal castings are:

- Access Hatches;
- Ballast Screen;
- Benches (Iron or Steel);
- Bollards;
- Cast Bases;
- Cast Iron Hinged Hatches, Square and Rectangular;
- Cast Iron Riser Rings;
- Catch Basin Inlet;
- Cleanout/Monument Boxes;
- Construction Covers and Frames;
- Curb and Corner Guards;
- Curb Openings;
- Detectable Warning Plates;
- Downspout Shoes (Boot, Inlet);
- Drainage Grates, Frames and Curb Inlets;
- Inlets;
- Junction Boxes;
- Lampposts;
- Manhole Covers, Rings and Frames, Risers;
- Meter Boxes;
- Steel Hinged Hatches, Square and Rectangular;
- Steel Riser Rings;
- Trash receptacles;
- Tree Grates;
- Tree Guards;
- Trench Grates; and
- Valve Boxes, Covers and Risers.

### **What is 'structural steel'?**

Structural steel is rolled flanged shapes, having at least one dimension of their cross-section 3 inches or greater, which are used in the construction of bridges, buildings, ships, railroad rolling stock, and for numerous other constructional purposes. Such shapes are designated as wide-flange shapes, standard I-beams, channels, angles, tees and zees. Other shapes include H-piles, sheet piling, tie plates, cross ties, and those for other special purposes.

### **What is a 'construction material' for purposes of the AIS requirement?**

Construction materials are those articles, materials, or supplies made primarily of

iron and steel, that are permanently incorporated into the project, not including mechanical and/or electrical components, equipment and systems. Some of these products may overlap with what is also considered "structural steel". This includes, but is not limited to, the following products: wire rod, bar, angles, concrete reinforcing bar, wire, wire cloth, wire rope and cables, tubing, framing, joists, trusses, fasteners, welding rods, decking, grating, railings, stairs, access ramps, fire escapes, ladders, wall panels, dome structures, roofing, ductwork, surface drains, cable hanging systems, manhole steps, fencing and fence tubing, guardrails, doors, gates, and screens.

**What is not considered a 'construction material' for purposes of the AIS requirement?**

The following examples are NOT considered construction materials: gear reducers, drives, mixers, heat exchangers, pumps, motors, blowers/aeration equipment, meters, variable frequency drives (VFDs), valve actuators, controls, supervisory control and data acquisition (SCADA), membrane bioreactor systems, membrane filtration systems, filters, disinfection systems, belt presses, HVAC (excluding ductwork), water heaters, generators, cabinetry and housings, lighting fixtures, electrical conduit, emergency life systems, metal office furniture, shelving, laboratory equipment, and analytical instrumentation.

**Are welding rods considered a construction material?**

For purposes of construction of the project, yes, welding rods are a construction material and must be produced in the US. Additionally, if welding rods are used in the production of a listed product, that welding rod used by a manufacturer, fabricator, etc., must also be produced in the US.

**If the iron or steel is produced in the US, may other steps in the manufacturing process take place outside of the US, such as assembly?**

No. Production in the US of the iron or steel used in a listed product requires that all manufacturing processes must take place in the United States, except metallurgical processes involving refinement of steel additives.

**What processes must occur in the US to be compliant with the AIS requirement for reinforced precast concrete?**

While reinforced precast concrete may not be at least 50% iron or steel, in this particular case, the reinforcing rebar must be produced in the US and meet the same standards as for any other iron or steel product. Additionally, the casting of the concrete product must take place in the US. If the reinforced concrete is cast at the construction site, the reinforcing rebar is considered to be a construction material and must be produced in the US.

**How should an assistance recipient document compliance with the AIS**

## **requirement?**

In order to ensure compliance with the AIS requirement, EPA recommends that specific AIS contract language be included in each contract, starting with the assistance agreement, all the way down to the purchase agreements. Language for assistance agreements and contracts can be found in Appendix 3 and 4.

EPA recommends the use of a step certification process, similar to one used by the Federal Highway Administration. The step certification process is a method to ensure adherence to AIS requirements. The process would also establish accountability and better enable States to take enforcement actions against intentional violators.

Step certification creates a paper trail which documents the location of the manufacturing process involved with the production of steel and iron materials. A step certification is a process under which each handler (supplier, fabricator, manufacturer, processor, etc.) of the iron and steel products certifies that their step in the process was domestically performed. Each time a step in the manufacturing process takes place, the manufacturer delivers its work along with a certification of its origin. A certification can be quite simple. It should include the name of the manufacturer, the location of the manufacturing facility where the product or process took place (not its headquarters), a description of the product or item being delivered, and a signature by a manufacturer's responsible party. Attached as appendix 5 is a sample certification.

Alternatively, the final manufacturer that delivers the iron or steel product to either the worksite, vendor, or contractor, may provide a certification asserting that all manufacturing processes occurred in the US. While this type of certification may be acceptable, it does not provide the same degree of assurance. Additional documentation may be needed if the certification is lacking important information. Step certification is the best practice.

## **How should a State ensure assistance recipients are complying with the AIS requirement?**

In order to ensure compliance with the AIS requirement, States SRF programs should, as a best practice, conduct onsite inspections of projects during construction.

## **What happens if a State or EPA finds a non-compliant iron and/or steel product permanently incorporated in the project?**

If a potentially noncompliant product is identified, the assistance recipient should be notified by the State of the apparent unauthorized use of the non-domestic component, including a proposed corrective action, and should be given the opportunity to reply. If unauthorized use is confirmed, the State can take one or more of the following actions: request a waiver where appropriate; require the removal of the non-domestic item; or withhold payment for all or part of the project. Only EPA can issue waivers to authorize the use of a non-domestic item. If EPA determines that the State is not enforcing the AIS



requirements, EPA may use remedies available to it under the Clean Water Act, the Safe Drinking Water Act, and 40 CFR part 31 grant regulations.

It is recommended that the State work collaboratively with EPA to determine the appropriate corrective action, especially in cases where the State is the one who identifies the item in noncompliance or there is a disagreement with the assistance recipient.

If fraudulent activities are suspected, the OIG should be contacted immediately. The OIG can be reached at 1-888-546-8740 or [OIG\\_Hotline@epa.gov](mailto:OIG_Hotline@epa.gov). More information can be found at this website: <http://www.epa.gov/oig/hotline.htm>.

### **How do international trade agreements affect the implementation of the AIS requirements?**

The AIS provision applies in a manner consistent with United States obligations under international agreements. Typically, these obligations only apply to direct procurement by the entities that are signatories to such agreements. In general, SRF assistance recipients are not signatories to such agreements, so these agreements have no impact on this AIS provision. In the few instances where such an agreement applies to a municipality, that municipality is under the obligation to determine its applicability and requirements and document the actions taken to comply for the State.

### **Waiver Process**

The statute permits EPA to issue waivers for a case or category of cases where EPA finds (1) that applying these requirements would be inconsistent with the public interest; (2) iron and steel products are not produced in the US in sufficient and reasonably available quantities and of a satisfactory quality; or (3) inclusion of iron and steel products produced in the US will increase the cost of the overall project by more than 25 percent.

In order to implement the AIS requirements, EPA has developed an approach to allow for effective and efficient implementation of the waiver process to allow projects to proceed in a timely manner. The framework described below will allow States to apply for waivers of the AIS requirement directly to EPA Headquarters. Pursuant to the Act, EPA has the responsibility to make findings as to the issuance of waivers to the AIS requirements.

### **Definitions**

The following terms are critical to the interpretation and implementation of the AIS requirements and apply to the process described in this memorandum:

**Reasonably Available Quantity:** The quantity of iron or steel products is available or will be available at the time needed and place needed, and in the proper form or specification as specified in the project plans and design.

Satisfactory Quality: The quality of iron or steel products, as specified in the project plans and designs.

Assistance Recipient: A borrower or grantee that receives funding from a State CWSRF or DWSRF program.

### **Step-By-Step Waiver Process**

#### Application by Assistance Recipient

Each local entity that receives SRF water infrastructure financial assistance is required by section 436 of the Act to use American made iron and steel products in the construction of its project. However, if the recipient can justify a claim made under one of the categories below, the recipient may request a waiver. Until a waiver is granted by EPA, the AIS requirement stands, except as noted above with respect to municipalities covered by international agreements.

The waiver process begins with the SRF assistance recipient. In order to fulfill the AIS requirement, the assistance recipient must in good faith design the project (where applicable) and solicit bids for construction with American made iron and steel products. It is essential that the assistance recipient include the AIS terms in any request for proposals or solicitations for bids, and in all contracts (see Appendix 3 for sample construction contract language). The assistance recipient may seek a waiver at any point before, during, or after the bid process, but before installation of the product, if one or a combination of three conditions is met:

1. Applying the American Iron and Steel requirements of the Act would be inconsistent with the public interest;
2. Iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or
3. Inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

Proper and sufficient documentation must be provided by the assistance recipient. A checklist detailing the types of information required for a waiver to be processed is attached as Appendix 1.

Additionally, it is strongly encouraged that assistance recipients hold pre-bid conferences with potential bidders. A pre-bid conference can help to identify iron and steel products needed to complete the project as described in the plans and specifications that may not be available from domestic sources. It may also identify the need to seek a waiver prior to bid, and can help inform the recipient on compliance options.

In order to apply for a project waiver, the assistance recipient should email the request in the form of a Word document (.doc) to the State SRF program. It is strongly

recommended that the State designate a single person for all AIS communications (staff to be determined). The State SRF designee will review the application for the waiver and determine whether the necessary information has been included. Once the waiver application is complete, the State designee will forward the application to either of two email addresses. For CWSRF waiver requests, please send the application to: [cwsrfwaiver@epa.gov](mailto:cwsrfwaiver@epa.gov). For DWSRF waiver requests, please send the application to: [dwsrfwaiver@epa.gov](mailto:dwsrfwaiver@epa.gov).

### Evaluation by EPA

After receiving an application for waiver of the AIS requirements, EPA Headquarters will publish the request on its website for 15 days and receive informal comment. EPA Headquarters will then use the checklist in Appendix 2 to determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver – that it is quantitatively and qualitatively sufficient – and to determine whether or not to grant the waiver.

In the event that EPA finds that adequate documentation and justification has been submitted, the Administrator may grant a waiver to the assistance recipient. EPA will notify the State designee that a waiver request has been approved or denied as soon as such a decision has been made. Granting such a waiver is a 3-step process:

1. Posting – After receiving a complete application for a waiver, EPA is required to publish the application and all material submitted with the application on EPA's website for 15 days. During that period, the public will have the opportunity to review the request and provide informal comment to EPA.
2. Evaluation – After receiving an application for waiver of the AIS requirements, EPA Headquarters will use the checklist in Appendix 2 to determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver – that it is quantitatively and qualitatively sufficient – and to determine whether or not to grant the waiver.
3. Signature of waiver approval by the Administrator or another agency official with delegated authority – As soon as the waiver is signed and dated, EPA will notify the State SRF program, and post the signed waiver on our website.

### Public Interest Waivers

EPA has the authority to issue public interest waivers. Evaluation of a public interest waiver request may be more complicated than that of other waiver requests so they may take additional time for a decision to be made. An example of a public interest waiver that might be issued could be for a community that has standardized on a particular type or manufacturer of a valve because of its performance to meet their specifications. Switching to an alternative valve may require staff to be trained on the new equipment and additional spare parts would need to be purchased and stocked,

existing valves may need to be unnecessarily replaced, and portions of the system may need to be redesigned. Therefore, requiring the community to install an alternative valve would be inconsistent with public interest.

EPA also has the authority to issue a public interest waiver that covers categories of products that might apply to all projects.

EPA reserves the right to issue national waivers that may apply to particular classes of assistance recipients, particular classes of projects, or particular categories of iron or steel products. EPA may develop national or (U.S. geographic) regional categorical waivers through the identification of similar circumstances in the detailed justifications presented to EPA in a waiver request or requests. EPA may issue a national waiver based on policy decisions regarding the public's interest or a determination that a particular item is not produced domestically in reasonably available quantities or of a sufficient quality. In such cases, EPA may determine it is necessary to issue a national waiver.

### **Split Funding**

Many States intend to fund projects with "split" funding, from the SRF program and from State or other programs. Based on the Act language in section 436, which requires that American iron and steel products be used in any project for the construction, alteration, maintenance, or repair of a public water system or treatment works receiving SRF funding between and including January 17, 2014 and September 30, 2014, any project that is funded in whole or in part with such funds must comply with the AIS requirement. A "project" consists of all construction necessary to complete the building or work regardless of the number of contracts or assistance agreements involved so long as all contracts and assistance agreements awarded are closely related in purpose, time and place. This precludes the intentional splitting of SRF projects into separate and smaller contracts or assistance agreements to avoid AIS coverage on some portion of a larger project, particularly where the activities are integrally and proximately related to the whole. However, there are many situations in which major construction activities are clearly undertaken in segregable phases that are distinct in purpose, time, or place, in which case, separate contracts or assistance agreement for SRF and State or other funding would carry separate requirements.

Any questions concerning the contents of this memorandum may be directed to Jordan Dorfman, Attorney-Advisor, State Revolving Fund Branch, Municipal Support Division, at [dorfman.jordan@epa.gov](mailto:dorfman.jordan@epa.gov) or (202) 564-0614 or Kiri Anderer, Environmental Engineer, Infrastructure Branch, Drinking Water Protection Division, at [anderer.kirsten@epa.gov](mailto:anderer.kirsten@epa.gov) or (202) 564-3134.

Attachments

## Appendix 1: Information Checklist for Waiver Request

The purpose of this checklist is to help ensure that all appropriate and necessary information is submitted to EPA. EPA recommends that waiver applicants review this checklist carefully and provide all appropriate information to EPA. This checklist is for informational purposes only and does not need to be included as part of a waiver application.

Items	✓	Notes
<p>General</p> <ul style="list-style-type: none"> <li>• Waiver request includes the following information:               <ul style="list-style-type: none"> <li>— Description of the foreign and domestic construction materials</li> <li>— Unit of measure</li> <li>— Quantity</li> <li>— Price</li> <li>— Time of delivery or availability</li> <li>— Location of the construction project</li> <li>— Name and address of the proposed supplier</li> <li>— A detailed justification for the use of foreign construction materials</li> </ul> </li> <li>• Waiver request was submitted according to the instructions in the memorandum</li> <li>• Assistance recipient made a good faith effort to solicit bids for domestic iron and steel products, as demonstrated by language in requests for proposals, contracts, and communications with the prime contractor</li> </ul>		
<p>Cost</p> <ul style="list-style-type: none"> <li>• Waiver request includes the following information:               <ul style="list-style-type: none"> <li>— Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products</li> <li>— Relevant excerpts from the bid documents used by the contractors to complete the comparison</li> <li>— Supporting documentation indicating that the contractor made a reasonable survey of the market, such as a description of the process for identifying suppliers and a list of contacted suppliers</li> </ul> </li> </ul>		
<p>Availability</p> <ul style="list-style-type: none"> <li>• Waiver request includes the following supporting documentation necessary to demonstrate the availability, quantity, and/or quality of the materials for which the waiver is requested:               <ul style="list-style-type: none"> <li>— Supplier information or pricing information from a reasonable number of domestic suppliers indicating availability/delivery date for construction materials</li> <li>— Documentation of the assistance recipient's efforts to find available domestic sources, such as a description of the process for identifying suppliers and a list of contacted suppliers.</li> <li>— Project schedule</li> <li>— Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of construction materials</li> </ul> </li> <li>• Waiver request includes a statement from the prime contractor confirming the non-availability of the domestic construction materials for which the waiver is sought</li> <li>• Has the State received other waiver requests for the materials described in this waiver request. for comparable projects?</li> </ul>		

## Appendix 2: HQ Review Checklist for Waiver Request

Instructions: **To be completed by EPA.** Review all waiver requests using the questions in the checklist, and mark the appropriate box as Yes, No or N/A. Marks that fall inside the shaded boxes may be grounds for denying the waiver. If none of your review markings fall into a shaded box, the waiver is eligible for approval if it indicates that one or more of the following conditions applies to the domestic product for which the waiver is sought:

1. The iron and/or steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality.
2. The inclusion of iron and/or steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

Review Items	Yes	No	N/A	Comments
Cost				
<ul style="list-style-type: none"> <li>• Does the waiver request include the following information?               <ul style="list-style-type: none"> <li>— Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products</li> <li>— Relevant excerpts from the bid documents used by the contractors to complete the comparison</li> <li>— A sufficient number of bid documents or pricing information from domestic sources to constitute a reasonable survey of the market</li> </ul> </li> <li>• Does the Total Domestic Project exceed the Total Foreign Project Cost by more than 25%?</li> </ul>				
Availability				
<ul style="list-style-type: none"> <li>• Does the waiver request include supporting documentation sufficient to show the availability, quantity, and/or quality of the iron and/or steel product for which the waiver is requested?               <ul style="list-style-type: none"> <li>— Supplier information or other documentation indicating availability/delivery date for materials</li> <li>— Project schedule</li> <li>— Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of materials</li> </ul> </li> <li>• Does supporting documentation provide sufficient evidence that the contractors made a reasonable effort to locate domestic suppliers of materials, such as a description of the process for identifying suppliers and a list of contacted suppliers?</li> <li>• Based on the materials delivery/availability date indicated in the supporting documentation, will the materials be unavailable when they are needed according to the project schedule? (By item, list schedule date and domestic delivery quote date or other relevant information)</li> <li>• Is EPA aware of any other evidence indicating the non-availability of the materials for which the waiver is requested? Examples include:               <ul style="list-style-type: none"> <li>— Multiple waiver requests for the materials described in this waiver request, for comparable projects in the same State</li> <li>— Multiple waiver requests for the materials described in this waiver request, for comparable projects in other States</li> <li>— Correspondence with construction trade associations indicating the non-availability of the materials</li> </ul> </li> <li>• Are the available domestic materials indicated in the bid documents of inadequate quality compared those required by the project plans, specifications, and/or permits?</li> </ul>				

#### **Appendix 4: Construction Contract Language**

The Contractor acknowledges to and for the benefit of the \_\_\_\_\_ (“Purchaser”) and the \_\_\_\_\_ (the “State”) that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking Water State Revolving Fund and such law contains provisions commonly known as “American Iron and Steel;” (P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), section 436) that requires all of the iron and steel products used in the project to be produced in the United States (“American Iron and Steel Requirement”) including iron and steel products provided by the Contractor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Purchaser or the State. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney’s fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Purchaser). While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.

## Appendix 5 – Sample Certification for Step Certification Process

The following information is provided as a sample letter of step certification for Buy America compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: Buy America Step Certification for Project (XXXXXX-XXXXXXA)

I, (company representative), certify that the (melting, bending, coating, galvanizing, cutting, etc.) process for (manufacturing or fabricating) the following products and/or materials shipped or provided for the subject project is in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. XXXX
2. XXXX
3. XXXX

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative



The following information is provided as a sample letter of certification for Buy America compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: Buy America Certification for Project (XXXXXX-XXXXXXXA)

I, (company representative), certify that the following products and/or materials shipped/provided to the subject project are in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. XXXX
2. XXXX
3. XXXX

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative



**ANNEX A**  
**TECHNICAL SPECIFICATIONS**



SECTION 01 10 00

TECHNICAL SCOPE OF WORK AND PERFORMANCE REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION SUMMARY

- A. PVSC utilizes pure oxygen as part of the secondary treatment process. The oxygen is currently generated using an onsite cryogenic facility. The facility is approximately 40 years old and has reached the end of its useful life and will be replaced with more reliable, energy efficient equipment. The project has been divided into two contracts, this contract: Procurement of Oxygen Production Facility Equipment Contract and a separate future construction contract for installation of the Oxygen Production Facility. As such, the successful respondent of this procurement contract shall design, engineer, furnish and deliver Oxygen Production Facility Equipment in accordance with the Technical Specifications. In addition, the successful respondent of this procurement contract shall also provide various assistance and supervision services for installation, commissioning and startup, field testing, performance testing, and acceptance testing as part of the separate future construction contract for installation of the oxygen production facility.
1. The VPSA oxygen production facility shall be furnished by a single System Supplier, the Seller, who shall assume responsibility for providing a complete and integrated system including design, engineering, furnishing, installation supervision, factory and field testing, training, and post start-up operational services.
  2. All equipment, components and materials required shall be furnished by the single System Supplier who shall assume the responsibility for adequacy, performance, and warranty of all items.
  3. The System Supplier shall supply his company's quality assurance plan.

1.02 TECHNICAL SCOPE OF WORK

- A. The work under these specifications shall include furnishing the following:
1. The Seller shall provide an Oxygen Generation System comprised of multiple Vacuum Pressure Swing Adsorption (VPSA) plants and related equipment to generate oxygen gas on-site to supply clean, dry, hydrocarbon free gaseous oxygen over the specified production range to satisfy the specified requirements of the high-purity oxygen reactors at the minimum specified pressure and purity as measured at the outlet of the pressure reducing valves under all operating conditions.
  2. Liquid Oxygen Storage and Vaporization System

- 3. Electrical & Power Distribution System for the Oxygen Production Facility
  - 4. Instrumentation and Controls System for the Oxygen Production Facility
- B. Third-party suppliers acting as intermediary between Seller and the Installation Contractor are strictly prohibited.
- C. The Seller shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish, install, calibrate, startup, test, and place in operation all equipment and software as specified herein and in the related sections, resulting in a complete VPSA oxygen production facility and LOX storage, vaporization system including an electrical and power distribution system and an instrumentation and control system.
- D. In the event of technical conflicts, errors, or discrepancies, the detailed technical specifications listed below take precedence.

<b>Supplied Equipment</b>	<b>Specification Technical Section</b>
Vacuum Swing Adsorption Oxygen Generation System	11 55 10
Liquid Oxygen Storage and Vaporization System	11 55 20
Electrical & Power Distribution Systems	11 55 10, 26 05 00, 26 05 19, 26 05 26, 26 05 33, 26 05 53, 26 05 60, 26 05 80, 26 14 00, 26 22 00, 26 23 16, 26 24 16, 26 24 19, 26 27 26, 26 28 16, 26 29 53
Instrumentation and Controls System	40 90 00, 40 90 02, 40 90 03, 40 90 04, 40 90 05, 40 90 06, 40 90 07, 40 90 08, 40 90 09, 40 90 10, 40 90 11, 40 90 12, 40 90 13, 40 93 50, 40 96 52, 40 99 00
All Systems	09 90 00, 01 33 00, 01 33 05, 01 45 00, 01 66 00, 01 78 18, 01 78 23, 01 78 32, 01 79 00

- E. The following Scope Matrix provides a summary breakdown of the Scope of Supply for the oxygen production facility equipment and services to be provided under this contract (B355); and the scope of work and services to be provided under the separate future oxygen production facility installation contract (B356). The matrix below is a summary of the scope. The RFP together with the Attachments, the Technical Specifications, and the Drawings provide the entire Scope Of Supply.

Scope Matrix		Seller B355	Not Required	Installation Contractor B356
Item No.	Description			
1.	Design, engineer, manufacture, and furnish the VPSA oxygen production facility including the related instrument air, cooling systems and all other required equipment components and subsystems as specified.	X		
2.	Design, engineer, manufacture and furnish the Liquid oxygen storage and vaporization system	X		
3.	Design, engineer, manufacture and furnish the complete electrical and power distribution system including integrated lighting and service outlet system, and grounding system.	X		
4.	Design, engineer, manufacture and furnish instrumentation and control system for the VPSA system and for the liquid oxygen storage and vaporization system.	X		
5.	Provide detailed plan and section layout drawings, installation details, and installation instructions for the VPSA Systems, LOX Systems, related electrical and power distribution system, and the related instrumentation and control system.	X		
6.	Complete factory installation and testing of all equipment, piping, valves, and support structures on for all skid mounted equipment.	X		
7.	Field services for installation instruction, supervision, and certification.	X		
8.	Field Services for instruction, supervision, and consulting related to commissioning, startup and field testing of all systems provided under this contract.	X		
9.	Field Services for instruction, supervision, and consulting related to performance and acceptance testing of all systems provided under this contract.	X		
10.	Post acceptance field services as directed by the Owner in writing.	X		
11.	Skid mounted NEMA 4X junction boxes, for equipment located on skids, to serve as interface points for external field power and control wiring (except 4160V and 480V motor power wiring directly connected to loads)	X		
12.	Engineering, design and furnishing anchor bolts, nuts, washers, and lock-tabs and other embedment's to be cast in the concrete foundations	X		
13.	All necessary instrument, power and control wiring and raceways integral to any equipment furnished by Seller	X		

Scope Matrix		Seller B355	Not Required	Installation Contractor B356
Item No.	Description			
14.	All necessary piping, valves, and tubing integral to any equipment and systems furnished by Seller	X		
15.	Instrument air tubing, fittings, instruments, valves and manifolds, instrument enclosures (as required) and supports for all skid mounted valves, instruments, and control devices	X		
16.	Instrument air tubing, fittings, instruments, valves and manifolds, instrument enclosures and supports for all <b>non-skid mounted</b> valves, instruments, and control devices	X		
17.	Shop painting of all factory manufactured and skid mounted equipment	X		
18.	Construction of foundations and supporting concrete slabs for the VPSA units and for the LOX storage and vaporization system furnished by the Seller			X
19.	Installation of the VPSA units and the LOX storage and vaporization system furnished by the Seller			X
20.	Furnishing and installation of one 4160v and one 480v electrical feeder to each VPSA unit and one 480v feeder to the LOX storage and vaporization system			X
21.	Furnishing and installation of oxygen gas pipelines from the buffer tank at each VPSA and the LOX system discharge to the connection point with the PVSC oxygen gas manifold			X
22.	Installation of VPSA and LOX networking equipment within the refurbished central Control Room. Furnishing and installation of control consoles within refurbished central Control Room.			X
23.	Integration of VPSA and LOX instrumentation and Control Systems with the existing Plant SCADA System.			X
24.	Furnishing and installation of outdoor area lighting system, grounding systems, and lighting protection systems.			X
25.	Field painting of all equipment exterior to enclosures and accessible after final assembly			X
26.	Furnishing and installation of all conduit, wire and raceways from the VPSA units and LOX system to the central control room in the Oxygen production Building for information, communication, and data			X



Scope Matrix		Seller B355	Not Required	Installation Contractor B356
Item No.	Description			
27.	Furnishing and installation of all conduit, wire and raceways interconnecting the various skids comprising the VPSA units and LOX system, interconnecting the skids to non skid mounted equipment, controls, and electrical equipment, and interconnections as required to the electrical and control equipment located within the local pre engineered electrical and control room structure for power, information, communication, and data			X
28.	Installation of anchor bolts, nuts, washers, and lock-tabs			X
29.	Installation of other embedment's to be cast in the concrete foundations			X
30.	Grouting materials and the placing thereof			X
31.	Commissioning, startup, and field testing of the VPSA oxygen production facility and the LOX storage and vaporization system.			X
32.	Performance and acceptance testing of the VPSA oxygen production facility and the LOX storage and vaporization system			X
33.	Receiving, unloading, storing, and securing of Seller-furnished equipment and materials delivered to the PVSC site			X

1.03 ENGINEERING SERVICES

- A. Engineering Services: The Seller shall furnish all engineering and design required for the furnished equipment. The engineering and design services shall fully comply with the requirements of this specification. The following are the basic requirements:
- B. General Engineering: General engineering and design services to be provided by Seller shall include, but not be limited to the following:
1. Detailed design drawings, information and data as listed in the Schedule of Submittals and in the submittal requirements within the technical specifications.
  2. Performance and acoustical guarantees.
  3. Home office construction support.
  4. Equipment and instrumentation identification with Seller's standard identification numbers.

5. Coordination with Buyer for the design and installation of VPSA and LOX storage and vaporization system.
  6. Drawings and data conformed to construction records.
- C. Field Services: Seller shall provide qualified personnel to advise Buyer and Installation Contractor personnel in the proper unloading, storage, erection, commissioning, startup, field testing, performance testing and acceptance testing for the furnished equipment, including, as a minimum, the following activities and functions:
1. Participate in regularly scheduled on-site construction/commissioning meetings as required by the Contract and otherwise as reasonably requested by Buyer.
  2. Inspection, unloading and storage of the major components at the installation site and supervision of their placement on the foundation.
  3. Guidance and inspection of Buyer's concrete foundation slab including foundation anchor-bolts and other embedment's.
  4. Supervise and certify setting of the sole plates or other equipment anchors.
  5. Supervise and certify setting of any necessary shims between Buyer-supplied sole plates and the equipment.
  6. Removal of shipping supports on the equipment.
  7. Supervise and certify installation of the major equipment packages to the proper location, centerline and elevation.
  8. Supervise and certify horizontal and vertical alignment for the VPSA and for the LOX System.
  9. Supervise and certify checkout of piping, power and control wiring and instrumentation tubing between Seller provided equipment.
  10. Certify in writing that the installation is correct, complete and ready for commissioning.
  11. Instruction, supervisory, and consulting services related to commissioning, startup and field testing of all systems installed under this contract.
  12. Instruction, supervisory, and consulting related to performance and acceptance testing of all systems installed under this contract.
  13. Start-up assistance of the equipment with Buyer's operating personnel.

14. Mark-up of Seller drawings to reflect the as-built condition of the supplied equipment.
15. Instruct the Installation Contractor and Buyer's operating personnel, at the site at the time of the work activity in accordance with the installation schedule, in the:
  - a. Conducting of such component and operating tests as required.
  - b. Initial starting and placing the equipment in good operating condition.
  - c. Seller's recommended procedure for regularly starting, operating and shutting down the equipment.
16. Provide interpretation, when requested by Buyer, of technical documents provided by Seller or its Subcontractors, including clarification(s) or omitted information.
17. Provide technical advisory services for systems and equipment supplied by Subcontractors as deemed necessary by Seller and as required per the Contract.
18. Coordinate resolution of issues associated with Seller-provided equipment delivered to the site, including in-process inspections on the corrective action(s) as deemed necessary by the Seller.
19. Provide reports to Installation Contractor with observations made and any concerns identified.

1.04 MISCELLANEOUS MATERIALS AND SERVICES

- A. Miscellaneous materials and services not otherwise specifically called for shall be furnished by the Seller in accordance with the following:
- B. All nuts, bolts, gaskets, special fasteners, backing rings, expansion joints, etc., required for field assembly of components and equipment furnished under these specifications.
- C. All piping integral to any equipment furnished under these specifications, except as otherwise specified. This includes all vents, drains, instrument piping and fittings, instrument manifolds, insulation (provided by Seller and installed by Buyer for Seller's scope), pipe supports, and other piping work required for a complete unit. Piping connection points shall be provided for each service at the edge of skids or equipment area. This includes fuel, air, drains, or any other piping systems.
- D. All necessary connections for the Buyer's piping and instruments.
- E. All necessary instrument, power and control wiring and raceways integral to any skid furnished under these specifications. This shall include terminal blocks and internal wiring to these terminal blocks for equipment requiring external connection.

All skid mounted equipment terminal boxes for external connection shall be installed at the edge of the equipment within 5 feet from the ground. The terminal boxes for external connection shall be located to permit convenient access by the Buyer. All internal conduits and raceways shall be furnished and installed to junction boxes with the exception of motor power feeds, which will be direct connected.

- F. Erection drawings, prints, information, instructions and other data for use by the Buyer's Engineering and Installation Contractor.
- G. Detailed storage requirements for use by the Installation Contractor.

#### 1.05 TRAINING

- A. Training of Owner's Personnel: Training of the Owner's personnel on the operation and maintenance of the equipment specified herein shall be provided by the Seller. The Seller shall provide both classroom and field training to familiarize Buyer personnel with the operation and maintenance of all aspects of the Seller provided equipment. At a minimum, the Seller shall provide their standard training program.
- B. Training of Buyer's Personnel: The Seller shall work jointly with the Installation Contractor to plan and schedule the training of Buyer personnel as it relates to the Seller's Equipment. The Installation Contractor will make any necessary arrangements with the Buyer to facilitate this training, and the Seller shall furnish the personnel and materials as specified herein and as may reasonably be requested by the Installation Contractor or the Buyer to facilitate the training that relates to the Seller's Equipment.
  - 1. The Buyer will ensure that appropriate members of their operation and maintenance staff are made available for training, and these members of the Buyer's staff will perform the operation and maintenance procedures that are necessary during the training.
  - 2. The training shall consist of both classroom and field instruction. The purpose of field instruction will be to reinforce topics covered in the classroom and to identify the location of any valves, pushbuttons, control panels switches, and other equipment required for operation; and to identify the location of any maintenance equipment such as grease fittings, oilers, isolation valves, safety lockout switches, and other similar equipment.
  - 3. All training shall be conducted by qualified training specialists that are provided by the Seller and shall take place at the Project site at a place specified by the Buyer.
  - 4. The Installation Contractor will coordinate the scheduling of the Seller's training services for the Seller's Equipment with the Buyer and the Engineer. A minimum of fourteen (14) days' prior notice of training shall be provided to the Buyer and the dates proposed for the training are subject to the approval of the Engineer and the Buyer.

5. A minimum of one (1) 8-hour training day shall be provided for each major component of the Oxygen Production Facility and LOX System.
  6. All of the training materials relating to the Equipment shall be provided by the Seller to the Installation Contractor for onward submittal to the Engineer and the Buyer. The Seller shall work jointly with the Installation Contractor to ensure that the training materials are submitted to the Engineer and the Buyer a minimum of fourteen (14) days prior to the scheduled training for the equipment.
  7. Training shall be limited to no more than three (3) days per week. No training shall be conducted on Mondays or Fridays.
- C. Video Recording of Training: The Seller's training specialist shall meet with the Installation Contractor and the Engineer for a minimum of three (3) days to prepare training scripts and to video record the training sessions relating to the Equipment. The video recording shall be performed at the Project site at a suitable location that is designated by the Buyer. The Seller shall provide the video recording equipment and the services of qualified technicians to operate the equipment and prepare DVDs of the training sessions relating to the Equipment.
- D. Lesson Plans: The Seller shall prepare lesson plans for the training relating to the Equipment and shall work jointly with the Installation Contractor to ensure that the lesson plans are submitted to the Buyer. The Seller shall furnish the lesson plans for the Equipment, which shall include specific information pertaining to each component, including controls. Lesson plans shall be prepared in full compliance with the following requirements.
1. Lesson plans shall be submitted to the Buyer for approval no less than 30 days prior to the date that the training is to take place.
  2. Lesson plans shall indicate the estimated duration of each segment of the training and the training audience that the instruction is to address. The training audience refers to the Buyer's mechanical operation and maintenance personnel and the Buyer electronic/electrical maintenance personnel, as appropriate.
  3. Lesson plans shall indicate when training aids will be used or referred to during the course of instruction. The contents of the lesson plans shall include, but shall not be limited to, the following subjects: Equipment Description: Purpose and function of equipment and auxiliary equipment and systems, Physical arrangement of equipment components and electrical supply, General function of controls, including automatic and manual operation, interlocks, and shutdowns
  4. Equipment Operation: Operating requirement for equipment to perform satisfactorily, Typical operating characteristics, Start-up and shutdown procedures, Use of controls.

5. Equipment Monitoring: Recommended routine instrument readings and operational checking, Early warning signs of developing operational or equipment problems, Procedures for handling non-routine problems such as alarms, power failures, component failures, etc.
  6. Equipment operational trouble-shooting procedures.
  7. Safety and Housekeeping: Safety features of the equipment, Safe practices and Housekeeping practices. Description of the use of the O&M Manual.
  8. Preventive Maintenance Requirements: Maintenance needs for equipment, Explanation of maintenance procedures that are described in the Designated Supplier's O&M Manual and are necessary for the maintenance of the equipment, Outline or summarize procedures, Recommended schedule for performing preventive maintenance, Provide preventive maintenance record forms (if available).
  9. Maintenance Inspection Program: Parts, components and areas of equipment to inspect for routine preventive maintenance, Recommended frequency of inspection, Inspection procedures, and Problem identification.
  10. Maintenance Trouble-Shooting: Sections in O&M Manual detailing trouble-shooting procedures, Summarize trouble-shooting procedures, Testing equipment used in trouble-shooting, Demonstration of use of specialized testing equipment if supplied with equipment, Other testing equipment, Tests used to verify trouble-shootings findings.
  11. Disassembly and Assembly: Summarize disassembly and assembly procedures, O&M Manual coverage of subject, Testing to verify success of corrective maintenance.
  12. Equipment Calibration: Calibration needs and tolerances, Calibration equipment, O&M Manual listing of calibration ranges, tolerances and setting.
- E. Training Aids: Training aids shall be provided by the Seller and shall be used as an integral part of the training program. Training aids shall include text and/or pictorial handouts specific to the equipment supplied. Handouts shall be legible and printed on good quality stock. Handouts shall be submitted when lesson plans are submitted.
1. Additional training aids shall be furnished and used as necessary for maximum training effectiveness. The additional training aids shall consist of the following as appropriate.
    - a. Audio visual aids, films, videotapes, slides, overhead transparencies, posters, blueprints, diagrams and catalogue cuts.
    - b. Models and samples, for example, cutaways, spare parts, tools, miniature models, equipment assemblies, and damaged parts.

2. The use of additional training aids shall be identified in the lesson plans, and a description of the additional training aids shall be given.
- F. Qualification of Training Specialists: The Designated Supplier shall furnish documentation of the qualifications of its proposed training specialists for approval fifteen (15) days prior to the date of proposed training. The documentation shall include the experience of the training specialists in the operation and maintenance of the equipment and a summary of relevant training experience.
1. The qualifications of the training specialist will be subject to approval by the Buyer, and only those training specialists whose qualifications have been approved shall be permitted to conduct the training.

#### 1.06 SPARE PARTS AND SPECIAL TOOLS

- A. Startup Spares: The Seller shall provide one complete set of startup spare parts to include all items that may normally be required during the course of equipment erection, commissioning, and testing for the Power Generation System.
- B. Recommended Additional Spares: The Seller shall submit a price list of recommended spare parts for the VPSA system that are in addition to the spare parts already specified in the technical specifications. Buyer may purchase any of the recommended spare parts for the listed price up to 2 years after delivery of the equipment. The recommended spare parts list shall be a complete list for all equipment furnished through the first major overhaul.
- C. Special Tools and Lift Fixtures: The Seller shall provide all special tools and lift fixtures (including software) required for installation, checking, inspection, repair and maintenance of the equipment provided. Special tools, fixtures and appurtenances required to assemble, maintain or operate the equipment during continuous operation. Special lift fixtures are fixture and lifting rigs required for transport and offloading of the equipment. Special tools and lift fixtures will remain Buyer's property.

#### 1.07 CARGO PREPARATION, SHIPPING AND HANDLING

- A. Packing and Packaging: Seller shall package the Work to protect it from the rigors of shipment, transshipment, and multiple handlings, loadings, unloadings and storage. Off-Site Storage for the Goods shall be provided for the entire Oxygen Production System in the event the PVSC, or its Assignee, is not ready and willing to receive the Goods at the Point of Destination by the Milestone 2 and Milestone 4 deliverable dates. No space is available at the Point of Destination for storage of equipment or materials. Equipment and materials shall not be delivered to PVSC until the separate Installation Contractor is ready to receive and install them and has provided written notice that he is ready. Proposer shall be responsible for preparing the items for, and placing them into, storage in such

a manner as to be compliant with Proposer's standard guidelines and requirements for storage of such items. At a minimum, Seller shall:

1. Pack the Work in accordance with the standard practices of the industry and of the modes of transportation used to ship the Work.
2. Take "customary and usual" precautions to prevent damage from rain, moisture, humidity, condensation, mold, rust, corrosion, shock, and vibration.
3. Use Supplier's knowledge of the Work to provide supplementary packaging when customary and usual packaging may not provide sufficient protection.
4. Configure the Work to minimize cube and to prevent damage during shipment.
5. Secure and protect equipment with moving or rotating parts that might be damaged during shipment.
6. Provide vacuum packing, vapor-proof barriers, and desiccant when electrical or sensitive equipment or material may be exposed to rain, moisture, high humidity, or similar conditions.
7. Coat bright or machined surfaces required for precision fit with a rust-preventive compound.
8. Ensure the inside of parts and fittings are clean and free from metallic filings, machining debris, and cleaning media such as blasting grit.
9. Protect pipes and fittings by capping both ends or by other proven methods. Pipes and tubing must be dry inside and will be inspected by Purchaser before shipment unless otherwise specified.
10. Adhere to the requirements of International Standards for Phytosanitary Measures, Publication No. 15 ("ISPM-15").
11. Consolidate small packages, cartons or loose items that require additional boxing or crating and skid/palletize such items on strong 4-way skids stamped with an ISPM-15 stamp. Skids must be shrink-wrapped and double-metal banded both ways. Each skid must be numbered and the quantity of boxes/units on the skids must be clearly indicated.
12. Pack hazardous materials in United Nations Specification packaging and in accordance with hazardous material regulations for the mode of transportation used.
13. Separately pack spare parts, tools, and any item shipped on a "borrowed" or a "returned" basis, such as testing instruments.



B. Marks and Labels: Seller shall Mark and Label the Goods for Shipment.

1. Stencil marks on at least two opposite sides and ends of each shipping unit, such as a barrel, box, bundle, crate, pallet, skid, or loose items. Stenciled lettering shall be:
  - a. At least two inches high;
  - b. in black, indelible ink;
  - c. in block letters; and
  - d. clear enough to be read from at least fifty feet.
2. Apply standard symbols indicating care and precaution to be used in handling and storing the shipping unit.
3. If stenciling is not possible, Supplier shall use placards attached to the opposite sides and ends of the shipping unit. The contents of the placard must be formatted the same as if the marks were stenciled. The placard must be attached with studs or heavy gauge wire on at least two corners, or secured by such means that rough handling, wind, rain or other weather will not loosen or remove the placard. When stenciling is not practical for carton and palletized shipments, Supplier shall label the cartons or palletized shipments on at least two opposite sides.
4. For out-of gauge shipments, either heavy or over-dimensional, Supplier shall mark the center of gravity for the shipping unit and clearly indicate the lifting points.
5. Supplier shall clearly mark all packages that contain spare parts, tools, or borrowed equipment with marks indicating their uses, such as erection, commissioning, or start up. Supplier shall clearly mark all hazardous material with the appropriate symbols and placards. The minimum marks to be applied to each shipping unit are:
  - a. Project and client name.
  - b. Project number and specification number.
  - c. Net weight in kgs and imperial (each out to two decimal places).
  - d. Gross weight in kgs and imperial (each out to two decimal places).
  - e. Dimensions (L x W x H) in inches (out to one decimal place).
  - f. Country of destination.

C. Shipping Documentation: Seller shall:

1. Attach a packing slip to each shipping unit. The packing slip must clearly identify the quantity and contents of the shipping unit to which it is attached.
2. Prepare a packing list for each shipment. The packing list shall:
  - a. Indicate the package number marked on the package and summarize the contents of the packing slips.

- b. Identify which package numbers contain hazardous materials.
  3. Prepare the bill of lading required for each shipment. Supplier shall arrange to have the following placed in the body of the bill of lading:
    - a. Description of hazardous materials on a separate line.
  4. Attach to the bill of lading a material safety data sheet for each hazardous material item in the shipment or a certification that material safety data sheets do not apply to materials furnished in the shipment.
  - 5.
- D. Handling, Loading and Unloading: Seller is responsible for loading the Work safely onto the truck, trailer, flatbed, container, railcar, aircraft or ocean vessel and securing it to withstand the rigors of transportation, transshipment, and multiple handlings, loadings and unloadings. These obligations include, but are not limited to, the following:
  1. Blocking and bracing any shipping unit or its components that may move while in transit.
  2. Loading the Work on skids or pallets as much as possible to allow for safe and efficient handling with standard equipment.
  3. Designing and providing a handling frame or saddles to support large pieces of the Work to be transported or stored. Any angles, bars, channels, etc., used for shipping purposes and requiring removal before installation must be painted yellow and clearly identified by stenciling "Remove Before Installation" in a contrasting color.
  4. For Work requiring saddles but that is shipped to intermediate delivery points without saddles, securing the Work to the saddles after placement of the Work onto saddles by the responsible party in order to allow safe and efficient handling of the Work.
  5. Advising Buyer in advance of any non-standard unloading that may require cranes, winches, or any other special equipment.

END OF SECTION

SECTION 01 33 00

SUBMITTALS

PART 1 – GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

- A. This section specifies the general methods and requirements of submissions applicable to the following work-related submittals: Shop Drawings, Product Data, Samples, Maintenance and Lubrication Schedule/Survey, Certified Shop Test Reports, Equipment Manufacturers certification and Mock-Ups. Additional general submission requirements are contained in paragraphs 6.17 of the General Conditions. Detailed submittal requirements will be specified in the technical specification sections.
- B. All submittals shall be clearly identified by reference to Specification Section, Paragraph, Drawing No. or Detail as applicable. Submittals shall be clear and legible and of sufficient size for sufficient presentation of data.

1.02 SHOP DRAWINGS, PRODUCT DATA, SAMPLES

- A. Shop Drawings
  - 1. Shop drawings, as defined in the General Conditions, and as specified in individual work sections include, but are not necessarily limited to, custom-prepared data such as fabrication and erection/installation (working) drawings, scheduled information, setting diagrams, actual shopwork manufacturing instructions, custom templates, special wiring diagrams, coordination drawings, individual system or equipment inspection and test reports including performance curves and certifications, as applicable to the Work.
  - 2. All shop drawings submitted by subcontractors for approval shall be sent directly to the Seller for checking. The Seller shall be responsible for their submission at the proper time so as to prevent delays in delivery of materials.
  - 3. The Seller shall check all subcontractor's shop drawings regarding measurements, size of members, materials, and details to satisfy himself that they conform to the intent of the Drawings and Specifications. Shop drawings found to be inaccurate or otherwise in error shall be returned to the subcontractors for correction before submission thereof.
  - 4. All details on shop drawings submitted for approval shall show clearly the relation of the various parts to the main members and lines of the structure, and where correct fabrication of the Work depends upon field measurements, such measurements shall be made and noted on the drawings before being submitted for approval.

B. Product Data

1. Product data as specified in individual Sections, include, but are not necessarily limited to, standard prepared data for manufactured products (sometimes referred to as catalog data), such as the manufacturer's product specification and installation instructions, availability of colors and patterns, manufacturer's printed statements of compliances and applicability, roughing-in diagrams and templates, catalog cuts, product photographs, standard wiring diagrams, printed performance curves and operational-range diagrams, production or quality control inspection and test reports and certifications, mill reports, product operating and maintenance instructions and recommended spare-parts listing and printed product warranties, as applicable to the Work.

C. Samples

1. Samples specified in individual Sections, include, but are not necessarily limited to, physical examples of the Work such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effect, graphic symbols and units of work to be used by the Engineer or Owner for independent inspection and testing, as applicable to the Work.

1.03 SELLER'S RESPONSIBILITIES

- A. The Seller shall review shop drawings, product data and samples, including those by subcontractors, prior to submission to determine and verify the following:
  1. Catalog numbers and similar data
  2. Conformance with the Specifications
- B. All submittals, including shop drawings prepared by or under the direction of the Seller, shall be thoroughly checked by the Seller for accuracy and conformance to the intent of the Contract Documents before being submitted to the Engineer and shall bear the Seller's certification with signature of approval certifying that they have been so checked. Submittals without the Seller's certification with signature of approval, will not be reviewed by the Engineer and will be returned to the Seller stamped "Rejected." Before submitting them to the Engineer, all submittals shall be bound, properly labeled and consecutively numbered and bear the certification statement, listed below, on the cover sheet for sheets 11" x 17" and smaller or in a clear space above the title block for drawings.

**PASSAIC VALLEY SEWERAGE COMMISSION**

NAME OF PROJECT: OXYGEN PRODUCTION FACILITY EQUIPMENT  
PROCUREMENT

Date:

Contract No.: B355

Name of Equipment:

Contract Drawing No.:

Specification Section:

I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements and they are hereby approved. The information contained herein has been coordinated with all involved Sellers.

Seller:

Signed:

Provide to the Resident Project Representative a copy of each submittal transmittal sheet for shop drawings, product data and samples at the time of submittal of said drawings, product data and samples to the Engineer.

- C. The Seller shall utilize an 11-character submittal identification numbering system in the following manner:
1. The first character shall be a D, S, P, M, or R, which represents Shop/Working Drawing and other Product Data (D), Sample (S), Preliminary Submittal (P), Operating/Maintenance Manual (M), or Request for Information (R).
  2. The next six digits shall be the applicable Specification Section Number.
  3. The next three digits shall be the number 001-999 to sequentially number each initial separate item or drawing submitted under each specific Section number.

4. The last character shall be a letter, A-Z, indicating the submission, or resubmission of the same Drawing, i.e., "A=1st submission, B=2nd submission, C=3rd submission, etc. A typical submittal number would be as follows:

Contract No.- B3355 D-030000-008-B

D = Shop Drawing  
030000 = Specification Section for Concrete  
008 = The eighth initial submittal under this specification section.  
B = The second submission (first resubmission) of that particular shop drawing.

- D. Notify the Engineer in writing, at the time of submittal, of any deviations in the submittals from the requirements of the Contract Documents.
- E. The review and approval of shop drawings, samples or product data by the Engineer shall not relieve the Seller from his/her responsibility with regard to the fulfillment of the terms of the Contract. All risks of error and omission are assumed by the Seller and the Engineer will have no responsibility therefor.
- F. No portion of the Work requiring a shop drawing, sample, or product data shall be started nor shall any materials be fabricated or installed prior to the approval or qualified approval of such item. Fabrication performed, materials purchased or on-site construction accomplished which does not conform to approved shop drawings and data shall be at the Seller's risk. The Owner will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.
- G. Project work, materials, fabrication, and installation shall conform with approved shop drawings, applicable samples, and product data.

#### 1.04 SUBMISSION REQUIREMENTS

- A. The PVSC or its designated representative will be establishing a project specific folder structure for this project. The Seller shall utilize the predefined folder structure by placing all project related documents within the designated location.
- B. All documents will remain in their native form (xls, word, dwg, etc).
- C. The Seller shall scan all documents, in PDF format, that are in hard copy form. These scanned document files shall be uploaded and maintained in the Document Management System for this project.
- D. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the Work or in the Work of any other seller.
- E. Each submittal, appropriately coded, will be returned within **21 working days** following receipt of submittal by the Engineer.

- F. Number of final approved hard copy submittals required:
1. Shop Drawings as defined in Paragraph 1.02 A: Three (3) hard copies.
  2. Product Data as defined in Paragraph 1.02 B: Three (3) hard copies.
  3. Samples: Submit the number stated in the respective Specifications Sections.
- G. Submittals shall conform:
1. The date of submission and the dates of any previous submissions.
  2. The project title and number.
  3. Seller identification.
  4. The name of:
    - a. Seller
    - b. Supplier
    - c. Manufacturer
  5. Identification of the product, with the specification section number, page and paragraph(s).
  6. Field dimensions, clearly identified as such.
  7. Relation to adjacent or critical features of the Work or materials.
  8. Applicable standards, such as ASTM or Federal Specification numbers.
  9. Distinct identification of any deviations from Contract Documents.
  10. Identification of revisions or resubmittals.
  11. An 8" x 3" blank space for Seller and Engineer stamps.
- H. All markings to identify model number, part number, dimension, capacity, etc., shall be reproducible. Highlight markings are unacceptable.
- 1.05 REVIEW OF SHOP DRAWINGS, PRODUCT DATA, WORKING DRAWINGS AND SAMPLES
- A. The review of shop drawings, data, and samples will be for general conformance with the design concept and Contract Documents. They shall not be construed.
1. As permitting any departure from the contract requirements;
  2. As relieving the Seller of responsibility for any errors, including details, dimensions, and materials.
  3. As approving departures from details furnished by the Engineer, except as otherwise provided herein.

- B. The Seller remains responsible for details and accuracy, for coordinating the Work with all other associated work and trades, for selecting fabrication processes, for techniques of assembly, and for performing work in a safe manner.
- C. If the shop drawings, data or samples as submitted describe variations and show a departure from the contract requirements which the Engineer finds to be in the interest of the Owner and to be so minor as not to involve a change in Contract Price or time for performance, the Engineer may return the revised drawings without noting an exception.
- D. Submittals will be returned to the Seller under one of the following codes:

Code 1 - "APPROVED" is assigned when there are no notations or comments on the submittal. When returned under this code the Seller may release the equipment and/or material for manufacture.

Code 2 - "APPROVED AS NOTED" This code is assigned when a confirmation of the notations and comments IS NOT required by the Seller. The Seller may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product.

Code 3 - "APPROVED AS NOTED/CONFIRM" This combination of codes is assigned when a confirmation of the notations and comments is required by the Seller. The Seller may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product. This confirmation shall specifically address each omission and nonconforming item that was noted. Confirmation is to be received by the Engineer within 15 calendar days of the date of the Engineer's transmittal requiring the confirmation.

Code 4 - "APPROVED AS NOTED/RESUBMIT" This combination of codes is assigned when notations and comments are extensive enough to require a resubmittal of the package. The Seller may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product. This resubmittal is to address all comments, omissions and non-conforming items that were noted. Resubmittal is to be received by the Engineer within fifteen (15) calendar days of the date of the Engineer's transmittal requiring the resubmittal.



- Code 5 - "NOT APPROVED" is assigned when the submittal does not meet the intent of the Contract Documents. The Seller must resubmit the entire package revised to bring the submittal into conformance. It may be necessary to resubmit using a different manufacturer/vendor to meet the Contract Documents.
- Code 6 - "COMMENTS ATTACHED" is assigned where there are comments attached to the returned submittal which provide additional data to aid the Seller.

Codes 1 through 5 designate the status of the reviewed submittal with Code 6 showing there has been an attachment of additional data.

- E. Resubmittals will be handled in the same manner as first submittals. On resubmittals the Seller shall direct specific attention, in writing on the letter of transmittal and on resubmitted shop drawings by use of revision triangles or other similar methods, to revisions other than the corrections requested by the Engineer, on previous submissions. Any such revisions which are not clearly identified shall be made at the risk of the Seller. The Seller shall make corrections to any work done because of this type revision that is not in accordance to the Contract Documents as may be required by the Engineer.
- F. Partial submittals may not be reviewed. The Engineer will be the only judge as to the completeness of a submittal. Submittals not complete will be returned to the Seller, and will be considered "Not Approved" until resubmitted. The Engineer may at his/her option provide a list or mark the submittal directing the Seller to the areas that are incomplete.
- G. Repetitive Review
1. Shop drawings and other submittals will be reviewed no more than twice at the Owner's expense. All subsequent reviews will be performed at times convenient to the Engineer and at the Seller's expense, based on the Engineer's then prevailing rates. The Seller shall reimburse the Owner for all such fees invoiced to the Owner by the Engineer. Submittals are required until approved.
  2. Any need for more than one resubmission, or any other delay in obtaining Engineer's review of submittals, will not entitle Seller to extension of the Contract Time.
- H. If the Seller considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, the Seller shall give written notice thereof to the Engineer at least seven working days prior to release for manufacture.
- I. When shop drawings have been completed to the satisfaction of the Engineer, the Seller shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.

1.06 DISTRIBUTION

- A. Distribute reproductions of approved shop drawings and copies of approved product data and samples, where required, to the job site file and elsewhere as directed by the Engineer. Number of copies shall be as directed by the Engineer but shall not exceed six.

1.07 MOCK-UPS

- A. Mock-up units as specified in individual Sections, include but are not necessarily limited to, complete units of the standard of acceptance for that type of work to be used on the project. Remove at the completion of the Work or when directed.

1.08 MAINTENANCE AND LUBRICATION SCHEDULE/SURVEY

- A. For all items of equipment furnished, the Seller shall provide a list including the equipment name, and address and telephone number of the manufacturer's representative and service company so that service and/or spare parts can be readily obtained. In addition, a maintenance and lubrication schedule for each piece of equipment shall be submitted with the shop drawings. Final approved submission shall be three (3) hard copies. The schedules shall be in the form indicated below:

Typical Maintenance Schedule

Item	Action	Frequency	Remarks
Motors	Check cleanliness	As required	Motor exterior to be kept clean. Keep air intake openings free of foreign material and do not block air outlet.
	Removal of accumulated moisture	As required	Remove plug in motor frame to drain moisture.

### Typical Lubrication Schedule

Item	Action	Frequency	Remarks
Check insulation resistance	Annually	See manufacturer operation and maintenance manual for method.	
Motor Bearings	Grease lubricant, Gulf-crown Grease #2 for operating temperatures from 15°F to 300°F	6 Months	Add grease to inlet, replace inlet plugs, run motor for ½ hour, before replacing drain plug.

\* See manufacturer's instructional manual for initial operation instructions (important).

- B. The Seller shall furnish lubricants for all equipment supplied under this Contract in one delivery consisting of a minimum number of products, reflecting the results of the lubrication survey, as hereinafter specified.
- C. A lubrication survey, made by an independent consultant, subject to the approval of the Engineer shall be provided by the Seller. A representative of a lubrication supply firm is not acceptable. The lubrication survey shall list all manufacturer's lubrication recommendations and an interchangeable lubricants tabulation standardizing and consolidating lubricants whenever possible. Three (3) hard copies of the final approved Lubrication Survey shall be furnished prior to final acceptance. All costs for lubricants and lubrication survey shall be included in the lump sum price bid of this Contract.

#### 1.09 CERTIFIED SHOP TEST REPORTS

- A. Certified shop test data, for equipment not requiring witness shop tests, shall be furnished by the Seller in accordance with the requirements of the General Conditions. Where witness shop tests are required, the Seller shall give written notice of the tests and furnish witness shop test reports in accordance with the requirements of the General Conditions. No equipment or material shall be shipped to the Project until the Engineer notifies the Seller, in writing, that the shop test data or reports are acceptable.

#### 1.10 MANUFACTURERS' CERTIFICATION FORM

- A. The Seller shall submit a certificate, in the form attached to this section, from each equipment manufacturer, certifying that the equipment as installed and tested meets all the requirements of the Contract Documents that it is fully suitable and will function properly for the use intended and within the system called for by the Contract Documents, and that the guarantees as required by this Contract will be in full force and effect.

- B. When the specifications call for “supervision, installation, adjustment, start-up,” and words of similar intent, by the manufacturer’s factory employed technicians or manufacturer’s representatives, the Seller shall provide a certificate co-signed by the manufacturer as to compliance with the stipulated requirements.
  - C. The final acceptance of any equipment will be withheld, appropriate amount of money will be retained by the Owner, and the warranty will not commence until such certifications are supplied.
- 1.11 PROFESSIONAL ENGINEER (P.E.) CERTIFICATION FORM
- A. If specifically required in other Sections of these Specifications, the Seller shall submit a P.E. Certification for each item required, in the form attached to this Section, completed filled in and stamped.
- 1.12 GENERAL PROCEDURES FOR SUBMITTALS
- A. Coordination of Submittal Times: Prepare and transmit each submittal sufficiently in advance of performing the related work or other applicable activities, or within the time specified in the individual work sections, of the Specifications, so that the installation will not be delayed by processing times including disapproval and resubmittal (if required), coordination with other submittals, testing, purchasing, fabrication, delivery and similar sequenced activities. No extension of time will be authorized because of the Seller's failure to transmit submittals sufficiently in advance of the Work.
- 1.13 AMERICAN IRON AND STEEL REQUIREMENTS AND PROCEDURES FOR SUBMITTALS
- A. The Seller shall submit a certificate (on company letterhead), in the sample form attached to this section, for each of the covered iron and steel products noted herein, certifying that the equipment meets with the Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014.
  - B. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel (AIS)" requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works if the project is funded through an assistance agreement executed beginning January 17, 2014 (enactment of the Act), through the end of Federal Fiscal Year 2014.
  - C. Covered Iron and Steel Products - For purposes of the CWSRF and DWSRF projects that must comply with the AIS requirement, an iron or steel product is one of the following made primarily of iron or steel that is permanently incorporated into the public water system or treatment works:
    - 1. Lined or unlined pipes or fittings
    - 2. Manhole Covers

3. Municipal Castings (defined in more detail by the Act)
4. Hydrants
5. Tanks
6. Flanges
7. Pipe clamps and restraints
8. Valves
9. Structural steel (defined in more detail below)
10. Reinforced precast concrete
11. Construction materials (defined more detail by the Act)

NO FURTHER TEXT ON THIS PAGE

**P.E. CERTIFICATION FORM**

The undersigned hereby certifies that he/she is a Professional Engineer registered in the State of New Jersey and that he/she has been employed by (Name of Contractor)

\_\_\_\_\_

to design \_\_\_\_\_ in accordance with Specification Section \_\_\_\_\_ for Contract No. B355 – Oxygen Production Facility Equipment Procurement.

The Contract No. B355 – Oxygen Production Facility Equipment Procurement Undersigned further certifies that he/she has performed the design of the \_\_\_\_\_, that said design is in conformance with all applicable local, state and federal codes, rules and regulations, and that his/her signature and P.E. stamp have been affixed to all calculations and drawings used in, and resulting from, the design.

The undersigned hereby agrees to make all original design drawings and calculations available to the Passaic Valley Sewage Commissioners or their representative with seven days following written request therefore by the Owner.

\_\_\_\_\_  
P.E. Name

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Address

\_\_\_\_\_  
Contractor's Name

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

**EQUIPMENT MANUFACTURER'S CERTIFICATION**

Owner: Passaic Valley Sewerage Commission

Project: Oxygen Production Facility Equipment Procurement  
(PROJECT TITLE)

Contract No.: B355 \_\_\_\_\_

EQUIPMENT SPECIFICATION SECTION: \_\_\_\_\_

EQUIPMENT DESCRIPTION: \_\_\_\_\_

I \_\_\_\_\_, authorized representative of  
(Print Name)

\_\_\_\_\_  
(Print Manufacturer's Name)

hereby CERTIFY that

\_\_\_\_\_  
(Print Equipment Name & Model with Serial Number)

has been installed in complete accordance with the contract documents and manufacturer's instructions and is satisfactory to

\_\_\_\_\_. The  
(Manufacturer)

equipment as installed has been fully tested, operates in accordance with the contract and manufacturer's specifications, is suitable for its intended use, and is ready for permanent use by the Owner.

**CERTIFIED BY:**

\_\_\_\_\_  
(Signature of Manufacturer)

\_\_\_\_\_  
(Date)

\_\_\_\_\_  
(Print Name and Title)

**AMERICAN IRON AND STEEL CERTIFICATION (SAMPLE NO. 01)**

The following information is provided as a sample letter of step certification for AIS compliance.

**Documentation must be provided on company letterhead.**

Date

Company Name  
Company Address  
City, State Zip

Subject: American Iron and Steel Step Certification for Project (B355 - Oxygen Production Facility Equipment Procurement)

I, (company representative), certify that the (melting, bending, coating, galvanizing, cutting, etc.) process for (manufacturing or fabricating) the following products and/or materials shipped or provided for the subject project is in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. XXXX
2. XXXX
3. XXXX

Such process took place at the following location:

\_\_\_\_\_

If any of the above compliance statements change while providing material to this project, we will immediately notify the prime contractor and the engineer.

Signed by company representative



**AMERICAN IRON AND STEEL CERTIFICATION (SAMPLE NO. 02)**

The following information is provided as a sample letter of step certification for AIS compliance.

**Documentation must be provided on company letterhead.**

Date

Company Name  
Company Address  
City, State Zip

Subject: American Iron and Steel Step Certification for Project (B355 - Oxygen Production Facility Equipment Procurement)

I, (company representative), certify that the following products and/or materials shipped/provided to the subject project are in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. Xxxx
2. Xxxx
3. Xxxx

Such process took place at the following location:

\_\_\_\_\_

If any of the above compliance statements change while providing material to this project, we will immediately notify the prime contractor and the engineer.

Signed by company representative

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 45 00

QUALITY CONTROL

PART 1 - GENERAL

1.01 TESTING SERVICES

- A. All tests to determine compliance with the Contract Documents shall be performed by a firm acceptable to Engineer excluding testing as specified to be conducted directly by Seller. The testing firm's laboratory shall be staffed with experienced technicians, properly equipped and fully qualified to perform the tests in accordance with the specified standards.
- B. Testing Services Provided by Seller. Unless otherwise specified, Seller shall provide all testing services in connection with the following:
1. Any Work or part thereof specifically to be inspected, tested or approved by an employee or representative of an Authority Having Jurisdiction. Seller shall assume full responsibility for arranging and obtaining such inspections, tests or approvals. Seller shall pay all costs associated for these activities and shall provide the required certificates of inspection or approval.
  2. Any inspections, tests or approvals required for Owner or Engineer acceptance of materials or equipment to be incorporated in the Work. This includes any items required for acceptance of materials, or equipment submitted for approval prior to Seller's purchase for incorporation in the Work.
  3. Testing, adjusting and balancing of electrical and other equipment and systems as specified to be incorporated into the Work. This includes services required by manufacturers of equipment or other products furnished under the Contract Documents.
  4. Pressure or leakage testing of piping as specified.
  5. Any Work (or part thereof) required by the Contract Documents to be approved by Owner, Engineer or other designated individual or entity. Seller shall assume full responsibility for arranging and obtaining such approvals, pay all costs in connection therewith and submit to Engineer the required certificates of approval.
  6. Excluding those conducted directly by an Authority Having Jurisdiction or expressly specified to be conducted directly by Seller, inspections and tests shall be performed by independent inspectors, approved agencies or other qualified individuals or entities acceptable to Seller and Engineer.
- C. Transmittal of Test Reports. Written reports of tests and engineering data furnished by Seller for Engineer review of materials and equipment proposed to be used in the Work shall be submitted as specified for Shop Drawings.

1.02 MANUFACTURER'S FIELD SERVICES

- A. Manufacturer's field services shall be as specified herein except as also specified in the Technical Specification sections.
- B. Services Furnished Under This Contract. An experienced, competent, and authorized representative of the manufacturer of each item of equipment for which field services are indicated in the respective equipment section or in the equipment schedule section shall visit the shipment Point of Destination and inspect, check, adjust if necessary, and approve the equipment installation. In each case, the manufacturer's representative shall be present when the equipment is placed in operation. The manufacturer's representative shall revisit the jobsite as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Engineer.
- C. Each manufacturer's representative shall furnish to Owner, through Engineer, a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.
- D. All costs for these services shall be included in the Seller's Price.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 66 00

PRODUCT STORAGE AND HANDLING REQUIREMENTS

PART 1 – GENERAL

1.01 SCOPE

- A. This section covers delivery, storage, and handling of materials and equipment. Off-Site Storage for the Goods shall be provided for the entire Oxygen Production System in the event the PVSC, or its Assignee, is not ready and willing to receive the Goods at the Point of Destination by the Milestone 2 and Milestone 4 deliverable dates. No space is available at the Point of Destination for storage of equipment or materials. Equipment and materials shall not be delivered to PVSC until the separate Installation Contractor is ready to receive and install them and has provided written notice that he is ready. Proposer shall be responsible for preparing the items for, and placing them into, storage in such a manner as to be compliant with Proposer's standard guidelines and requirements for storage of such items.

1.02 DELIVERY

- A. Seller shall bear the responsibility for delivery of equipment, spare parts, special tools, and materials to the site and shall comply with the requirements specified herein and shall provide required information concerning the shipment and delivery of the materials specified in this Contract. These requirements also apply to any sub-suppliers making direct shipments to the Site.
- B. Seller shall, either directly or through contractual arrangements with others, accept responsibility for the safe handling and protection of the equipment and materials furnished under this Contract before and after receipt. Acceptance of the equipment shall be made after it is installed, tested, placed in operation, found to comply with all the specified requirements and been accepted by the OWNER.
- C. All items shall be checked against requirements of Contract Documents, approved submittals, and packing lists immediately on delivery to the site for damage and for shortages. Damage and shortages shall be remedied with the minimum of delay.
- D. Delivery of portions of the equipment in several individual shipments shall be subject to review of Engineer before shipment. When permitted, all such partial shipments shall be plainly marked to identify, to permit easy accumulation, and to facilitate eventual installation.

1.03 STORAGE AND PROTECTION

- A. Upon delivery, all equipment and materials shall immediately be stored and protected.
- B. Storage of equipment shall be in strict accordance with the "instructions for storage" of each equipment supplier and manufacturer including connection of heaters, placing of storage lubricants in equipment, etc. Furnish a copy of the manufacturer's

instructions for storage to the Engineer prior to storage of all equipment and materials. Corroded, damaged or deteriorated equipment and parts shall be replaced before acceptance of the project. Equipment and materials not properly stored will not be included in a payment estimate. The location for the storage of equipment shall be as directed by the Engineer and Owner.

C. Store Products in accord with manufacturer's instructions, with seals and labels intact and legible.

1. Store products subject to damage by the elements in weather tight enclosures.
2. Maintain temperature and humidity within the ranges required by manufacturer's instructions.
3. Store fabricated products above the ground, on blocking or skids, prevent soiling or staining. Cover products which are subject to deterioration with impervious sheet coverings, provide adequate ventilation to avoid condensation.
4. Stacked items shall be suitably protected from damage by spacers or load distributing supports that are safely arranged. No metalwork (miscellaneous steel shapes and reinforcing steel) shall be stored directly on the ground. Masonry products shall be handled and stored in a manner to hold breakage, chipping, cracking, and spalling to a minimum. Cement, lime, and similar products shall be stored off the ground on pallets and shall be covered and kept completely dry at all times. Pipe, fittings, and valves may be stored out of doors, but must be placed on wooden blocking. PVC pipe, geomembranes, plastic liner, and other plastic materials shall be stored off the ground on pallets and protected from direct sunlight.
5. Pumps, motors, electrical equipment, and all equipment with antifriction or sleeve bearings shall be stored in weathertight structures maintained at a temperature above 60°F. Electrical equipment, controls, and insulation shall be protected against moisture and water damage. All space heaters furnished in equipment shall be connected and operated continuously.

D. All materials to be incorporated in the Work shall be handled and stored by the Seller before, during, and after shipment in a manner to prevent warping, twisting, bending, breaking, chipping, rusting, and any injury, theft or damage of any kind whatsoever to the material or equipment.

E. All materials which, in the opinion of the Engineer, have become so damaged as to be unfit for the use intended or specified shall be promptly removed from the site of the Work, and the Seller shall receive no compensation for the damaged material or its removal.

F. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored Products to assure that Products are maintained under specified conditions, and free from damage or deterioration.

G. Protection after Installation

Contract B355

01 66 00 - 2

Product Storage and Handling

PVSC Oxygen Production Facility

Requirements

Equipment Procurement

09/08/2023

1. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove covering when no longer needed.
- H. The Seller shall be responsible for all material and supplies sold and delivered to the Owner under this Contract until final inspection of the Work and acceptance thereof by the Owner. In the event any such material and supplies are lost, stolen, damaged, or destroyed prior to final inspection and acceptance, the Seller shall replace same without additional cost to the Owner.
- I. Should the Seller fail to take proper action on storage and handling of material supplied under this Contract within seven days after written notice to do so has been given, the Owner retains the right to correct all deficiencies noted in previously transmitted written notice and deduct the cost associated with these corrections from the Seller's Contract. These costs may be comprised of expenditures of labor, equipment usage, administrative, clerical, engineering and any other costs associated with making the necessary conditions.
- J. In addition to the protection specified for prolonged storage, the packaging of spare units and spare parts shall be for export packing and shall be suitable for long-term storage in a damp location. Each spare item shall be packed separately and shall be completely identified on the outside of the container.

#### 1.04 HANDLING

- A. Provide equipment and personnel to handle Products by methods to prevent soiling or damage to Products or packaging.
- B. Stored items shall be laid out to facilitate their retrieval for use in the Work. Care shall be taken when removing the equipment for use to ensure the precise piece of equipment is removed and that it is handled in a manner that does not damage the equipment.
- C. During handling, carbon steel constructed material including chains, straps, and forks on lifting equipment shall not directly contact any equipment or material constructed of stainless steel. It shall be the Seller's responsibility to correct any carbon steel contamination of stainless steel.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

NO TEXT ON THIS PAGE



SECTION 01 78 18

CONTRACT CLOSEOUT

PART 1- GENERAL

1.01 SCOPE OF WORK

- A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:
  - 1. Closeout procedures
  - 2. Final cleaning
  - 3. Adjusting
  - 4. Project record documents
  - 5. Spare parts and maintenance materials

1.02 RELATED WORK

- A. Operation and Maintenance Manuals are specified in Section 01 78 23 - Operation and Maintenance Manuals.
- B. Warranties and Bonds are specified in Section 01 78 32 - Warranties and Bonds.
- C. Additional closeout procedures are specified in Section 00 73 00.

1.03 RECORD DOCUMENTS

- A. Record Documents shall be maintained in accordance with Attachment D, Section P-00400.

1.04 CLOSEOUT PROCEDURES

- A. Submit in accordance with Section 00 73 00 - Supplemental General Conditions, Article 14 written certification that Contract Documents have been reviewed, work has been inspected and that work is complete in accordance with Contract Documents and ready for Engineer's inspection.
- B. Provide submittals to Engineer that are required by governing or other authorities.
- C. Submit Application for Final Payment identifying total adjusted Contract Sum, previous payments and sum remaining due.

1.05 SUBSTANTIAL COMPLETION

- A. Standard procedures related to Substantial Completion are included in Article 14.04 of Section 00 73 00 - Supplemental General Conditions.

- B. When the Proposer considers the Work to be Substantially Complete, he shall submit to the Engineer:
    - 1. A written notice that the Work, or designated portion thereof, is substantially complete.
    - 2. A list of items to be completed or corrected.
  - C. Within a reasonable time after receipt of such notice, the Engineer will make an inspection to determine the status of completion.
  - D. Should the Engineer determine that the Work is not Substantially Complete:
    - 1. The Engineer will notify the Proposer in writing, giving the reasons therefore.
    - 2. Proposer shall remedy the deficiencies in the Work and send a second written notice of substantial completion to the Engineer.
    - 3. The Engineer will reinspect the Work.
- 1.06 FINAL INSPECTION

- A. When Proposer considers the Work is complete, he shall submit written certification that:
  - 1. Contract Documents have been reviewed.
  - 2. Work has been inspected for compliance with Contract Documents.
  - 3. Work has been completed in accordance with Contract Documents.
  - 4. Equipment and systems have been successfully tested in the presence of Owner's representatives and are operational.
  - 5. Work is completed and ready for final inspection.
- B. The Engineer will inspect to verify the status of completion with reasonable promptness after receipt of such certification.
- C. Should the Engineer consider that the Work is incomplete or defective:
  - 1. The Engineer will promptly notify the Proposer in writing, listing the incomplete or defective work.
  - 2. Proposer shall take immediate steps to remedy the stated deficiencies and send a second written certification to the Engineer that the Work is complete.
  - 3. The Engineer will reinspect the Work.

- D. When the Engineer finds that the Work is acceptable under the Contract Documents, he shall request the Proposer to make closeout submittal.
- 1.07 REINSPECTION FEES
- A. Should the Engineer perform reinspections due to failure of the Work to comply with the claims of status of completion made by the Proposer:
    - 1. Owner will compensate the Engineer for such additional services.
    - 2. Owner will deduct the amount of such compensation from the final payment to the Proposer.
- 1.08 PROPOSER'S CLOSEOUT SUBMITTALS TO ENGINEER
- A. Evidence of compliance with requirements of governing authorities.
  - B. Project Record Documents.
  - C. Operation and Maintenance Data, and Care and Cleaning Instruction: In accordance with requirements of Section 01 78 23 - Operation and Maintenance Manuals.
  - D. Warranties and Bonds: In accordance with requirements of the General and Supplemental Conditions and Section 01 78 32 – Warranties and Bonds.
  - E. Tools, Spare Parts and Maintenance Material: To requirements of Section 01 78 23 - Operation and Maintenance Manuals.
  - F. Evidence of Payment and Release of Liens: To requirements of General and Supplemental Conditions.
- 1.09 FINAL CLEANING
- A. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.
    - 1. Remove labels that are not permanent labels.
    - 2. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances
    - 3. Wipe surface of mechanical and electrical equipment. Remove excess lubrication and other substances.
- 1.10 FINAL ADJUSTMENT OF ACCOUNTS
- A. Submit a final statement of accounting to the Engineer.

- B. Statement shall reflect all adjustments to the Contract Sum:
1. The original Contract Sum.
  2. Additions and deductions resulting from:
    - a. Previous Change Orders
    - b. Allowances
    - c. Unit Prices
    - d. Deductions for uncorrected Work
    - e. Deductions for reinspection payments
    - f. Other adjustments
  3. Total Contract Sum, as adjusted.
  4. Previous payments.
  5. Sum remaining due.
- C. Engineer will prepare a final Change Order, reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.

#### 1.11 FINAL APPLICATION FOR PAYMENT

- A. Proposer shall submit the final Application for Payment in accordance with procedures and requirements stated in the Supplemental General Conditions. Costs for reinspections due to failure of the Work to comply with Proposer's representations of status of completion shall be deducted from amounts due and payable to Proposer.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 78 23

OPERATION AND MAINTENANCE MANUALS

PART 1 – GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

- A. This section specifies the general methods and requirements of submissions applicable to Operation and Maintenance Manuals. Operation and Maintenance Manuals shall be provided for all equipment and process systems supplied under this Contract. The Seller shall submit a list of all Operation and Maintenance Manuals to be supplied for the Engineer's review and approval. Additional general submission requirements are contained in Section 01 33 00 - Submittals and individual technical specification sections.

1.02 OPERATION AND MAINTENANCE MANUALS

- A. Operation and maintenance manuals include, but are not necessarily limited to, a separate document for each piece of equipment and process system which cover only the specific equipment or process installed with the following specific requirements:
  - 1. Contents
    - a. Title page
    - b. Copy of complete specifications for equipment installed, including model, serial number and all other nameplate data
    - c. Brief description of each system (process, mechanical, electrical, etc.) components and flow diagrams
    - d. Equipment function, normal operating characteristics, and limiting conditions
    - e. Assembly, installation, alignment, adjustment, and checking instructions
    - f. Exploded views of equipment
    - g. Pre-startup procedures
    - h. Starting and stopping procedures (both normal and emergency)
    - i. Special operating instructions, including abnormal operating conditions and procedures to return to normal operating conditions
    - j. Routine maintenance procedures and troubleshooting procedures

- k. Routine and special lubrication procedures and instructions, and a list of all required lubricants by commercial name
  - l. Safety considerations
  - m. Emergency procedures
  - n. Description of potential leak or discharge conditions, including control and mitigation procedures
  - o. Description of leak monitoring and containment equipment
  - p. Inspection procedures
  - q. Operational logs and checklists
  - r. Manufacturer's printed operating and maintenance instructions, parts lists, illustrations, and diagrams
  - s. Instrumentation drawings per ISA-S5.4, Schematics per JIC, EGP and EI, latest revisions
  - t. One (1) hard copy each of wiring diagram
  - u. Electric motor data including bearing data
  - v. Test data and performance curves, where applicable
  - w. One (1) final approved hard copy of each shop drawing and each Seller's coordination and layout drawing
  - x. List of recommended spare parts, manufacturer's price, and recommended quantity
  - y. List of all required special tools (or statement that none are required)
  - z. All markings on catalog cuts, drawings, etc., shall be reproducible ("highlighter" markings are not acceptable)
  - aa. Name, address and telephone numbers of local service representatives
2. Material
- a. Loose leaf punched paper
  - b. Page size, 8-1/2" by 11"
  - c. Diagrams and illustrations, attached foldouts as required of original quality, reproducible by dry copy method

- d. Drafting shall be in accordance with current ANSI Drafting Manual.
  - e. Covers: oil, moisture and wear resistant 9” x 12” size
3. Labeling. As a minimum, the following information shall be included shall be included on all final O&M manual materials, including CD-ROM disks, jewel cases, and hard copy manuals:
- a. Equipment name and/or O&M title spelled out in complete words
  - b. Project name
  - c. PVSC Project/Contract Number
  - d. Specification Section Number.
  - e. Manufacturer’s name
  - f. File name and date
4. Submittals to the Engineer
- a. Preliminary manuals shall be submitted in electronic format with form attached to this section prior to the date of shipment of the equipment. The Seller is to provide information and initial each item on check list. The Engineer will initial form as part of the review. Manuals not accompanied by this form will be returned without being reviewed. These preliminary copies must be submitted no later than **fifteen (15) days** following approval of the shop drawings for each piece of equipment or system and three (3) final approved hard copies of complete manuals prior to Engineer’s tests and acceptance for beneficial use.
  - b. When the O&M manuals are reviewed “APPROVED AS NOTED/RESUBMIT”, the corrections shall be made as instructed by the Engineer, and corrected manuals resubmitted to the Engineer.
  - c. Not more than forty percent (40%) of the cost of the equipment, installed in place, (based on the Seller’s lump sum breakdown) will be paid until the preliminary copies of the operation and maintenance manuals have been approved by the Engineer.
  - d. Each manufacturer’s operation and maintenance manual(s) shall have printed on the cover of the manual B355 - Oxygen Production Facility Equipment Procurement, Operation and Maintenance Manual, Product/Process System Identification, the specification section with item number and specific equipment’s plant location.
  - e. Where existing systems or equipment are being modified, Contractor shall furnish such information needed to fully update and revise the existing manufacturer’s manuals. The information shall be in such form as to be easily inserted in the existing manufacturer’s manuals. Where electrical or control modifications are being made, Contractor shall furnish as-built electrical power, control, and ladder diagram drawings for all work performed.

5. Electronic Operation and Maintenance Manuals: Electronic manuals shall be in Adobe Acrobat's Portable Document Format (PDF) and shall be prepared at a resolution between 300 and 600 dots per inch (dpi), depending on document type. Optical Character Recognition (OCR) capture shall be performed on these documents. OCR settings shall be performed with the "original image with hidden text" option in Adobe Acrobat Exchange. File size shall be limited to 10 MB. When multiple files are required the least number of files possible shall be created. File names shall be in the format OMXXXXXX-YYYZ-V.pdf, where XXXXXX is the six-digit number corresponding to the specification section, YYY is a three digit O&M manual number, e.g. 001, Z is the letter signifying a resubmittal, A, B, C, etc., and V is a number used only when more than one 10 MB is required for an O&M manual. Documents prepared in PDF format shall be processed as follows:
  - a. Pages shall be searchable (processed for optical character recognition) and indexed when multiple files are required.
  - b. Pages shall be rotated for viewing in proper orientation.
  - c. A bookmark shall be provided in the navigation frame for each entry in the Table of Contents.
  - d. Embedded thumbnail shall be generated for each completed PDF file.
  - e. The opening view for PDF files shall be as follows:
    - i. Initial View: Bookmarks and Page
    - ii. Page Number: Title Page (usually Page 1)
    - iii. Magnification: Set to Fit in Window
    - iv. Page: Single Page
  - f. Where the bookmark structure is longer than one page the bookmarks shall be collapsed to show the chapter headings only.
  - g. When multiple files are required the first file of the series (the parent file) shall list every major topic in the Table of Contents. The parent file shall also include minor headings bookmarked based on the Table of Contents. Major headings, whose content is contained in subsequent files (children), shall be linked to be called from the parent to the specific location in the child file. The child file shall contain bookmark entries for both major and minor headings contained in the child file. The first bookmark of any child file shall link back to the parent file and shall read as follows "Return to the *Equipment Name* Table of Contents", e.g. Return to the Polymer Feed System Table of Contents.
  - h. Drawings shall be bookmarked individually.
  - i. Files shall be delivered without security settings to permit editing, insertion and deletion of material to update the manual provided by the manufacturer.



**PASSAIC VALLEY SEWERAGE COMMISSION  
 CONTRACT NO. B355  
 OXYGEN PRODUCTION FACILITY EQUIPMENT PROCUREMENT  
 OPERATION AND MAINTENANCE MANUAL – MINIMUM CHECKLIST**

**Submittal No.** \_\_\_\_\_

	Cont	Eng
Three (3) preliminary and three (3) final approved complete sets of operation and maintenance instructions		
The manuals for each piece of equipment and process system shall be a separate document and cover only the specific equipment or process system installed with the following specific requirements:		
Contents:		
Title Page		
Copy of complete specifications for equipment for equipment installed, including model, serial number and all other nameplate data.		
Brief description of each system (process, mechanical, electrical, etc.), components and flow diagrams		
Exploded views of equipment		
Pre- startup procedures		
Starting and stopping procedures (both normal and emergency)		
Special operation instructions, including abnormal operating conditions and purchases to return to normal operating conditions		
Routine maintenance procedures and troubleshooting procedures		
Routine and special lubrication procedures and instructions, and a list of all required lubricants by commercial name		
Safety considerations		
Emergency procedures		
Description of potential leak or discharge conditions, including control and mitigation procedures		
Description of leak monitoring and containment equipment		
Inspection procedures		
Operational logs and checklists		
Manufacturer’s printed and operating and maintenance instructions, parts lists, illustrations, and diagrams		
Instrumentation drawings per ISA-S5.4, Schematics per JIC, EGP and EI, latest revisions		
One copy of each wiring diagram		

Electric motor data including bearing data		
One (1) approved hard copy of each shop drawing and each Contractor's coordination and layout drawing		
List of recommended spare parts, manufacturer's price, and recommended quantity		
List of all required special tools (or statement that none are required)		
All markings on catalog cuts, drawings, etc., shall be reproducible. "Highlighter" markings are not acceptable		
Name, address and telephone numbers of local service representatives		
Material:		
Loose leaf punch paper		
Page size, 8-1/2" by 11"		
Diagrams and illustrations, attached fold outs as required for original quality, reproducible by dry copy method		
Drafting shall be in accordance with current ANSI Drafting Manual		
Covers: oil, moisture and wear resistant 9" x 12" size		
Each manufacturer's Operating and Maintenance Manual(s) shall have printed on the cover of the manual Contract No. B355 - Oxygen Production Facility Equipment Procurement, "Operation and Maintenance Manual", Product/Process System Identification, the specification section with item number and specific equipment's plant location		

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01 78 32

WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Procurement Documents, including manufacturers standard warranties on products and special warranties.

1.02 RELATED WORK

- A. Refer to Conditions of Contract for the general requirements relating to warranties and bonds.
- B. General closeout requirements are included in Section 01 78 18 - Contract Closeout.
- C. Specific requirements for warranties for the Work and products and installations that are specified to be warranted, are included in the individual Technical Specification Sections of Division 02 00 00 through 50 00 00.

1.03 SUBMITTALS

- A. Submit written warranties to the Owner prior to the date fixed by the Engineer for Substantial Completion. If the Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Owner.
- B. When a designated portion of the Work is completed or accepted and used by the Owner, by separate agreement with the Seller during the construction period, submit properly executed warranties to the Owner within 15 days of completion of that designated portion of the Work.
- C. When a special warranty is required to be executed by the Seller, or the Seller and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner for approval prior to final execution.
- D. Refer to individual Sections of Divisions 02 00 00 through 50 00 00 for specific content requirements, and requirements for submittal of special warranties.

#### 1.04 WARRANTY REQUIREMENT

- A. All equipment warranties will have a minimum duration of coverage not less than two (2) years starting on the date of final acceptance of the equipment by the Owner unless otherwise stated in individual Technical Specification Sections of Division 02 00 00 through 50 00 00.
- B. Related Damages and Losses: When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.
- C. Reinstatement of Warranty: When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- D. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of Procurement Documents. The Seller is responsible for the cost of replacing or rebuilding defective work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- E. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
- F. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- G. The Owner reserves the right to refuse to accept work for the project where a special warranty, certification, or similar commitment is required on such work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.
- H. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Seller of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers and subcontractors required to countersign special warranties with the Seller.

#### 1.05 DEFINITIONS

- A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for products and are specifically endorsed by the manufacturer to the Owner.

- B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 01 79 00

DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section contains requirements for training the Owner's personnel in the proper operation and maintenance of the equipment and systems installed under this contract. This section supplements and is in addition to Training Requirements that are specified within the Technical Specification Sections.

1.02 GENERAL

- A. Where indicated in the specification sections and as required by the specifications, the manufacturer's representative shall provide on-the-job training of the Owner's personnel. The training sessions shall be conducted by qualified, experienced, factory trained representatives of the various equipment manufacturers. Training shall include instruction in both operation and maintenance of the subject equipment.

1.03 SUBMITTALS

- A. The following information shall be submitted to the Engineer in accordance with the provisions of the Submittals section. The material shall be submitted not less than 4 weeks prior to the provision of training.
  - 1. Lesson plans, training manuals, handouts, visual aids, and other reference materials for each training session to be conducted by the manufacturer's representatives.
  - 2. Subject of each training session, identity and qualifications of individuals to be conducting the training, and tentative date and time of each training session.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Where specified, the Seller shall conduct training sessions for the Owner's personnel to instruct staff on the proper operation, care, and maintenance of the equipment and systems installed under this contract. Training shall take place at the site of the Work and under the conditions specified in the following paragraphs. Approved operation and maintenance manuals shall be available at least 30 days prior to the date schedule for the individual training session.

2.02 LOCATION

- A. Training sessions shall take place at the site of the Work at a location designated by the Owner.

2.03 LESSON PLANS

- A. Formal written lesson plans shall be prepared for each training session. Lesson plans shall contain an outline of the material to be presented along with a description of the visual aids to be utilized during the sessions. Each plan shall contain time allocation for each subject.
- B. One complete set of originals of the lesson plans, training manuals, handouts, visual aids and reference materials shall be the property of the Owner and shall be suitable bound for proper organization and easy reproduction. The Seller shall furnish ten copies of necessary training manuals, handouts, visual aids, and reference materials at least 1 week prior to each training session.

2.04 FORMAT AND CONTENT

- A. Each training session shall include classroom and time at the location of the subject equipment or system. As a minimum, training sessions shall cover the following subjects for each item of equipment or system:
  - 1. Familiarization
    - a. Review catalog, parts lists, drawings, etc., which have been previously provided for the plan files and operation and maintenance manuals.
    - b. Guided inspection of the subject equipment.
    - c. Demonstration of the subject equipment and how operation in accordance with the specified requirements.
  - 2. Safety
    - a. Review and demonstration of safety procedures and related documentation.
    - b. Inspection and discussion of hazardous components of the subject equipment.
  - 3. Operation
    - a. Review of subject equipment operations literature and theory of operation.
    - b. Overview of equipment operation and function.



- c. Explanation and demonstration of all modes of operation including start up, shut down, normal, and emergency operation, and manual and automatic operation through the plant control system.
  - d. Explanation of all hardwired interlocks.
  - e. Explanation and demonstration of equipment related valves and their purpose.
  - f. Explanation of all equipment related instruments including primary element, instrument indicator, purpose, and interpretation of information.
  - g. Check out of Owner's personnel on proper use of the equipment.
4. Preventative Maintenance
- a. Review preventative maintenance documentation and discussion of maintenance require at various intervals; e.g. daily, weekly, monthly, annually.
  - b. Demonstrate performance of each preventive maintenance task.
  - c. Identification of indicators of equipment problems.
  - d. Discussion of corrosion protection and lubrication requirements.
  - e. Requirements for periodic exercise of equipment and demonstration of equipment exercise where required.
  - f. Identification of inspection points and demonstration of inspection covers removal and routine disassembly and assembly of equipment.
5. Corrective Maintenance and Equipment Repair
- a. Discussion of common repairs and identification of special problems.
  - b. Explanation and demonstration of equipment inspection and troubleshooting.
  - c. Demonstration of calibration procedures.
  - d. Demonstration of repair procedures where practical.
6. Parts
- a. Discussion of the parts list and ordering of parts.
  - b. Review of spare parts provided with the equipment and identification of other recommended spare part.

7. Local Representatives
  - a. Name, address, telephone of local representative.
  - b. Review of contact information for providers of routine and emergency repair and operational assistance.
8. Operation and Maintenance Manuals
  - a. Review of O&M manual content and organization.
  - b. Update O&M material as required.

2.05 VIDEO RECORDING

- A. The Seller shall record each training session and shall give the Owner exclusive rights to each training session recording. The Seller shall advise all manufacturers providing training sessions that the material will be recorded.

PART 3 - EXECUTION

3.01 TRAINING

- A. Training shall be conducted in conjunction with the operational testing and commissioning periods. Classes shall be scheduled so that training is performed when equipment is available for operation. The Seller shall arrange to have the training conducted on consecutive days, with no more than 6 hours of class scheduled for any one day. Concurrent classes will not be permitted.

END OF SECTION

SECTION 09 90 00

PAINTS AND COATINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Preparation of surfaces, shop painting of items furnished, piping, conduit, ductwork and equipment, masonry waterproofing and parking lot marking.

1.02 REFERENCES

- A. Codes and standards referred to in this Section are:

1. SSPC - Steel Structures Painting Manual
2. SSPC SP 1 - Solvent Cleaning
3. SSPC SP 3 - Power Tool Cleaning
4. SSPC SP 6 - Commercial Blast Cleaning
5. SSPC SP 10 - Near-White Blast Cleaning
6. FS-TT-V-51F - Asphalt Varnish
7. NSF 61 - Drinking Water System Components - Health Effects
8. AWWA D102 - Standard for Painting Steel Water-Storage Tanks

1.03 SUBMITTALS

- A. Provide all submittals, including the following, as specified in Division 1.
1. Submit manufacturer's standard color chart for color selection.
  2. Where equipment is customarily shipped with a standard finish, submit samples of the proposed color and finish for approval prior to shipping.
  3. Furnish affidavits from the manufacturer certifying that materials furnished conform to the requirements specified and that paint products have been checked for compatibility.
  4. Submit a supplementary schedule of paint products with mil thickness, and solids by volume, including all paint applied in the shop. Provide a schedule that is in accordance with the recommendations of the paint manufacturer.
  5. Furnish affidavits from the manufacturer certifying that coatings in immersion service contain no water soluble solvents or corrosion inhibitive (active) pigments with slight water solubility.

#### 1.04 PAINTING REQUIREMENTS

- A. Shop Primed and Finished Items: Furnish the following items with the manufacturer's standard prime and finish coats applied in the shop: pumps, motors, gears, gear housings, wall fans, temperature control and instrument panels, engines, meters, generators, panelboards, transformers, boilers, condensing units, air handling units, air conditioning and dehumidification units, unit heaters, enclosures for finned tube radiators, cabinet heaters, metal toilet partitions, metal urinal screens, aluminum fascia, motor control centers, aluminum light standards, hoisting equipment.
- B. Shop Primed Items: Furnish the following items shop primed: structural steel and wrought metals, steel joists and joist girders, composite metal floor deck, pipelines, hangers and supports, sluice gates, valves, valve and sluice gate operators and stands, guard housings, steel stair framing, steel lintels, hollow metal doors and frames.
- C. Field Primed and Finished Items: Field prime and finish, where exposed to view, all items not shop primed or shop finished. This Work generally includes, but is not limited to, the following: gypsum wallboard, interior concrete block, interior concrete walls, columns, beams and ceilings, covering over insulation on piping, electrical conduit systems, small piping and copper tubing, ducts, covering over ducts, exterior PVC piping valves, and fittings, drain piping.
- D. Unpainted Items: Do not paint the following items, unless otherwise specified: interior structural steel not exposed to view, registers, grilles, dampers and linkage, fire sprinklers, name and identification plates and tags, floor gratings, brass pipe and fittings, brass valves, stainless steel, wood, cast-iron piping installed underground, stop log panels, spray-on fireproofing steel to receive spray-on fireproofing, surfaces to receive field welding, faying surfaces of high strength bolted connections, steel to be embedded or in contact with cast-in-place concrete.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows:
- B. Delivery and Storage: Deliver and store paint at the site from the approved manufacturer only.
- C. Packaging and Labeling: Prepare, pack and label paints, stains, varnish or ingredients of paints to be used on the job. Deliver all material to the site in original, unbroken containers.
- D. Storage: Store the painting materials at the site in accordance with applicable codes and regulations and in accordance with manufacturer's instructions. Keep the storage space clean at all times. Take every precaution to eliminate fire hazards.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.
  - 1. Paint - General
    - a. Tnemec Co., Inc.
  - 2. Protective Coating - Concrete roofs of walkways and parapet walls
    - a. Mameco; Vulkum 450/451 over 171 primer
  - 3. Masonry Waterproofing
    - a. Harris Specialty Chemicals, Inc., Hydrozo Clear Environseal Double 7 for Block (for Brick)

### 2.02 MATERIALS

- A. General: Furnish paint and other materials of the type and quality of the manufacturer on which the painting schedule specified herein is based.
  - 1. Provide compatible shop and field coats.
  - 2. Provide all coats of paint for any particular surface from the same manufacturer.
  - 3. Provide coatings, including paints, primers and materials in contact with potable water listed by NSF International under Standard 61 for materials and products in contact with potable water.
  - 4. Provide paint of approved color as selected from the manufacturer's standard range of colors.
- B. Paint Schedule: Provide all painting in accordance with the following schedule with the number of coats not less than the number shown on the schedule.

**MATERIAL PAINTING SCHEDULE**

Class of Work	Primer Shop Coat	Field Coats		
		1st	2nd	3rd
Nonferrous Metal and Galvanized Steel:				
Interior		A	A	A
Exterior		A	A	C
Steel and Iron:				
Interior	B	B*	A	A
Interior not Exposed to View	B	B*		
Exterior	B	B*	A	C
Submerged, Buried or Constantly Wetted	B	B*	D	D
Concealed in Masonry	B	B*		
Air Main Pipe,				
Submerged, Interior and Buried	E	E*	A	A
Exposed to Sunlight	E	E*	A	C
Exposed to Potable Water	B	B*	B	F
Wrapped in Insulation	B	B*		
Exterior, Exposed to Process Wetting and Drying	B	B*	D	D
Concrete Masonry:				
Interior		G	D	D
Concrete:				
Interior vertical surfaces		D	D	
Interior horizontal surfaces and floors		K	K	
Pipe and Duct Insulation:				
Exposed		I	I	
PVC:				
Interior	A	A		
Exterior	A	A	C	
Gypsum Wallboard		H	J	J

\*Touch-up bare metal with primer

- C. Schedule of Paints: Alphabetical designations in the following list are given solely for the purpose of indicating the type and quality of materials desired. Equivalent material from other approved manufacturers may be submitted for approval.

<u>Symbol</u>	<u>Product Name and Number</u>	<u>Volume Solids %</u>	<u>Dry Film Thickness Mils Per Coat</u>
A	Tnemec Series 69 Hi-Build Epoxoline II	69	2.0-3.0
B	Tnemec Series 140-1255 Pota-Pox Plus	67	4.0-6.0
C	Tnemec Series 740 Endura-Shield	66	2.0-3.0
D	Tnemec Series N69 Hi-Build Epoxoline II	67	4.0-6.0
E	Tnemec Series N69 Hi-Build Epoxoline II	67	2.0-3.0

Contract B355

09 90 00 - 4

Painting

PVSC Oxygen Production Facility

Equipment Procurement

09/08/2023

<u>Symbol</u>	<u>Product Name and Number</u>	<u>Volume Solids %</u>	<u>Dry Film Thickness Mils Per Coat</u>
F	Tnemec Series N140-15BL Tank White Pota-Pox Plus	67	4.0-6.0
G	Tnemec Series 130 Envirofill Masonry Filler	68	60 sq. ft. / gal.
H	Tnemec Series 151-1051Elasto-Grip FC	17	0.7-1.5
I	Tnemec Series 6 (flat) 1029 Endura- Tone (semi-gloss)	43	2.0-3.0
J	Tnemec Series 113 Tneme-Tufcoat	44	2.0-3.0
K	Tnemec Series 629 CT Densifyer		Manufacturer Recommended

### PART 3 - EXECUTION

#### 3.01 PREPARATION

- A. Inspection: Prior to surface preparation perform the following:
1. Verify that surface substrate conditions are ready to receive Work as instructed by the product manufacturer.
  2. Examine specifications for all Work and become thoroughly familiar with all provisions regarding painting.
- B. Surface Preparation: After inspection and prior to painting, perform the following:
1. Inspect all Work prior to application of any paint or finishing material.
  2. Prepare the surface to be painted in accordance with the instructions of the manufacturer, and as approved.
  3. Brush and wash concrete surfaces and concrete masonry. Remove all loose dirt, free lime, form oil, curing compounds and other foreign matter by approved methods. Patch concrete surfaces requiring repair and spackle and repair surfaces to receive paint. Acid etch concrete surfaces to be painted as recommended by the manufacturer of the coating to be applied, to produce a slightly granular surface required for adherence of the paint to the concrete unless otherwise indicated. Determine that concrete and concrete masonry is thoroughly dry prior to painting.
  4. Thoroughly clean surfaces to be given protective coatings.
  5. Refinish shop-coated equipment that has scratches and abrasions.
  6. Thoroughly clean wood surfaces to remove all foreign matter. Properly fill and smooth cracks and nail holes. Finish exposed wood with sandpaper to a fine finish and wipe clean of dust.

7. Prepare and clean all surfaces prior to painting, as specified and required. Verify that surfaces are dry before any paint is applied. Perform special surface preparation work as directed by the manufacturer of the paint specified to be applied to the surface.
8. Clean the surface of structural steel, exterior and interior dry surfaces of water storage tanks and steel encased in concrete, masonry or spray-on fireproofing by removing all rust, mill scale, oil, grease or dirt in accordance with Steel Structures Painting Council SSPC-SP6.
9. Prior to painting steel and interior wet surfaces of water storage tanks, grind smooth all welds, beads, blisters or protuberances, other than identification markings and remove other imperfections. Remove all rust, mill scale, oil, grease and dirt by sandblasting in accordance with Steel Structures Painting Council Near White SSPC SP 10 unless otherwise indicated.
10. Prior to painting metals other than steel, grind smooth all welds, beads, blisters or protuberances, other than identification markings, and remove other imperfections. Solvent clean all nonferrous metals, galvanized steel and stainless steel whether shop primed or field primed, in accordance with SSPC-SP-1 prior to the application of the primer.
11. Prime cleaned metal the same day immediately after sandblasting to prevent rusting.
12. Remove all adhering debris on pipe and duct covering and smooth out indentations or unsightly spots and brush clean.
13. Remove all bituminous or asphaltic coating from cast iron drain and soil pipe prior to painting.
14. Prepare gypsum wallboard as recommended by the wallboard manufacturer to obtain the specified finish level.
15. Remove all adhering debris on PVC, roughen surface with sandpaper and brush clean.

### 3.02 INSTALLATION

- A. General: Install all painting and coatings in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1.
  1. Apply products in accordance with the latest edition of AWWA D102 and the manufacturer's instructions.
  2. Apply paint that is at a minimum temperature of 60 degrees F.
  3. Paint or finish all surfaces that are left unfinished by the requirements of other specifications and specified herein to be painted or finished.



4. Paint surfaces in accordance with the material painting schedule included in this Section.
  5. Completely cover all surfaces to be painted. Cover by additional coats when color on undercoats shows through the final coat of paint, until paint is of uniform color and appearance and coverage is complete.
  6. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
  7. Provide sufficient temporary ventilation during painting operations in enclosed areas to remove moisture and solvents, and to keep the atmosphere safe from harmful or dangerous fumes and dust levels for personnel.
- B. Touch-Up Shop-Primed and Finished Items: Touch-up all damaged portions and imperfections in shop-primed and finished items. Use the same paint as used for the shop prime and finish. Prepare the surface prior to touch-up by wire brushing and sanding to remove rust, scale and loose paint.
- C. Aluminum and Incompatible Surfaces: Where aluminum surfaces come in contact with incompatible metals, lime, mortar, concrete or other masonry materials, apply one field coat of Tnemec Series 69 Hi-Build Epoxoline II or two coats of asphalt varnish conforming to FS-TT-V-51F.
- D. Steel Pipe: Applicable to insulated and uninsulated steel pipe. Immediately after installation, prime pipe not available with a shop coat.
- E. Shop Prime: Apply one shop coat of primer, before exposure to weather, to all structural steel, wrought metals, metal castings, mechanical equipment and electrical equipment, and all piping specified to be field painted before exposure to the weather. Apply this shop coat as the first coat as specified in the Material Painting Schedule.
- F. Color Coding: For colors to be used for identification of electrical piping, tubing and conduit see the following:
1. Section 26 05 53 - Electrical Identification
- G. Equipment Colors: Furnish the following equipment in their respective groups to be shop painted in the colors herein specified.
1. Provide chart of standard colors offered by each equipment manufacturer. Coordinate color selection.
  2. Furnish all electrical equipment shop painted in a color selected from the manufacturer's standard colors.
- H. Masonry Waterproofing: Coat all exterior concrete masonry units with clear sealer. Prepare the masonry surfaces and apply the waterproof coating in accordance with the manufacturer's recommendations.

3.03 CLEANING AND PAINTING

- A. Touch up and restore any finish damaged. Remove paint or other finishes spilled, splashed or splattered from all surfaces taking care not to mar any surface or item being cleaned. Touch up of minor damage shall be acceptable where result is not visibly different from adjacent surfaces. Recoat entire surface where touch up results are visibly different, either in sheen, texture, or color.
- B. Coating Defects: Repair in accordance with manufacturer's instructions coatings that exhibit film characteristics or defects that adversely affect performance or appearance of coating systems.
- C. Remove temporary coverings and protection of surrounding areas and surfaces.
- D. Upon completion of the blast cleaning operations, remove all abrasives from property. Make all necessary arrangements for abrasive removal.

END OF SECTION

SECTION 11 55 10

VACUUM PRESSURE SWING ADSORPTION OXYGEN GENERATION SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

- A. The Seller shall provide an Oxygen Generation System comprised of multiple Vacuum Pressure Swing Adsorption (VPSA) plants and related equipment to generate oxygen gas on-site to supply clean, dry, hydrocarbon free gaseous oxygen over the specified production range to satisfy the specified requirements of the high-purity oxygen reactors at the minimum specified pressure and purity as measured at the outlet of the pressure reducing valves under all operating conditions.
- B. The VPSA plants shall separate oxygen from air by adsorbing nitrogen onto media. The VPSA processes shall produce oxygen by adsorptive separation in a vessel at higher pressure than the regeneration step. Regeneration of the bed shall be accomplished at a lower pressure than the production step. VPSA suction will be from ambient atmospheric air.
- C. The quantity of VPSA plants provided shall be dependent on the rated flow capacity of each plant. All VPSA plants shall be rated for the same capacity. Plants (including subfacilities such as electrical distribution enclosures, cooling water systems, and instrument air systems) must fit within the designated VPSA Areas as shown on the Contract Drawings. VPSA plants within VPSA Area I must produce 500 tons per day (TPD) of gaseous oxygen meeting the design requirements. One additional VPSA plant of capacity equivalent to those used in VPSA Area I will be placed in VPSA Area II.
- D. The VPSA plants shall be comprised of multiple skids and enclosures which will be pre-fabricated and configured by the Seller prior to delivery. Installation of system components on individual skids shall be completed to the greatest extent practical prior to delivery to the site.

1.02 RELATED SPECIFICATIONS

- A. Section 11 55 20 - Liquid Oxygen Storage and Vaporization System
- B. Section 40 90 00 - Instrumentation for Process Control - Basic Requirements
- C. Section 40 90 08 - Control Strategies
- D. Section 40 90 04 - Primary Sensors and Field Instruments
- E. Section 40 90 02 - Programmable Logic Controllers – Hardware and Software

F. Section 40 90 05 - Control Panels and Enclosures

G. Section 40 90 07 - Input/Output List

### 1.03 SYSTEM DESCRIPTION

A. Each VPSA plant shall consist of the following major equipment items:

1. Feed air blower(s), vacuum blower(s), and instrument air systems housed in an outdoor acoustical attenuating enclosure.
2. Inlet filter, inlet and outlet silencers and gas temperature control equipment for the blowers
3. Switching valve skid(s) to allow cycling between the adsorb and desorb adsorbent vessels;
4. Two adsorbent vessels supplied with nitrogen adsorbing media to produce oxygen as a product gas and all piping required between the switching valve skid and the adsorbent vessels;
5. Low pressure oxygen buffer vessel(s);
6. One (1) VPSA control panel in stainless steel enclosure complete with Programmable Logic Controller (PLC) and human-machine interface (HMI);
7. One (1) remote mounted auxiliary control panel in stainless steel with a second HMI for installation outside the noisy environment
8. Piping and valves required for the operation of the system, including all skid-mounted piping and all interconnecting piping to the point of discharge to the common piping system.
9. One (1) air-cooled dry-type cooling system where required by the Seller
10. One (1) prefabricated electrical and control building as described in Specification Section 26 23 16 - Electrical Equipment Enclosures.
11. Electrical components as specified in Division 26.

### 1.04 QUALITY ASSURANCE

A. Reference Standards

1. American National Standards Institute (ANSI)
2. American Society of Mechanical Engineers (ASME)
3. Section VIII, Division 1 - Rules for Construction of Pressure Vessels

4. ASTM International
5. Compressed Gas Association (CGA)
6. CGA G-4.1 – Cleaning Equipment for Oxygen Service
7. CGA G-4.4 - Industrial Practices for Gaseous Oxygen Transmission and Distribution Piping Systems
8. CGA G-10.1 - Commodity Specification for Nitrogen
9. Factory Mutual (FM)
10. Institute of Electrical & Electronics Engineer (IEEE)
11. IEEE Standard 519 - Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
12. National Electrical Code (NEC)
13. National Electrical Manufacturers Association (NEMA)
14. National Fire Protection Association (NFPA)
15. NFPA 50 - Standard for Bulk Oxygen Systems at Consumer Sites
16. NFPA 55 - Standard for the Storage, Use, and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers, Cylinders, and Tanks
17. National Safety Council (NSC)
18. Occupational Safety & Health Administration (OSHA)
19. Standard No. 1910.104 - Hazardous Materials - Oxygen
20. The Instrumentation, Systems and Automation Society (ISA)
21. Underwriters Laboratories (UL)

B. General

1. The VPSA Oxygen Generation System shall be furnished by a single Seller who shall assume responsibility for providing a complete and integrated system including design, engineering, furnishing, installation supervision and certification, factory testing, training; and supervision for field services during installation including commissioning, startup, field testing, performance testing, acceptance testing and service contract. Additional post acceptance operational services shall be provided when requested in writing per the specifications.

2. All equipment, components and materials required shall be furnished by the single Seller who shall assume the responsibility for adequacy and performance of all items.
3. The Seller shall supply their company's quality assurance plan.
4. All equipment, valves, and instruments shall be assigned a unique alphanumeric identification tag. No two components shall share the same tag. The Seller shall provide their standard tagging consistently in all submittals. The Seller shall coordinate with the Installation Contractor to convert and correlate the Seller's tagging nomenclature to PVSC's nomenclature for incorporation into PVSC's asset management system.

C. Seller's Qualifications

1. Conform to the qualifications requirements established in Attachment D - Section P-00400.

D. Warranty

1. Provide warranty as specified in Section 01 78 32 - Warranties and Bonds.

E. Seller's Responsibility

1. The Seller shall assume the responsibilities specified below.
  - a. Design, engineering, furnishing, installation supervision, fabrication, implementation and programming of the VPSA oxygen production system and all subsystems, including blowers, motors, adsorber vessels, switching valves, aftercoolers/moisture separators, instrumentation system, and all related instruments, controls, instrument air supply system, and electrical power distribution, and where applicable cooling system, cooling water pumps, and service water system in accordance with the Contract Documents and all referenced standards and codes. The Seller shall confirm that the VPSA plants fit within the designated footprints shown on the Contract Drawings. Instrument air and cooling water systems for each plant must also fit with the designated spaces. VPSA Area I must support 500 TPD of oxygen production. VPSA Area II must support one additional VPSA plant of capacity matching those in Area I.
  - b. The Seller shall be responsible for the procurement and incorporation of a LOX storage and vaporization system into the oxygen production system as detailed in Specification Section 11 55 20 - Liquid Oxygen Storage and Vaporization System. The Seller shall contract a single supplier for the design, engineering, furnishing, installation supervision, and programming of the LOX Storage and Vaporization System.
  - c. Preparation, assembly and correction of all submittals in accordance with the Contract Documents.

- d. Supervision of the installation of all equipment required.
- e. Assistance and supervision for calibration, testing and start-up.
- f. Post start-up operational services.
- g. Training of the Owner personnel in operation and maintenance.
- h. Handling of all warranty obligations for the system components.
- i. Maintenance of two up-to-date reproducible copies of the complete system and application software at the Seller's facility for the duration of the warranty period. Software copies shall be maintained and shall be directly loadable on the supplied system.

F. Performance Bond: The Seller shall provide a Performance Bond for faithful performance of the oxygen system improvements conforming to the Section 01 78 32 - Warranties and Bonds.

#### 1.05 SUBMITTALS

- A. Shop Drawing submittals are to be in accordance with the following list, with the RFP, with the requirements of 01 33 00 – Submittals, and as required by Attachment E Exhibit A-1.
  - 1. General layout, system description, and erection/installation drawings indicating all process mechanical and instrumentation equipment, piping, system process flow, and electrical components. Drawings shall be provided which indicate dimensions, weights, structural loads, foundation requirements, and anchor bolting requirements.
  - 2. Product data for all machinery and equipment.
  - 3. Certification statements for all machinery and equipment listing all performance, reliability, and quality control requirements of the Seller and confirming that they are met.
  - 4. Manufacturing schedules and proposed delivery timelines based upon approval date.
  - 5. Electrical schematics, instrument loop diagrams, panel layouts, wiring diagrams, P&IDs, instrumentation sheets, and product data sheets for all equipment being supplied.
  - 6. A complete bill of materials for all equipment.
  - 7. Equipment inspection and test reports including performance curves and certifications.

8. Delegated Design submittals containing signed and sealed drawings and calculations by a Professional Engineer licensed in the state of New Jersey. Delegated Design submittals will be required for all anchor bolts and pipe supports provided by the Seller. A signed and seal design drawing and calculation set is also required for the overall VPSA installation.

1.06 OPERATIONS AND MAINTENANCE DATA

- A. The Seller shall furnish O&M manuals in accordance with Section 01 78 23 - Operation and Maintenance Manuals.

1.07 RECORD DOCUMENTS

- A. The Seller shall furnish Record Documents in accordance with Section 01 78 18 - Contract Closeout.

1.08 DELIVERY, HANDLING, AND STORAGE

- A. Product storage and handling requirements shall conform to Section 01 66 00.
- B. Equipment shall be packaged at the factory prior to shipment to protect each item from damage during shipment and storage. Containers shall be protected against impact, abrasion, corrosion, discoloration and/or other damages. Clearly label contents of each container and provide information on the required storage conditions necessary for the equipment. Keep the Owner and the Engineer informed of equipment delivery.
- C. Transportation and handling of the equipment and appurtenances shall comply with the requirements of Division 1, requirements of the Seller, and requirements of equipment manufacturers.
- D. Protection of materials and equipment shall comply with the requirements of Division 1 and in accordance with manufacturer's instructions and relevant organization standards. Seller shall notify the Owner and the Engineer of the storage requirements and recommendations for the equipment prior to shipment.

1.09 WARRANTY

- A. Provide a warranty as specified in Section 01 78 32 - Warranties and Bonds.

1.10 SPARE PARTS

- A. Furnish all spare parts anticipated to be replaced during the first two years of operation and special tools suitably packaged and indelibly labeled. A recommended spare parts and special tools list including costs shall also be furnished. The following will be required at a minimum:
  1. Two Supply Blowers of each size
  2. Two Vacuum Blower of each size
  3. Two blower drive motors of each size



4. One Instrument Air Pressure Swing Adsorber (Desiccant) Dryer
5. Eight switching valves of each size used
6. Twelve switching valve solenoids
7. One switching valve seat of each size used
8. Two sets of inlet air filters per plant (including instrument air compressor filters)
9. One of each type of sensor installed
10. One Processor of each type used
11. One I/O Card of each type used
12. T/C Relay for blower motors
13. Two blower rebuild kits
14. Two blower bearing kits
15. Oil Pump (if applicable)
16. Oil sufficient for two oil changes per plant
17. Two spare oil filters per plant

#### 1.11 SEQUENCE OF CONSTRUCTION

- A. A general sequence of construction is depicted on drawings CS-01 through CS-03. Maintaining a minimum of 500 tons per day (TPD) of oxygen to the process reactors without any disruption to service is the basis for development of this sequence. Each stage is dependent on the successful completion of all previous stages, except for the LOX system in Stage 1 and certain components of Stage 6. The six stages of construction include:

1. Stage 1: Scrubber Demolition, Construction of Electrical Substation and Liquid Oxygen (LOX) System: This phase includes complete demolition of the existing O<sub>2</sub> scrubber building to clear space for construction of VPSA Area 1, and construction of a new electrical substation. New VPSA construction cannot begin until demolition of the Scrubber Building is complete. Construction of the new LOX system can be started during this stage. Commissioning of the new LOX system is not prerequisite for progress to Stage 2 but is required for progress to Stage 5.
2. Stage 2: VPSA Area 1 Construction: This stage requires the construction of 500 TPD of VPSA capacity. This can be achieved with multiple VPSA plants, however, all plants required to provide the continuous 500 TPD supply must fit within the designated footprint for VPSA Area 1 as shown on the Drawings. The existing ASU plants must remain in continuous operation during this phase. The production oxygen line cannot be shut down for tie-in connections. Rerouting of the hot water return and supply lines in the Oxygen Production Yard may also be required prior to progression to Stage 3.
3. Stage 3: Air Separation Unit (ASU) Demolition: This stage includes the demolition of the existing ASUs. Demolition of the cold boxes in the Oxygen Production Yard is required for progression to Stage 4. The existing LOX Storage and Vaporization system (including boilers, pumps, hot water supply/lines, and any necessary appurtenances) will be utilized as a back-up system to the Area 1 VPSA's during this Stage and through the completion of Stage 4.

4. Stage 4: Vacuum Pressure Swing Adsorption (VPSA) Area 2 Construction: This stage includes the installation of one redundant VPSA plant with capacity equal to one of those constructed in Stage 2. The additional VPSA plant shall be constructed within the designated footprint for PVSA Area 2 as shown on the Drawings.
5. Stage 5: Existing LOX System Demolition: This stage includes the demolition of the Existing LOX system and all appurtenances.
6. Stage 6: Site Finalization: This stage will utilize the space cleared in Stage 5 to construct a new parking area. Other site work may be completed prior to Stage 6, but all site work must be finalized for the completion of Stage 6.

## PART 2 - PRODUCTS

### 2.01 DESIGN CRITERIA

- A. The Oxygen Generation System shall be provided to meet the following requirements:

Criteria	Value
Rated Flow without Redundancy (TPD)	500
Outlet Pressure (psi)	4.5
Redundancy	One additional VPSA plant
Minimum VPSA plant Quantity	3
Minimum Oxygen Purity (%)	93
Minimum Turndown (%)	50
Maximum Startup Time to Peak Purity	1 hour
Responsiveness to Process Demand (min)	10
Energy at Maximum Production	8.5 kw/ton
Design Temperature (°F)	94
Design Relative Humidity (%)	80

- B. All structures shall be designed for wind, snow and seismic loadings according to the New Jersey Building Code using a Category IV importance factor.
- C. Each VPSA plant shall be designed to achieve 85 dBA calculated as a timeweighted average when measured 20 feet from the Seller-supplied plant boundary at the four corners and four mid-points of the perimeter at 5 feet above ground level with a single plant in operation.

### 2.02 VPSA AIR SUPPLY BLOWERS

- A. Air supply units for VPSA plants shall be blowers of the rotary lobe positive displacement type. The air blowers shall be of industrial quality. The blowers shall produce oil-free air. Blower bodies shall be gray cast iron.
- B. The blower and electric motor drive shall be mounted on a common structural steel baseplate skid.

- C. The system will have a dual shaft motor that operates a separate air blower and vacuum blower. The VPSA blowers, motors, and instrument air compressor of each plant shall be housed inside of a single sound attenuating blower enclosure.
- D. Each blower shall have a design rating to satisfy the required adsorber train production and turndown as specified.
- E. The blower shall be sized to operate under the maximum pressure drop across the inlet particle filter, silencers, and aftercooler, and deliver air to the adsorbers in the required quantity and at the pressure to enable the air separator to produce the required quantity and quality of oxygen.
- F. Each blower shall operate smoothly, in accordance with the vibration, noise and heat limits throughout the entire range of operating conditions. All rotating parts shall be accurately machined and shall be in as nearly perfect rotational balance as practicable.
- G. A vibration shop test shall be performed on each blower. Any blower with overall vibration velocity exceeding 25 mm/s shall be rejected.
- H. Capacity flow control shall be provided for each air blower and integrated with the VPSA control system.
- I. Equipment for capacity control of rotary lobe blowers shall include blowoff pipe, blowoff valve, and silencer.
- J. Special Requirements - Rotary Lobe Type Blowers
  - 1. Suitably sized safety relief valves shall be provided with air blowers. The relief valves shall be a pilot operated design. Direct acting spring safety valves shall not be utilized on the blower discharge. The vacuum blowers shall be provided with controls that shall continuously monitor the blower and shutdown if high differential pressure, temperature, or vibration is detected.
  - 2. The lubricating system for rotary lobe positive displacement type blowers shall be of the pressure lubrication type or splash lubrication type.
  - 3. The system shall contain an indication of low oil pressure or low oil level.
- K. Seals
  - 1. Seals for rotary lobe air blowers shall be lip type. The air stream shall not be contaminated by leakage.
- L. Flexible Couplings
  - 1. The blower shall be connected to the motor by a flexible mechanical coupling which shall be covered by an approved coupling guard.
  - 2. All blower and motor sheaves required for the blower shall be furnished.

M. Impellers

1. Impellers shall be cast carbon steel reinforced by internal ribs and shall have all outside surfaces machined.
2. Bearings shall be antifriction, oil lubricated, AFBMA rated L10 for 80,000 hours continuous operation.

N. Protection Equipment: As a minimum, protection equipment shall be provided as required by Section 2.21.

O. At a minimum, instrumentation equipment shall be provided as specified in Section 2.19.

2.03 VPSA VACUUM BLOWERS

A. The Vacuum Blowers shall be selected to expel waste gas to the atmosphere. Each vacuum blower shall be powered by one end of a dual-shafted motor.

B. The vacuum blower and electric motor drive shall be mounted on a common structural steel baseplate skid.

C. The system will have a dual shaft motor that operates a separate air blower and vacuum blower. The VPSA blowers, motors, and instrument air compressor of each plant shall be housed inside of a single sound attenuating blower enclosure.

D. Vacuum blowers shall be rotary lobe type. The vacuum blower shall be of single stage configuration of the rotary lobe type with motor speed less than 1500 rpm and shall be supplied complete with piping, and silencers.

E. The drive train shall consist of an electric motor driver and a mechanical coupling. The vacuum blower/motor connection shall be covered by an approved coupling guard. The vacuum blower/motor connection shall be a flexible coupling drive.

F. Bearings shall be antifriction, oil lubricated, AFBMA rated L10 for 80,000 hours continuous operation.

G. The lubricating system for rotary lobe positive displacement type blowers shall be of the pressure lubrication type or splash lubrication type.

H. Seals shall be designed to prevent oil leakage into the pump over the range of specified operating conditions and during periods of idleness. The gas stream shall not be contaminated by leakage. Seals shall be lip type for rotary lobe positive displacement type.

I. Capacity control shall be provided on each vacuum blower and integrated with the VPSA control system such that automatic unloading of the vacuum blower is achieved based on the requirements of the adsorption unit.

2.04 DUAL SHAFT BLOWER MOTOR

- A. Motor shall be 4160V, three phase induction motor with squirrel cage rotor with copper windings.
- B. Provide a totally enclosed, fan-cooled type with removable drain plug.
- C. Motor shall have maximum horsepower of 3,000 HP.
- D. Provide NEMA Class F moisture resistant insulation and NEMA Class B, 80 degrees C temperature rise at rated nameplate load.
- E. Accessories
  - 1. Provide oversized conduit boxes on motor to facilitate conductor installation and auxiliary components as required.
  - 2. Provide separate boxes for motor power leads, accessory terminals and RTD leads.
  - 3. Provide motor space heaters to prevent moisture condensation when the motor is not operating.
  - 4. Provide motor bearing and winding Resistance Temperature Detectors (RTDs) of the 100-ohm platinum, three-wire type.
  - 5. Provide seismic vibration switches.

2.05 BLOWER ENCLOSURE

- A. The blower assembly skid and instrument air system of each plant shall be housed within an outdoor weather tight sound attenuating enclosure. The enclosure shall include electrical receptacles, heating, cooling or ventilation for the equipment inside, lighting, and sufficient space for maintenance staff to access and maintain all the equipment. The enclosure shall have a removable roof or other means of disassembly which allow for equipment removal. The Seller is responsible for providing a blower enclosure which achieves the sound requirements listed in Section 2.01. Materials of construction shall be painted galvanized steel or painted aluminum.

2.06 VPSA AIR INLET FILTER

- A. Inlet air to the blowers shall be through a filter and silencer to the air blowers. The inlet air filter box shall be ducted directly through the silencer to the air blower.
- B. The intake filter shall be sized for a maximum filter housing face velocity and shall connect to the suction piping without reducers.

- C. Each filter shall be cartridge type of all-welded steel construction with prime painted exterior, replaceable dry polyester filter element, or washable filter elements, and flanged outlet connection.
- D. A differential pressure gauge which measures pressure drop across the filter shall be provided. A high-pressure differential switch shall be provided for safety shutdown of the air blower on high filter differential.
- E. The filter shall be designed to allow easy replacement of the elements and shall be located to allow easy access for filter replacement.

## 2.07 VPSA SILENCERS

- A. Silencers shall be provided to vent surplus discharge air, oxygen, and waste gas to the atmosphere. Excess discharge air or gas shall not be discharged inside of enclosures.
- B. Silencers for rotating equipment shall be designed to eliminate resonance in the piping or equipment and shall be installed as close to rated equipment as possible.
- C. Outer and interior walls of the silencer shall be of stainless steel or formed concrete and shall conform with the corresponding requirements listed below.
- D. Stainless Steel Silencers
  1. The air blower inlet and discharge silencers for use with positive displacement blowers shall be multi-chambered type and no line-of-sight passages to limit pulsations and noise. Where applicable, packing shall be provided for blowers operating above transition speed and rated for a temperature higher than the maximum blower discharge air temperature. Provisions shall be made to eliminate or minimize packing blowout. Packing material shall be suitable for exposure to water and is not detrimental to the process in case minimal blowout occurs.
  2. Silencer for waste gas discharged shall be of the multi-chambered reactive/absorptive type. Multiple expansion and compression chambers with multi-hole orifice plates or similar designs are acceptable.
  3. Where applicable, silencers shall be fitted with drain holes designed to prevent blockage by loose rust or dirt. In any event, drain hole diameter shall not be less than 15mm.
  4. Stack Head/Shroud Silencer
    - a. Each stack shall be provided with a stack head to limit the entrance of rain and to attenuate noise.
    - b. Stack heads/shrouds shall consist of a shroud containing an annular space to permit rainwater to flow through and drain down the exterior of the stack.

- c. If required to meet specified noise levels, the stack head shall be a silencer and adequate annular spacing shall be provided to allow for the installation of silencing material. The shroud/silencer shall be installed outdoors at the top of the stack. The silencer portion, if required, shall be in addition to the vent silencer specified herein.
- d. The silencer, if provided, shall be designed so that moisture in the annular space does not adversely affect the silencing capability of any packing material.
- e. The shroud silencer shall be designed for a negligible pressure drop. The shroud silencer shall be constructed of stainless steel. The silencer shall be designed and installed to overlap the stack.
- f. Each stack shall be provided with the necessary brackets to bolt the shroud into place. Each stack shall be reinforced to support the weight of the stack head/shroud silencer. The shroud/silencer shall be supported from the stack. The stack shall be supported from the slab or enclosure floor.

E. Formed Concrete Silencers

- 1. Formed concrete silencers shall be designed by the Seller and installed by the Installation Contractor with the approval of the Engineer. Concrete silencers shall be signed and sealed by a Professional Engineer registered in the state of New Jersey. The delegated design package shall be submitted for review by the Engineer.

2.08 VPSA AIR AFTERCOOLERS

- A. An in-line aftercooler, consisting of a shell and tube, plate and frame or fin tube type heat exchanger shall be supplied if a temperature drop is required for the adsorption system.
- B. The aftercooler wetted parts shall be copper, aluminum, or stainless steel.
- C. The aftercooler shall be free from flow induced vibration.
- D. Lifting lugs shall be provided.
- E. The aftercooler shall be constructed, located and installed in a manner to prevent damage due to transmission of forces, pulsations, or vibration from the blower.

2.09 ADSORBER VESSELS

- A. The adsorbers shall comprise vertical pressure vessels. The design, manufacture and conformity assessment of the vessels shall be in compliance with PED, Pressure Equipment Directive 2014/68/EU designed to either AD2000, EN13445 or ASME VIII Div 1/2 and fabricated from carbon steel 151-360-A to BS EN 10028 Parts 1 to 3 and BS EN 10029. The vessels shall have flanged inlet

and outlet connections for air, oxygen, and nitrogen flanged blanking plates for adsorbent charging and removal, connections for pressure gauges, pressure relief valve to prevent over-pressurization, screen or similar to retain the adsorbent in place and a sieve plate support or similar to support the adsorbent and designed for uniform distribution of the gas across the adsorbent bed during the full range of oxygen production.

- B. A system to prevent fluidization of the media shall be provided. The system shall consist of bed limiters, media separation screens, or a monitoring system measuring bed differential to preclude fluidization under any operating or upset condition.
- C. The adsorbent shall be either zeolite molecular sieve or zeolite molecular sieve with a layer of activated alumina for water adsorption. The vessels shall contain sufficient adsorbent to produce high purity oxygen gas at the specified quality, quantity, and dew point. The adsorber volume shall be designed such that the media's expected functional life is 20 years or greater. The vessels shall either be charged with the adsorbent at the manufacturer's premises under controlled conditions to minimize moisture uptake and sealed for delivery to the Site or shall be filled onsite under the supervision by a representative of the manufacturer.
- D. The adsorbers shall be fully automatic, two vessel type arranged in a single train. Each VPSA shall be designed to work in a sequence to produce oxygen continuously. Each adsorber shall be sized to separate oxygen based on the incoming air loading. During production, the duty adsorber and regenerated adsorber shall be exchanged automatically. The regeneration shall include depressurization to remove nitrogen adsorbed and the regenerated bed shall be brought to pressure before changeover of duty and reactivated cells occur.
- E. The adsorbent vessels shall be suitable for outdoor installation.

#### 2.10 BUFFER TANK

- A. A painted carbon steel buffer tank shall be provided for each VPSA plant. The buffer tank shall be fabricated and designed in accordance to ASME Section VIII Div 1. Connection shall be standard weight 150# flanged fittings.

#### 2.11 VPSA PNEUMATIC ACTUATORS

- A. Pneumatic actuators shall be suitable for use with oxygen service valves and for outdoor installation. Cylinders shall be double-acting and shall provide satisfactory operation using dry, oil-free air.
- B. Valve actuator mechanism shall be fully enclosed. The cylinder shall be rigidly secured to the mechanism housing and shall not pivot, rotate or swing during operation. The cylinder piston rod shall be enclosed in the mechanism housing and shall not be exposed to view.



- C. The solenoid valve shall be a high cycle low maintenance design. The valve will be modular designed, pilot operated, 4-way, high capacity, aluminum die cast body with stainless steel non-lubricated frictionless spool and shall be provided with adjustable speed controls. The spool assembly, speed control unit, and coil shall be removable without removing the solenoid valve body from the piping.
  - D. The coil shall be rated for service at temperatures of up to 130°C and for use with 24V DC power.
- 2.12 VPSA AUTOMATIC CHANGEOVER VALVE ASSEMBLY (SWITCHING VALVE MANIFOLD)
- A. The changeover of adsorbers between oxygen separation and regeneration shall be by butterfly valves with resilient seating, quarter-turn, non-lubricated and oxygen rated. It shall be equipped with pneumatic actuators of double acting type.
  - B. The valves shall be provided with carbon steel bodies with stainless steel discs and 17-4 PH stainless steel shafts.
  - C. The actuator shall be designed to eliminate any risk (even in case of damage) of contact between the actuator lubricant and the gas conveyed.
  - D. The valve assembly shall be warranted to give failure free operation for the 10,000,000 cycles.
  - E. Provisions such as lifting eyes shall be included to allow valves and actuators to be removed from piping for maintenance.
  - F. The valve skirts shall be of carbon steel construction and shall be hot- dip galvanized or painted after fabrication and prior to assembly.
- 2.13 VPSA ISOLATING VALVES
- A. Isolating valves shall be of the high-performance butterfly type and of the same design as those specified for automatic changeover valve assembly. The isolating pneumatic valves shall have cycle time and speed control valves to slow the operation and prolong valve life. Valves shall be installed on the oxygen plant outlet and shall be of flanged type.
- 2.14 VPSA SAFETY RELIEF VALVES
- A. Pressure relief valves for oxygen service shall be direct spring loaded type. Valves shall be ASME coded or BS EN ISO 4126-1 set and the adjustment device sealed prior to shipment.
- 2.15 VPSA CONTROL VALVES
- A. Control valves shall be of the rotary globe type designed to operate at the maximum and minimum inlet pressures, reduced pressure settings and maximum

and minimum gas flow rates associated with the system. Globe valves shall have a minimum flow turndown of 100:1.

- B. The valves shall be flangeless style with pressure designation to match the pipework system and shall be fitted with modulating electric or pneumatic actuators. The actuator shall be designed to eliminate any risk (even in case of damage) of contact between the actuator lubricant and the gas conveyed.
- C. Valve body and trim shall be constructed of stainless steel. The valve materials shall be resistant to oxygen gas.
- D. Globe valves shall be fitted with modulating electric or pneumatic actuators. Pneumatic actuators shall be of diaphragm operated spring closing type with integral positioner and hand wheel operated override.
- E. The valves shall be tested in accordance with ANSI class IV.

2.16 PIPELINE SYSTEMS, SUPPORTING STRUCTURES AND EQUIPMENT SUPPORT SKIDS

- A. The Seller will be responsible for the procurement of all required piping to the discharge connection of the metering skid. The Seller shall install all piping integral to a skid system prior to shipping of the system. The Seller is not responsible for installation of field piping between system skids.
- B. All process air piping supplied by the Seller from the air intake to the adsorbers and back to the vacuum blower discharge silencer shall be minimum schedule 10 type 316 stainless steel piping. All other piping supplied by the Seller shall meet their standard system materials and requirements for the given design conditions. Pipes shall be rated for the intended service and 1.5 times the normal working pressure. Each plant discharge will connect to a common header piping network with a ASME/ANSI B16.5 flange connection. All components shall be cleaned in accordance with CGA G-4.1.
- C. The Seller shall provide proper safety measures where the process piping's surface temperature may exceed 140 °F. Safety measures may include signage and barriers or insulation.
- D. The Seller shall be responsible for the design of all skid-mounted pipe supports. All pipe supports shall be of galvanized steel. Pipe support design shall be stamped and signed by a Professional Engineer registered in the state of New Jersey. The New Jersey registered Professional Engineer shall have a minimum of 10 years of experience in design of similar pipe support systems. Hangers and supports shall be in accordance with MSS SP 58.
- E. Support skids and supporting structures shall be designed and furnished for all of the VPSA vessels, tanks, equipment, components, subcomponents, pipelines and other systems. Support skids and supporting structures shall be of painted galvanized steel construction. All structures shall be designed for wind, snow

and seismic loadings according to the New Jersey Building Code using a Category IV importance factor.

2.17 OXYGEN PRESSURE GAUGES

- A. The dial shall be 100 mm diameter minimum (white with black numerals). Accuracy shall be  $\pm 1\%$ . The range shall exceed 1.5 times the normal operating pressure.
- B. Gauges shall be pulsation dampened and shock resistant and suitable for GOX application.

2.18 ANCHOR BOLTS

- A. The Seller shall be responsible for the sizing of all required anchor bolts. Anchor bolt design shall be stamped and signed by a Professional Engineer registered in the state of New Jersey. The New Jersey registered Professional Engineer shall have a minimum of 10 years of experience in design of similar structural restraints.

2.19 INSTRUMENTATION AND CONTROL

- A. Instrumentation General Requirements
  - 1. The VPSA System Seller shall furnish all instrumentation required for the proper control, monitoring and operation of the VPSA Control System.
  - 2. Instrumentation shall meet the requirements of Section 40 90 04 – Primary Sensors and Field Instruments.
  - 3. Instrument Submittals: All instrumentation submittals shall meet the requirements of Section 40 90 04 – Primary Sensors and Field Instruments.
  - 4. Instrumentation shall have an expected 20-year service life.
  - 5. All wetted materials shall be selected to be compatible with the process fluid and shall resist corrosion, degradation, and mechanical failure when constantly exposed to the process fluid. Wetted materials shall be selected such that constant exposure to the process fluid shall not adversely impact the performance of the instrument. Instruments shall perform to the stated accuracies, uncertainties and tolerances when constantly exposed to the process fluid for the expected service life of the instrument.
  - 6. The Seller shall be responsible for selecting all instruments for the proper operation of the system. The Seller shall be responsible for specification of all process connections, calibration ranges, design temperatures, design pressures, signal outputs and any other required specifications for the instruments to be installed in the process and connected to the VPSA Control System.
  - 7. Provide all required mounting hardware for installing and operating instruments, including but not limited to mounting brackets, fittings, welding,

wiring, terminal blocks, power suppliers, signal converters, nuts, bolts and any other required equipment and accessories.

8. All instrumentation, piping, taps, valves, manifolds, mounting hardware and other appurtenances to be placed in oxygen service shall be cleaned for oxygen service in accordance with the Seller's standards and CGA 4.1 Cleaning Equipment for Oxygen Service (latest revision). Packaging of oxygen-clean equipment to maintain cleanliness shall be the responsibility of the Seller.

#### B. Instrument Installation

1. Install instrumentation on skids utilizing the below requirements prior to delivery to the site. Installation of instrumentation on site, if applicable, is the responsibility of the Installation Contractor under the supervision of the Seller.
  - a. Provide labor, materials, tools, equipment, supplies and services, and auxiliary devices including, but not limited to, brackets and mounting hardware to install the instrumentation.
  - b. Unless readily accessible for viewing and calibration from floor elevation, do not mount direct reading or electrical transmitters on process piping. Mount on instrument racks or stands or in enclosures near the sensor at a level that permits viewing from floor elevation.
  - c. Install the instrumentation and auxiliary devices to be accessible for maintenance. Provide space between instruments and other equipment and piping for ease of removal and servicing. Generally, install instrumentation to be accessible from floor level or grade. Permanent ladders or platforms may be required for instrumentation which must be installed in overhead locations.
  - d. Follow additional installation requirements as specified in the individual instrument sections and as recommended by the manufacturer.
  - e. Installation of oxygen-clean instrumentation, piping, taps, valves, manifolds, mounting hardware and other appurtenances shall be under the supervision of the Seller to ensure the preservation of cleanliness.

#### C. Instrument Tagging

1. Each instrument shall be assigned a unique alphanumeric identification tag. No two instruments shall share the same tag. The Seller shall provide their standard instrument tagging consistently in all submittals. The Seller shall coordinate with the Installation Contractor to convert and correlate the Seller's tagging nomenclature to PVSC's nomenclature for incorporation into PVSC's asset management system.

D. Minimum Required Instrumentation: Each VPSA Oxygen Generation Plant shall have the following minimum instrumentation.

1. Feed Air

No.	Instrument Service Description	Instrument Type
1	Feed Air Pressure	Pressure Indicating Transmitter
2	Feed Air Filter Pressure Differential	Pressure Differential Indicating Transmitter
3	Feed Air Temperature	Temperature Element (RTD) with Temperature Transmitter

2. Feed Blowers

No.	Instrument Service Description	Instrument Type
1	Inlet Temperature	Temperature Element (RTD) with Temperature Transmitter
2	Discharge Temperature	Temperature Element (RTD) with Temperature Transmitter
3	Inlet Pressure	Pressure Indicating Transmitter
4	Discharge Pressure	Pressure Indicating Transmitter
5	Vibration	Vibration Transmitter
6	Oil Level	By Manufacturer
7	Cooling Water Supply Pressure (if applicable)	Pressure Indicating Transmitter
8	Cooling Water Supply Temperature (if applicable)	Temperature Element (RTD) with Temperature Transmitter
9	Cooling Water Return Temperature (if applicable)	Temperature Element (RTD) with Temperature Transmitter

3. Vacuum Blowers

No.	Instrument Service Description	Instrument Type
1	Inlet Temperature	Temperature Element (RTD) with Temperature Transmitter
2	Discharge Temperature	Temperature Element (RTD) with Temperature Transmitter
3	Inlet Pressure	Pressure Indicating Transmitter

<b>No.</b>	<b>Instrument Service Description</b>	<b>Instrument Type</b>
4	Discharge Pressure	Pressure Indicating Transmitter
5	Vibration	Vibration Transmitter
6	Oil Level	By Manufacturer

4. Blower Motors

<b>No.</b>	<b>Instrument Service Description</b>	<b>Instrument Type</b>
1	Vibration	Vibration Transmitter
2	Winding Temperature Phase A	Temperature Element (RTD) with Temperature Transmitter
3	Winding Temperature Phase B	Temperature Element (RTD) with Temperature Transmitter
4	Winding Temperature Phase C	Temperature Element (RTD) with Temperature Transmitter

5. Aftercoolers (if required)

<b>No.</b>	<b>Instrument Service Description</b>	<b>Instrument Type</b>
1	Drain Level High	Level Switch – Insertion Float
2	Discharge Level High	Level Switch – Insertion Float
3	Discharge Temperature	Temperature Element (RTD) with Temperature Transmitter

6. Silencers

<b>No.</b>	<b>Instrument Service Description</b>	<b>Instrument Type</b>
1	Discharge Pressure	Pressure Indicating Transmitter

7. Feed Valve and Waste Valve Manifolds

No.	Instrument Service Description	Instrument Type
1	Flow for each feed valve and waste valve	Rotameter

8. Sampling Manifolds

No.	Instrument Service Description	Instrument Type
1	Sample Flow for each sample line and return line	Rotameter

9. Adsorbers

No.	Instrument Service Description	Instrument Type
1	Adsorber Inlet Pressure	Pressure Indicating Transmitter
2	Adsorber Discharge Pressure	Pressure Gauge
3	Adsorber Discharge Pressure Low	Pressure Switch
4	Adsorber Differential Pressure	Pressure Differential Indicating Transmitter
5	Adsorber Bed Bottom Temperature	Temperature Element (RTD) with Temperature Transmitter
6	Adsorber Bed Top Temperature	Temperature Element (RTD) with Temperature Transmitter

10. Oxygen Receiver/Surge Tanks

No.	Instrument Service Description	Instrument Type
1	Oxygen Receiver Pressure	Pressure Indicating Transmitter

11. Oxygen Product Supply

No.	Instrument Service Description	Instrument Type
1	Product O2 Flow	Thermal Mass Flowmeter OR Flow Conditioning Orifice Flow Element
2	Product O2 Temperature	Temperature Element (RTD) with Temperature Transmitter

<b>No.</b>	<b>Instrument Service Description</b>	<b>Instrument Type</b>
3	Product O2 Pressure	Pressure Indicating Transmitter
4	Customer O2 Pressure	Pressure Indicating Transmitter
5	Product O2 Purity	Paramagnetic Oxygen Analyzer

12. Instrument Air Systems

<b>No.</b>	<b>Instrument Service Description</b>	<b>Instrument Type</b>
1	Instrument Air Compressor Discharge Pressure	Pressure Gauge
2	Instrument Air Dryer (Moisture Separator) Pressure (required for all dryers or moisture separators)	Pressure Gauge
3	Instrument Air Filter Pressure Differential Gauge (required for all filters)	Pressure Differential Gauge
4	Instrument Air System Pressure	Pressure Indicating Transmitter

13. VPSA Cooling System (If required)

<b>No.</b>	<b>Instrument Service Description</b>	<b>Instrument Type</b>
1	Aftercooler Cooling Water Inlet Temperature	Temperature Element (RTD) with Temperature Transmitter
2	Aftercooler Cooling Water Outlet Temperature	Temperature Element (RTD) with Temperature Transmitter
3	Cooling Water Pump Inlet Pressure (required for all cooling water pumps)	Pressure Indicating Transmitter
4	Cooling Water Pump Discharge Pressure (required for all cooling water pumps)	Pressure Indicating Transmitter
5	Cooling Water Feed Pressure (required for all cooling water pumps)	Pressure Indicating Transmitter
6	Cooling Water Feed Temperature (required for all cooling water pumps)	Temperature Element (RTD) with Temperature Transmitter



E. Control System Architecture Requirements

1. General Architecture

a. VPSA Control System

- (1) Provide a dedicated VPSA control system for each VPSA unit. The VPSA control system shall have the ability to monitor, control and operate its associated VPSA unit as a standalone VPSA unit.
- (2) VPSA Control system shall be responsible for controlling:
  - (a) VPSA Unit
  - (b) Instrument Air System
  - (c) Cooling Water (if required)

b. Liquid Oxygen Storage and Vaporization (LOX) Control System

- (1) Provide a dedicated LOX Control System as required by Specification Section 11 55 20.
- (2) The LOX Control System shall have the ability to monitor, control, and operate the LOX system as a standalone unit.

c. Oxygen Production Remote Control Panel (OPRCP)

- (1) Provide an Oxygen Production Remote Control Panel. The VPSA Control Systems and LOX Control System shall be connected to the Oxygen Production Remote Control Panel.
- (2) The OPRPC shall be located in the Oxygen Production Facility Main Control Room.
- (3) Oxygen Production Remote Operator Workstation
  - (a) Provide a Remote Operator Workstation (located in the Oxygen Production Facility Main Control Room) providing a view-only node for all VPSA units and the LOX Control System.
  - (b) The Remote Operator Workstation shall have the same HMI software as the VPSA and LOX control systems.
  - (c) Provide a Historian at the Remote Operator Workstation that collects the data from all VPSA units and the LOX system.
- (4) Provide a SCADA network switch that interfaces to the existing plant-wide SCADA system, and to all the VPSA Main Control Panels and the LOX Control Panel.

- (5) Interfaces to all control panels shall use Ethernet/IP communication protocol over single-mode fiber optic cable.
  - (6) The OPRCP shall have a fiber optic patch panel for terminating single-mode fiber optic cables. Single-mode fiber optic patch cables shall be used to connect fiber optic patch panels to equipment internal to the OPRCP.
- d. The VPSA Control System shall be an industrial, ruggedized control system using the following components:
- (1) VPSA Main Control Panel
  - (2) Remote Input/Output Panels (RIO Panels), as required
  - (3) PLC consisting of power supplies, processors, Input/Output (I/O) modules, communication modules and any other required equipment for proper operation of the PLC.
  - (4) Network Switches
  - (5) Media Converters, as required to translate digital communication protocols
  - (6) Uninterruptible Power Supplies (UPS)
  - (7) Human Machine Interfaces (HMI) in the form of a desktop industrial PC Operator Workstation
  - (8) HMI Software
- e. The VPSA Control System and LOX Control System shall interface to process control elements (instruments, sensors, solenoids, valves, blowers, motors, VFDs, etc.) using hardwired signals of the following types. Digital communication interfaces with process control elements are not permitted.
- (1) Analog Inputs (4-20 mADC)
  - (2) Analog Outputs (4-20 mADC)
  - (3) Discrete Inputs (120VAC or 24VDC as required)
  - (4) Discrete Outputs (120VAC or 24VDC as required)
- f. Network and Digital Communication
- (1) All network and digital communications networks shall use Ethernet/IP communication protocol.

- (2) All network and digital communication interfaces shall use single-mode fiber optic cable to connect equipment, control panels and devices.
    - (a) Fiber optic patch panels shall be used to terminate single-mode fiber optic cables entering control panels and enclosures.
    - (b) Single-mode fiber optic patch cables shall be used to make final connections between patch panels and equipment within a control panel or enclosure.
    - (c) Single-mode fiber optic cables, patch panels, connectors and accessories shall meet the requirement of Section 40 93 50, Fiber Optic Cables and Accessories.
  - (3) For digital interfaces connecting equipment within the same building or the same VPSA unit, copper Ethernet/IP cables may be used. Copper ethernet cables shall be a minimum of Cat 6 cables. Cat 6 cable runs shall not exceed 300 feet of cable length. Cat 6 cables shall meet the requirements of Section 26 05 19 – Wires Cables = 600V and Below.
  - (4) Provide separate networks for process control and SCADA communication:
    - (a) Process Control Network: The process control network shall be limited to all equipment within a single VPSA unit and shall provide a dedicated process network switch connection the associated PLC, HMI and digital interfaces to RIO panels.
    - (b) SCADA Network: The SCADA network shall include connections to other VPSA units, the OPRCP and the existing plant SCADA system. The SCADA network shall have its own dedicated network switch that is separated from the Process Control Network.
- g. Referenced Specification Sections: The Specification Sections listed herein contain additional requirements for the VPSA Control Systems. VPSA Control System shall meet all requirements of the Division 40 Specifications.

<b>Component / Equipment</b>	<b>Section</b>	<b>Section Title</b>
Electrical Requirements (cables, wires, conduits, raceways)	Division 26	Electrical Specifications
General System Integration, Control System and Architecture Requirements	40 90 00	Instrumentation for Process Control - Basic Requirements
HMI Graphics Requirements Control Strategy Requirements	40 90 08	Control Strategies
Fiber Optic Cables Patch Panels Connectors Other related accessories	40 93 50	Fiber Optic Cable and Accessories
HMI Workstations HMI Software	40 90 03	Operator Interface Terminals, Operator Workstations and Programming Workstations
Network Communication Devices	40 90 11	Process Control System Network Hardware and Software
PLC Systems	40 90 02	Programmable Logic Controllers – Hardware and Software
Control Panels RIO Panels Enclosures	40 90 05	Control Panels and Enclosures
Panel-mounted equipment	40 90 06	Panel Instruments and Devices
Uninterruptible Power Supply	40 90 09	Process Control System Uninterruptible Power Supply

2. VPSA Main Control Panel (for each VPSA unit)
  - a. Provide a VPSA Main Control Panel constructed of type 316 stainless steel with a NEMA 4X enclosure rating.
  - b. The VPSA Main Control Panel shall contain the PLC, I/O modules, power supplies (120VAC and 24VDC as required), network switches, and UPS.

- c. All control panels and enclosures shall meet the requirements of Section 40 90 05 - Control Panels and Enclosures.
3. RIO Panels
- a. Remote I/O panels can be used and are encouraged for signals that require long cable runs back to the VPSA Main Control Panel and where final control elements are grouped and located in concentrated locations.
  - b. All final control elements shall be hardwired to I/O modules located in Remote I/O Panels.
  - c. Remote I/O panels shall be provided with digital communication modules for transmitting signals to the VPSA Main Control Panel. Digital communication protocol shall be Ethernet/IP.
  - d. Provide individual and dedicated power supplies.
  - e. All RIO panels and enclosures shall meet the requirements of Section 40 90 05 - Control Panels and Enclosures.
4. PLC
- a. PLC systems shall be the latest Allen Bradley CompactLogix 5380 processors (5069-L340ERM) meeting the requirements of Section 40 90 02 - Programmable Logic Controllers – Hardware and Software.
  - b. PLC processors (CPUs) shall have sufficient onboard controller memory and processor speed to support monitoring VPSA plant signals and actual program execution in microseconds.
5. Human Machine Interfaces (HMI)
- a. Provide an individual HMI for each VPSA unit.
  - b. The HMI shall consist of a Windows-based industrial PC workstation running the latest version of the Windows operating system.
  - c. The industrial PC shall have a minimum of 16GB of RAM.
  - d. Provide HMI software that performs advanced control, monitoring, data analytics and alarm prioritization for the associated VPSA unit.
  - e. HMI software shall be the latest version of GE Automation Proficy iFIX.
6. Historian
- a. Provide a Historian for historical data collection.
  - b. The VPSA Historian shall be installed on the Remote Operator Workstation.

- c. Historian shall have advanced graphing, trending and reporting functions built into the software.
- d. The Historian shall have the ability to export data to an external database or Excel spreadsheet.
- e. Historian shall be the latest version of GE Proficy Historian.

7. Plant SCADA Interface

- a. Provide a single plant SCADA interface from the Oxygen Production Remote Control Panel.
- b. The interface to the plant SCADA system shall be Ethernet/IP communication protocol.
- c. At a minimum, signals shall be provided to the plant SCADA system for each VPSA Unit as specified in the subsection titled Control System Input/Output.

8. Control Room

- a. Provide a dedicated control room for each VPSA unit. The VPSA Main Control Panel and HMI Workstation shall be located in the control room. The Control Room will be in the same structure as the Electrical Distribution Equipment, but the Electrical Distribution Equipment must be in a separate room.
- b. Provide an Operator desk for the HMI Workstation.

F. Control System Input/Output

- 1. Refer to Section 40 90 07 - Input/Output List for details on format of information to be provided for each I/O point.
- 2. I/O shall be coordinated with the PLC input and output requirements specified in Section 40 90 02 - Programable Logic Controllers – Hardware and Software.
- 3. Each VPSA Control System shall at a minimum have the following I/O points available for monitoring and control for each of the following subsystems. Provide I/O list listing all equipment with the actual monitoring and control I/O points provided.
  - a. Feed Air Inlet Silencer

No.	I/O Description	I/O Type
1	Feed Air Inlet Silencer Inlet Pressure	AI
2	Feed Air Inlet Silencer Outlet Temperature	AI
3	Feed Air Inlet Silencer Outlet Pressure	AI

b. Feed Blower

No.	I/O Description	I/O Type
1	Feed Blower Vibration	AI
2	Feed Blower Low Oil Level	DI
3	Feed Blower Discharge Pressure	AI
4	Feed Blower Discharge Temperature	AI
5	Feed Blowers Motor Vibration	AI

c. Aftercooler

No.	I/O Description	I/O Type
1	Aftercooler Drain High Level	DI
2	Aftercooler Discharge Temperature	AI
3	Aftercooler Discharge High Level	DI
4	Aftercooler Cooling Water Valve Position Command	AO
5	Aftercooler Discharge Drain Valve Close Command	DO

d. Actuated Valves

No.	I/O Description	I/O Type
1	Open/Close Command	DO
2	Opened Status	DI
3	Closed Status	DI

e. Flow Control Valves

No.	I/O Description	I/O Type
1	Position Command	AO
2	Opened Status	DI
3	Closed Status	DI
4	Fault Status	DI

f. Adsorbers

No.	I/O Description	I/O Type
1	Adsorber Inlet Pressure	AI
2	Adsorber Differential Pressure	AI

No.	I/O Description	I/O Type
3	Adsorber Bed Bottom Temperature	AI
4	Adsorber Bed Middle Temperature	AI
5	Adsorber Bed Top Temperature	AI

g. Vacuum Blowers

No.	I/O Description	I/O Type
1	Vacuum Blower Vibration	AI
2	Vacuum Blower Low Oil Level	AI
3	Vacuum Blower Discharge Pressure	AI
4	Vacuum Blower Discharge Temperature	AI
5	Vacuum Blowers Motor Vibration	AI

h. Oxygen Receiver

No.	I/O Description	I/O Type
1	Oxygen Receiver Pressure	AI

i. Product O2

No.	I/O Description	I/O Type
1	Product O2 Flow	AI
2	Product O2 Temperature	AI
3	Product O2 Pressure	AI
4	Product O2 Purity	AI

j. VPSA Cooling System (if required)

No.	IO Description	IO Type
1	Aftercooler Cooling Water Inlet Temperature	AI
2	Aftercooler Cooling Water Outlet Temperature	AI
3	Cooling Water Pump Inlet Pressure (required for all cooling water pumps)	AI
4	Cooling Water Pump Discharge Pressure (required for all cooling water pumps)	AI
5	Cooling Water Feed Pressure (required for all cooling water pumps)	AI
6	Cooling Water Feed Temperature (required for all cooling water pumps)	AI



No.	IO Description	IO Type
7	Cooling Water Pump Running (required for all cooling water pumps)	DI
8	Cooling Water Pump Failure (required for all cooling water pumps)	DI
9	Cooling Water pump Run Command (required for all cooling water pumps)	DO

k. Instrument Air Compressor

No.	I/O Description	I/O Type
1	Instrument Air Compressor Running	DI
2	Instrument Air Compressor Alarm	DI
3	Instrument Air Compressor Shutdown	DI
4	Instrument Air Compressor Start/Stop	DO

2.20 OXYGEN GENERATION SYSTEM CONTROL AND MONITORING

- A. The VPSA main control panel contains the required electrical utilities, instrumentation, PLC and HMI to control, monitor and alarm the operation of the VPSA. Each VPSA shall be controlled by a separate VPSA main control panel. Each VPSA main control panel shall be located within the pre-engineered electrical equipment enclosure in a Control Room separate from the Electrical Equipment Room.
- B. Each VPSA train shall be monitored and controlled by a dedicated VPSA Control System PLC, with control of the VPSA equipment via local Human Machine Interface (HMI) mounted on the face of the control panel. Each VPSA Control System shall provide comprehensive monitoring signals to the Plant control system via the communication interface.
- C. The HMI shall have the following readouts as a minimum:
1. Volumetric percent oxygen purity
  2. Oxygen flow
  3. Oxygen temperature
  4. Oxygen pressure
- D. HMI functionality shall include the following:
1. Normal start-up of the system.
  2. Monitoring and controlling the operation of the process valves.
  3. Monitoring signals coming from sensors, transmitters, flowmeter, oxygen analyzer and pressure indicators; displaying these variables on the appropriate HMI screen page.
  4. Displaying status of all major VPSA equipment on the HMI.

5. An alarm system to indicate malfunctions in the VPSA Oxygen Generating System as well as system shutdown capabilities.
  6. The VPSA HMI can be monitored (with Customer permission) remotely at the Seller's main engineering center.
- E. The HMI shall have provisions for manual control of the feed air blower and waste gas vacuum blower.
- F. Safety-related permissives and shutdowns shall be active during both manual and automatic control.
- G. As a minimum the following signals shall be provided from each VPSA to plant SCADA (analog signals shall be 4-20 mAdc):
1. Oxygen purity
  2. Oxygen flow
  3. Oxygen temperature
  4. Oxygen pressure
  5. General failure alarm
  6. High blower and vacuum blower differential temperature alarm
  7. High differential pressure on intake filter
  8. High blower differential pressure alarm; positive displacement type blower
- H. The VPSA control panel shall be floor-mounted, freestanding, and complete with integral four-sided mounting base with front recess. Each VPSA control system shall accept a hard-wired fail-safe shutdown signals from the following sources:
1. E-stop buttons adjacent to each blower and cooling water pump motor
- I. Upon activation of any shutdown command or activation of the E-stop push button, the VPSA control system shall shutdown all rotating equipment and close the VPSA outlet valve.
- J. Each VPSA Control System shall be capable of operating independently of the other such that failure of one VPSA Control System shall not impact the other VPSA Control Systems.
- K. In general, the VPSA shall be controlled as follows:
1. Pressure Control
    - a. Control of the VPSA product flow is accomplished with pipeline pressure control. A pressure indicating transmitter provides a pipeline pressure signal to the VPSA PLC configured PID control (PIC) and modulates the position of a control valve with the goal of maintaining a pipeline pressure near set point.

- b. Because of the inherent pressure changes in the low-pressure receiver (typically 3 to 5 psig) there are corresponding flow changes as well. The VPSA PLC shall average the gas flow from the VPSA to provide more stable control parameters. The VPSA pressure/ flow control system performs all its functions based on a ~ 50 second flow average (the approximate time for a full VPSA cycle).

## 2. Flow Limit Control

- a. A flowmeter measures the total flow of product gas from the VPSA. This cycle average measurement is provided to the PLC configured PID control (FIC) and compares cycle average oxygen flow against a set point of VPSA maximum design flow capacity. If the total flow of product gas demanded by the WWTP process attempts to exceed the set point, then the PIC control shall throttle a control valve to limit the VPSA flow to the maximum design set point. Please note that during this event where the customer's process is attempting to demand VPSA flow in excess of design capacity, that the pressure control is overridden, and the flow limit is the controlling variable.

## 3. VPSA Turndown

- a. VPSA turndown is performed in the PLC with the input of the total gas flow being used by the process as compared to the VPSA design capacity. As the cycle average flow demand by the process decreases to less than full design, the VPSA unload cycle step time is increased. This increase in unload time is proportional to the reduced flow VPSA design capacity to allow for the proper amount of oxygen gas to be withdrawn from the low pressure tank.

- L. Product gas purity is continuously measured by an oxygen concentration analyzer and monitored by the VPSA PLC. If the purity decreases to less than the setpoint and alarm shall sound, and an alarm signal shall be initiated.
- M. During VPSA start-up, the gas shall not be discharged into the product line until the oxygen meets the required concentration, purity and dew point. If the process requirements are not met after 15 minutes an alarm shall be initiated. If the process requirements are not met after 30 minutes, the VPSA train shall automatically shut- down and an additional alarm initiated. VPSA design shall enable start-up of a cold standby unit to produce oxygen of quality meeting minimum dew point in less than 15 minutes.
- N. Pushbuttons for emergency shutdown of the entire VPSA train, regardless of positions of the local/remote hand switches, shall be provided at the VPSA. Additional controls or startup/shutdown modes required or recommended by the Seller shall be provided.
- O. Emergency stop arrangements shall result in the equipment failing safe without risk of damage to any of the equipment.

- P. The Oxygen Generation System shall utilize multiple VPSA plants to deliver the oxygen required by the process. The system shall ramp up and down the production of the online VPSA's to meet the system demands. The system will recommend starting and stopping VPSA's but will not automatically start or stop a VPSA. When multiple VPSA's are online at the same time, a lead/lag hierarchy shall be created for all online plants. The lead lag scheme shall be based upon different pressure set points for each VPSA, such that the lowest lag VPSA plant shall throttle first. The LOX system shall be activated at a pressure set point lower than that of all active VPSA plants.

## 2.21 CLOSED LOOP AIR COOLED DRY-TYPE COOLING SYSTEM

- A. The Seller shall provide an air-cooled dry-type cooling system where required by the Seller to cool the molecular sieve and blower lube oil. The cooling system shall utilize a 50% propylene glycol/water mixture ratio to maintain the design molecular sieve bed temp and blower lube oil temp. A separate cooling system shall be provided for each VPSA plant.
- B. Design Cooling Load: Per manufacturer's submitted cooling load calculations for cooling the molecular sieve beds and blower lube oil.
- C. Heat Exchanger: Each cooling system shall contain a heat exchanger which meets the following criteria:
  - 1. Heat exchanger shall conform to ASME Boiler and Pressure Vessels Code with U Stamp.
  - 2. The coil shall be made of seamless copper tubes that are mechanically expanded into corrugated full collared aluminum fins.
  - 3. The coil shall be helium leak tested and pneumatically pressure tested to 400 psi.
  - 4. The cabinet shall be constructed of galvanized steel, which is bolted, riveted, and reinforced by heavy gauge die-formed members.
  - 5. The heat exchanger shall include direct drive fan(s) with weather protected fan motor(s) incorporating automatic thermal overload protection, copper headers with Outside Diameter Sweat (ODS) connections and drain and vent valves.
  - 6. Fan motor(s) shall be wired to a distribution block mounted in a NEMA 4X panel located on the air-cooled heat exchanger.
  - 7. Fan cycling capacity control shall be located in the control panel on the pump skid. Fan sections shall be partitioned to prevent air bypass for greater efficiency. Quiet multi-bladed propeller fan(s) shall provide uniform air distribution throughout the coil surface.
  - 8. Standard support legs shall be shipped loose with the heat exchanger for field mounting.

- D. Trim Cooler: The cooling system shall contain a shell and tube heat exchanger to serve as a trim cooler. Trim cooler shall be fully mounted and piped onto the pump skid with a temperature control valve.
- E. Pump and Control Unit: The pump and control unit shall consist of a combination vent and surge tank; close-coupled centrifugal circulating pump; trim cooler with temperature control valve; full capacity standby pump; service valves; and an electrical control panel, all mounted on a structural steel frame with a solid steel deck. All carbon steel piping; one temperature gauge on the supply to the equipment, one temperature gauge on the return from the equipment, each provided with a thermowell; one pump suction pressure gauge, one pump discharge pressure gauge, each provided with a gauge cock; isolation valves for the pump(s); and wiring shall be included within the confines of the pump skid. An emergency stop button shall be located within reach of each pump.
- F. Tank: The vent and surge tank shall be designed with sufficient volume to accommodate the closed loop fluid thermal expansion, shall separate air and liquid, and cushion the surge of water when starting and stopping the system. The tank shall include a gauge glass, manual vent valve, fill connection, and drain valve.
- G. Circulating Pump: The circulating pump shall be a close-coupled centrifugal pump with the impeller, motor speed, and motor power selected such that the pump does not overload the motor anywhere along the manufacturer's pump curve. The pump motor shall be TEFC. The pump shall be piped and installed such that it can be isolated and removed. The piping shall not induce any stress on the pump. Each pump shall include isolation valves to allow for pump service with minimum coolant loss. An emergency stop button shall be located within reach of each pump.
- H. Electrical Controls: Controls shall include the following:
1. An electrical enclosure shall include IEC motor starter protectors with an integrated circuit breaker, contactor, and overload protection for the circulating pump(s). This enclosure shall be located with the Electrical Room of the Electrical Equipment Enclosure as specified in Specification Section 26 23 16. Fan motors shall include individual, automatic thermal overload protection and be grouped and thermostatically operated with a contactor protected by a multipole circuit breaker. A single point 460/3/60 electrical power feed connection to a power distribution block shall be provided.
  2. A local control panel shall be provided adjacent to the circulating pumps and fans. The local control panel shall be a NEMA 4X enclosure. Controls shall include a 115/1/60 control voltage transformer, power on light, Hand-Off-Auto selector switch for the circulating pump(s), thermostatic fan cycling controls, and Hand-Off-Auto selector switch for the fan(s). The electrical panel shall only utilize UL listed or UL recognized electrical components and shall be designed and fabricated in accordance with the latest revision of UL 508A as certified by ETL.

I. Alarms and Devices: The following alarms and devices shall also be provided at a minimum at the local electrical panel.

1. Alarm Horn/Silence Pushbutton
2. Low Liquid Level Alarm
3. Low Flow Alarm
4. High Temperature Alarm
5. Motor Failure Alarm
6. Main Panel Disconnect Switch
7. Pump Motor Disconnect Switch
8. Fan Motor Group Disconnect Switch

## 2.22 INSTRUMENT AIR SYSTEM

A. The Seller shall provide an instrument air system, and all required auxiliary piping, fittings, connections, devices, sensors, and controls required to operate each VPSA plant. The instrument air systems shall each be housed in an enclosure within the blower enclosure of each plant. The instrument air system for each plant shall contain at a minimum:

1. Oil-flooded rotary screw compressor of the size required to power the VPSA plant, and one standby rotary screw compressor. Each compressor shall be housed in a sound enclosure with a manufacturer provided HMI.
2. Receiving tank(s)
3. Pressure swing adsorber (desiccant) dryer system with a design dew point of -40 °F.
4. Any other accessories deemed necessary by the Manufacturer for a robust reliable instrument air system.

## 2.23 LOX STORAGE AND VAPORIZATION SYSTEM

A. The Seller shall be responsible for the procurement, programming, and incorporation of the LOX Storage and Vaporization System as specified within Specification System 11 55 20 - Liquid Oxygen Storage and Vaporization System.

## 2.24 ELECTRICAL EQUIPMENT

A. Electrical equipment associated with the VPSA and liquid oxygen system shall be provided by the Seller as required by Division 26 Specification Sections.

## PART 3 - EXECUTION

Services included in Sections 3.01 to 3.05 are to be included in the Supplier's Lump Sum cost. Additional services, when requested in writing, will be performed at a unit price basis utilizing the unit costs from the Seller's cost proposal form.

### 3.01 SHOP TESTING

- A. Shop testing shall be performed by the Seller in accordance with their standard practices, or the minimum requirements listed below. The Seller shall submit a signed statement that the equipment has been tested in accordance with their standard shop testing procedures and meets all the performance and quality requirements.
- B. The following shop tests shall be performed at a minimum:
  - 1. Each blower shall be shop tested for volumetric performance and acceptable vibration levels.
  - 2. Switching valves shall be tested and set after skid assembly.
  - 3. All skids, main control panel, and remote I/O panels shall be completely checked out point to point for factory-assembled wiring.
  - 4. All skid-mounted instrumentation shall be verified and tested.

### 3.02 INSTALLATION SUPERVISION

- A. As described in Attachment E P-00500 10.2.B.1, The Contract will be executed in the name of Buyer initially and will be assigned to an Installation Contractor designated by Buyer. The assignment to the Installation Contractor will occur on the effective date of the agreement between Buyer and the Installation Contractor, which is expected to occur approximately 540 calendar days after execution of the Contract between the Buyer and the Seller. As of the date of acceptance of assignment by the Installation Contractor, all references in the Contract Documents to BUYER shall mean the designated contractor whose responsibilities will include the incorporation of the Goods.
- B. Installation Supervisions Services shall be provided as described in Attachment C – Cost Proposal Forms - Manufacturer’s Services.

### 3.03 FIELD SERVICES

- A. General Requirements
  - 1. The Seller shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish all equipment and supervise check-out, start-up and field testing of the equipment.
  - 2. The Seller shall supervise check-out, testing and start-up of all system components. As part of these services, the Seller shall include for those equipment items not manufactured by him the services of an authorized manufacturer’s representative to check the equipment installation and place the equipment in operation. The manufacturer’s representative shall be thoroughly knowledgeable about the installation, operation and maintenance of the equipment.

## B. Start-Up and Commissioning

1. The Seller and other suppliers as applicable, shall perform the following:
  - a. Check and approve the installation of all components and all connections between the various system components prior to placing the various processes and equipment into operation.
  - b. Conduct a complete system checkout and adjustment, including calibration of all instruments, tuning of control loops, checking operation functions, and testing of final control actions. When there are future operational functions included in this work, they should be included in the system checkout. All problems encountered shall be promptly corrected to prevent any delays in start-up of the various unit processes.
2. The Seller shall provide all test equipment necessary to perform the testing during system checkout and start-up.
3. The Seller shall be responsible for initial operation of the System and shall make any required changes, adjustment or replacements for operation, monitoring and control of the various processes and equipment necessary to perform the functions intended.
4. The Seller shall furnish to the Engineer certified calibration reports for field instruments, devices, and panel mounted devices specified as soon as calibration is completed.
5. The Seller shall furnish the Engineer an installation inspection report certifying that all equipment has been installed correctly and is operating properly. The report shall be signed by authorized representatives of the Seller.

## C. Performance Test

1. The ability of each VPSA plant to satisfy the performance guarantees and to operate as specified shall be determined based on performance tests to be carried out for the periods of time specified herein. Each VPSA plant shall run continuously during the entire testing period. The tests shall be conducted within one month after commencement of operation of each VPSA unit. Immediately prior to commencement of performance tests, all system piping, valves and equipment shall be cleaned and leakage tests performed as required.
2. Each oxygen generation plant shall be tested independently.
3. Ninety (90) days prior to scheduled start-up of the first VPSA plant, the Seller shall submit the procedures he intends to use in conducting the performance tests. This submission shall include the proposed method of calculating the adjustments to be applied to the test data to correct readings to specified ambient conditions. Testing shall not begin without the approval of the test procedures.



4. After the initial VPSA plant operations indicate that the Oxygen Production Guarantee and Power Demand Guarantee can be fulfilled, the Seller shall notify, in writing, of the proposed test run of the plant. Within 15 calendar days after issuing the notice, the Seller shall commence a test run, provided that, for a period of eight hours immediately prior to the commencement thereof, plant operations have been stabilized at operating conditions.
5. All test runs shall be conducted by the Seller using metering equipment installed in the VPSA plant, with additional required equipment supplied by the Seller. The results thereof shall be calculated with adjustments for variations in atmospheric pressure, air temperature, relative humidity and cooling water temperature, in accordance with the Seller's approved standard procedures. After commencing any test run, the Seller shall continue it to completion, unless prevented by conditions beyond control or unless it is mutually agreed that the results of such a test run would not be sufficient to demonstrate fulfillment of the Oxygen Production Guarantee and Power Demand Guarantee.
6. Any unscheduled shutdowns due to equipment failure, hazardous conditions, operational errors or adjustments shall require that the problem be rectified and the test period restarted.
7. The Seller shall verify, to his own satisfaction and to the satisfaction of the Engineer, that all instrumentation used in taking official measurements has been correctly calibrated.
8. The electrical energy readings shall be taken from watt-hour meters furnished and installed by the Seller.
9. Performance tests shall be made to demonstrate that the following specific requirements have been fulfilled:
  - a. Oxygen Production Guarantees. The Seller guarantees that the VPSA plant, when operated in accordance with the Seller's operating instructions, under the design ambient conditions set forth, and in accordance with the procedure set for herein, will be capable of producing the following:
    - (1) The approved rated capacity of the plant comprising its intended portion of the 500 TPD of the Oxygen Generation System (contained at a minimum purity of 93 percent by volume) with a minimum delivery pressure of 4.5 psig at the discharge valving. Guarantee turndown capacity is at least 50% of the rated capacity for the plant.
  - b. Power Demand Guarantee. The Seller guarantees that the electric power demand of the VPSA plant when producing gaseous oxygen at 100 percent capacity will not exceed 8.5 kW/ton.
10. Performance tests shall be conducted by the Seller to demonstrate that specific requirements have been met.

11. Throughout the entire performance test period, various items shall be measured or analyzed as called for in the approved test procedure and as requested by the Engineer. The following table lists the locations where official measurements shall be taken.
  - a. Oxygen gas production: at plant discharge to common production pipeline
  - b. Oxygen gas pressure: at plant discharge to common production pipeline
  - c. Oxygen gas purity: at oxygen production facility
  - d. Oxygen gas temperature: at existing pipeline connection to the aeration tanks

D. Performance Test Provisions

1. Three 24-hour tests for the plant shall be conducted to determine the various oxygen production rates and the actual power demands of the oxygen generation plant when operating at 100 percent capacity, 75 percent capacity and 50 percent capacity as described above for oxygen production guarantees. Instrument readings shall be recorded every four hours during the tests and minor adjustments will be permitted to maintain the required production rate. Electrical energy consumption shall be measured at the motor starters or feeder circuit breakers for the blowers and cooling water pumps if applicable.
2. Occurrence of any of the following shall nullify any 24-hour test and require that it be re-run:
  - a. Product pressure or purity falling below the minimum specified.
  - b. Oxygen generation plant shutdown.
  - c. Variation in the total 24-hour production more than 5 percent of the design point production.
3. At the successful conclusion of each 24-hour test the average power demand shall be determined by dividing the total energy usage in kilowatt-hours by 24. Adjustments to the guaranteed power demand for atmospheric conditions and actual production shall be made using the Seller's approved production curves. At the end of the test period, the power demand and oxygen production figures for the three tests shall be averaged to determine compliance with the oxygen production and power demand guarantees.
4. In the event that the VPSA plant does not successfully pass any performance test, the Seller shall make such alterations, additions and corrections as are required to enable the plant to fulfill the Oxygen Production Guarantee and Power Demand Guarantee and any additional performance requirements specified herein. All additional costs incurred in redesigning, repairing, replacing or reconstructing the plant or parts thereof shall be borne by the Seller. The Seller shall have no more than 15 days after the start of the test

period to make modifications to the plant prior to retesting. Should the plant again fail the performance tests, the Seller shall have the option of:

- a. Making, within a period of 15 days from the start of the second performance test, further modifications, at no additional expense to the Owner, in order to make the plant comply with the performance guarantees and specific requirements or,
- b. Delivering the plant “as is” and making payment of penalty damages as set forth in Section 3.04 below.
- c. If the Seller elects to make further modifications and the facility fails a third performance test, the Seller shall make payment of penalty damages as specified below and deliver the facility to the PVSC as is, provided that the oxygen generation system has successfully demonstrated an ability to generate gaseous oxygen within 10 percent of the guaranteed values at maximum gas production and at maximum turndown.

E. Acceptance Test

1. Following the checkout and initial operation of each plant the Seller shall perform a complete system test to verify that all equipment, instruments, and controls of the plant are operating properly as a fully integrated system. Any defects or problems found during the test shall be corrected by the Seller and then re-tested to demonstrate proper operation.
2. Following the demonstration of all system functions, each VPSA plant shall be running and fully operational for a continuous 168-hour period. During this period, the system shall be automatically operated from full capacity to minimum turndown.

3.04 PENALTY DAMAGES

- A. The Seller shall pay penalty damages to the Owner for “Failure to Meet Oxygen Generation” or “Failure to Meet Total Power Consumption” as specified below. Penalty damages will be paid if failure to meet the specified oxygen production, purity, and power demand guarantees is due to the design, manufacture or installation of work, materials, equipment or systems furnished, installed, repaired or rehabilitated as part of this Contract. Penalty damages will not be paid if failure to meet the specified guarantees is due to the performance of existing equipment not repaired or rehabilitated as part of this Contract.

B. Failure to Meet Oxygen Generation

1. The Oxygen Generation performance guarantee shall encompass the design criteria for Oxygen Rated Flow and Oxygen Purity by analyzing the mass flow of oxygen produced in comparison to the calculated value from the design criteria. In the event a VPSA plant fails to meet the performance guarantees during a second performance test after the Seller has made alterations, additions or corrections, and the Seller elects to deliver the facility as is under

the Seller's second option or in the event that the facility fails a third performance test, the Seller shall make payment to the Owner penalty damages in accordance with the following procedure, but not to exceed \$5,500,000:

- a. With respect to the Oxygen Production Guarantees, should the total quantity of contained oxygen gas generated by the modified oxygen generation facilities be less than the guaranteed amounts of GOX at maximum gas production at maximum turndown, or should the facility fail to reach the guaranteed GOX production at maximum turndown, the Seller shall pay the Owner as a penalty the following:
  - (1) Penalty Damages for the Maximum rated GOX Production of a VPSA plant: The shortcoming to the rated capacity of the plant (in TPD) times .5 occurrence factor times \$190.00 per ton times 365 days per year times 17.41 present worth factor (PWF) equals the penalty damages amount.
  - (2) Penalty Damages for GOX Production at Maximum Turndown of a VPSA plant: The differential between guaranteed turndown capacity and tested turndown capacity (in TPD) times \$190.00 per ton times .5 occurrence factor times 365 days per year times 17.41 PWF equals the penalty damages amount.

C. Failure to Meet Total Power Consumption Guarantees

1. Penalty damages will be assessed and levied on the Seller if, as a result of the Performance Verification Tests, actual consumptions of electricity exceed those guaranteed by the Seller.
2. Penalty damages will be assessed and levied based upon the present worth of the difference between the Actual Total Adjusted Electrical Power Consumption and the Guaranteed Total Adjusted Electrical Power Consumption. An average electrical power cost of \$0.1214/kWh and a present worth factor of 17.41 are used in the calculation.
3. Since the Oxygen Generation System is powered by supply and vacuum blowers, the power consumption must be calculated rather than measured. The calculation shall be done at the maximum GOX production performance point and at the maximum turndown performance point. The calculation shall be based on the blowers' actual performance curves with adjustments for atmospheric conditions and actual production rates.
4. Calculation: (Actual Total Adjusted Electrical Power Consumption in kWh/Day/Ton oxygen produced) minus (Guaranteed Total Adjusted Electrical Power Consumption in kWh/Day/Ton oxygen produced) multiplied by (\$0.1214/kWh) multiplied by the rated capacity of the VPSA Plant multiplied by (365 days/year) multiplied by (17.41) = Penalty damages for excess electrical power consumption.

### 3.05 TRAINING

#### A. General Requirements

1. Training shall meet the requirements of Specification 01 79 00 – Demonstration and Training.
2. The Seller shall provide all labor, materials, equipment and incidentals as shown, specified and required to perform and coordinate all required training at times acceptable to the Owner and the Engineer.
3. The Seller shall provide operation, and maintenance training for all equipment as specified herein.
4. For equipment items not manufactured by the Seller, he shall provide for on-site training by an authorized representative of the equipment manufacturer as part of his services. The manufacturer's representative shall be fully knowledgeable in the operation and maintenance of the equipment.
5. The Seller shall be responsible for all costs associated with training and shall provide all required materials including: computers, projectors, simulators, texts and required supplies.
6. A minimum of 18 4-hour training sessions shall be provided to cover all systems, equipment, instrumentation and controls furnished and installed under this Contract.

### 3.06 POST START-UP OPERATIONS AND MAINTENANCE SERVICES

#### A. Four (4) Year Services Contract

1. The Seller shall furnish a detailed, operations, maintenance, parts, service and repair program and experienced staffing available for plant operating support for the oxygen generation system for a period of 4 years. Commencing after completion of commissioning, start-up, testing and training for the Oxygen Generation System, the Services Contract shall include additional training for the operators, implementation of maintenance, service and parts; development and implementation of process and equipment performance optimization procedures; programming services; trouble-shooting; maintenance, service and repair of equipment, instrumentation and control systems, and any other services requested in writing by the PVSC. The cost of parts and materials identified in the Sellers operating maintenance, service and repair program as normal wearing parts requiring replacement within the term of the four-year program shall be included in the lump sum price for the services Contract. Failed parts requiring replacement that have not been identified in the program will be paid for separately by the Owner on an as needed basis. Additional services, when requested in writing, will be performed at a unit price basis utilizing the unit costs from the Seller's cost proposal form.

2. Services shall include:
  - a. Two (2) person days of operations and maintenance services per month during the first year period after start-up, or a total of 24 person days.
  - b. Two (2) person days of operations and maintenance services per month for the second year after start-up, or a total of 24 person days.
  - c. A total of twenty-four (24) person days of operating and maintenance services over the next year period delivered in monthly visits, or as required by the PVSC.
  - d. A total of twenty-four (24) person days of operations and maintenance services over the final year period delivered in monthly visits, or as required by the PVSC.
3. Services under the Services Contract shall be performed in accordance with the requirements of Division 1 and, in addition, shall meet the following requirements:
  - a. All Seller costs associated with providing the specified services, including travel and living expenses for service personnel, shall be included in the Seller's Lump Sum Bid Price.
  - b. As used herein, the term "person days" shall be defined as the hours between 8 a.m. and 4 p.m., local time, Monday through Friday; excluding holidays.
  - c. The service period shall commence upon final acceptance of the Oxygen Generation System by the Owner in accordance with the provisions of the Contract Documents.
  - d. All service personnel shall sign in/out upon entering and exiting plant.
4. All activities shall be documented with service reports which shall identify the equipment being serviced, state the condition of the equipment, describe all work performed and list materials used. A copy of all service reports shall be delivered to the Owner on the day the work is performed.
5. The Seller shall comply with all OSHA and Plant safety regulations governing work described in this Section. The Seller's written safety programs ensuring compliance with all safety requirements shall be kept up to date and in force throughout the Maintenance Service period.
6. The Seller at no time is allowed to shut down or in any way alter the status or condition of operating equipment. The Owner's personnel will make equipment ready for service by the Seller.

END OF SECTION

SECTION 11 55 20

LIQUID OXYGEN STORAGE AND VAPORIZATION SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

- A. The Seller shall provide a single supplier for the design, engineering, furnishing, installation supervision, and programming of the Liquid Oxygen (LOX) Storage and Vaporization System (LOSVS).
  - 1. The work includes the design, engineering, furnishing and; supervision and assistance with start up, testing, and commissioning of a packaged LOSVS, with associated piping and valves, sensors, monitoring, control and alarm systems, and other appurtenances required for a complete operating system as shown on the Drawings and as specified herein. The Seller shall provide an integrated Liquid Oxygen Storage Tank and Vaporizer monitoring and control system that meets the requirements set forth in this specification and will be solely responsible for the operation of the entire system.
  - 2. The equipment to be furnished shall be designed and constructed in accordance with the best practices, methods and codes of the industry. The installed equipment shall operate satisfactorily per the manufacturer's guarantees and the specification contained herein.
  - 3. The Seller shall confirm that the LOSVS shall fit and function within the site footprint designated on the Contract Drawings.
- B. Seller shall provide a factory-trained startup representative to coordinate with the Installation Contractor for proper installation, startup, field testing, performance testing, training, O&M manuals, and commissioning of the system once installed, to insure proper operation. Startup shall include all other adjustments required to properly operate the system.
- C. Field services prior to acceptance, installation certification, and site visits made by the Seller shall be included in this bid.
- D. The LOSVS shall meet the operation, performance, and service requirements specified herein. Equipment items, devices or design features not specified in these documents but necessary to provide a complete, workable and safe LOX storage and vaporization system shall be furnished.

1.02 RELATED SPECIFICATIONS

- A. Section 11 55 10 - Vacuum Swing Adsorption Oxygen Generation
- B. Section 40 90 00 - Instrumentation for Process Control - Basic Requirements

- C. Section 40 90 02 - Programmable Logic Controllers – Hardware and Software
- D. Section 40 90 03 - Operator Interface Terminal, Operator Workstation and Programming Workstation
- E. Section 40 90 04 - Primary Sensors and Field Instruments
- F. Section 40 90 05 - Control Panels and Enclosures
- G. Section 40 90 07 - Input/Output List
- H. Section 40 90 08 - Control Strategies

### 1.03 SYSTEM DESCRIPTION

- A. The LOX Storage and Vaporization System include but not be limited to the following items:
  - 1. One vertical LOX vessel/storage tank
  - 2. Ambient air vaporizers
  - 3. Vacuum insulated piping system
  - 4. Instrumentation and controls including but not limited to local control panel, drivers' information panel, mass flow meters and control valves
  - 5. Truck unloading station
  - 6. One pressure reducing assembly

### 1.04 QUALITY ASSURANCE

- A. Reference Standards
  - 1. American National Standards Institute (ANSI)
  - 2. American Society of Mechanical Engineers (ASME)
  - 3. Section VIII, Division 1 - Rules for Construction of Pressure Vessels
  - 4. ASTM International
  - 5. Compressed Gas Association (CGA)
  - 6. CGA G-4.1 – Cleaning Equipment for Oxygen Service
  - 7. CGA G-4.4 - Industrial Practices for Gaseous Oxygen Transmission and Distribution Piping Systems



8. CGA G-10.1 - Commodity Specification for Nitrogen
9. Institute of Electrical & Electronics Engineer (IEEE)
10. IEEE Standard 519 - Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
11. National Electrical Code (NEC)
12. National Electrical Manufacturers Association (NEMA)
13. National Fire Protection Association (NFPA)
14. NFPA 50 - Standard for Bulk Oxygen Systems at Consumer Sites
15. NFPA 55 - Standard for the Storage, Use, and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers, Cylinders, and Tanks
16. National Safety Council (NSC)
17. Occupational Safety & Health Administration (OSHA)
18. Standard No. 1910.104 - Hazardous Materials - Oxygen
19. Underwriters Laboratories (UL)

B. General

1. Seller of the VPSA system shall assume responsibility for providing a complete and integrated LOX Storage and Vaporization System including design, engineering, furnishing, installation supervision, factory and field testing, training, and post start-up operational services.

C. Seller's Qualifications

1. Conform to the qualifications requirements established in Attachment D, Section P-00400.

D. Warranty

1. Provide warranty as specified in Section 01 78 32 - Warranties and Bonds.

1.05 SUBMITTALS

- A. Shop Drawing submittals are to be in accordance with the requirements of Specification Section 01 33 00 - Submittals. Additional submittals shall be provided as required by Attachment E Exhibit A-1. Shop drawing submittals shall contain the following at a minimum:

1. General layout and installation drawings indicating all process mechanical and instrumentation equipment, piping, and electrical components. Drawings shall be provided which indicate dimensions, weights, structural loads, foundation requirements, and anchor bolting requirements.
2. Electrical schematics, instrument loop diagrams, panel layouts, wiring diagrams, P&IDs, instrumentation sheets, and product data sheets for all equipment being supplied.
3. A complete bill of materials for all equipment.
4. Inspection records for factory cleaned equipment.
5. Material test reports, upon request.

1.06 OPERATIONS AND MAINTENANCE MANUALS

- A. The Seller shall furnish O&M manuals in accordance with Section 01 78 23 - Operation and Maintenance Manuals.

1.07 DELIVERY, HANDLING, AND STORAGE

- A. Product storage and handling requirements shall conform to section 01 66 00 - Product Storage and Handling Requirements.
- B. Equipment shall be packaged at the factory prior to shipment to protect each item from damage during shipment and storage. Containers shall be protected against impact, abrasion, corrosion, discoloration and/or other damages. Clearly label contents of each container and provide information on the required storage conditions necessary for the equipment. Keep the Owner and the Engineer informed of equipment delivery.
- C. Transportation and handling of the equipment and appurtenances shall comply with the requirements of Division 1, requirements of the Seller, and requirements of equipment manufacturers.
- D. Protection of materials and equipment shall comply with the requirements of Division 1 and in accordance with manufacturer's instructions and relevant organization standards. Seller shall notify the Owner and the Engineer of the storage requirements and recommendations for the equipment prior to shipment.

1.08 SPARE PARTS

Furnish all spare parts anticipated to be replaced during the first five years of operation and special tools suitably packaged and indelibly labeled. A recommended spare parts and special tools list including costs shall also be furnished. Spare parts shall contain pressure safety elements, pressure safety valves, seal/rebuild kits for fill and supply valves, and spare gauges. The Seller shall provide a spare fill valve, supply valve, and pressure regulating valve.

1.09 SEQUENCE OF CONSTRUCTION

- A. A general sequence of construction (six stages) is depicted on drawings CS-01 through CS-03.
  - 1. The construction of the LOX System will be no earlier than Stage 2 and will be completed before Stage 4.

PART 2 - PRODUCTS

2.01 LIQUID OXYGEN STORAGE SYSTEM

- A. The LOX storage system shall include all related safety devices, appurtenances and equipment required for operation.
- B. The design of the storage tank shall be based on the following conditions:

Criteria	Value
Number of Tanks	1
Discharge Oxygen Flow rate	Match Single VPSA Unit Flow Rating
Volume Capacity	Equal to the total of 8 hours of VPSA runtime at the maximum Rated VPSA unit capacity
Configuration of Tank	Vertical
Maximum Allowable Working Pressure (psig)	175
Design Temperature (° F)	-320 to 120

- C. The tank shall be a cylindrical, double-walled, insulated cryogenic tank. The inner vessel shall be designed, fabricated, tested, inspected and stamped in accordance with the ASME Pressure Vessel Code, Section VIII, Division 1 and shall be registered with the National Board of Boiler & Pressure Vessel Inspectors. Material shall conform to ASME Section II, Part A, and shall be SA-240 T304 stainless steel or approved equal. The outer vessel (vacuum jacket) shall be constructed of painted carbon steel, designed for full vacuum internal with a safety factor not less than two (minimum collapse pressure of 30 psi) and to support the inner vessel. No code stamp is required for the outer vessel.
- D. The tank shall be provided with a mounting base. Anchor bolts shall be sized by a licensed Professional Engineer of record of the Seller and supplied by the Installation Contractor. The tank and its structural support system shall be designed to withstand all code required wind, snow, seismic and other loads.
- E. The tank shall be provided with an internal vessel pressure relief system consisting of both automatic primary and secondary relief devices and a manual tank vent valve, and an external vessel pressure relief system consisting of an automatic relief device.

- F. The insulation shall be Super-Fiber, or composite insulation in the annular ring and a high vacuum such that the tank boil-off rate shall not exceed 0.10 percent of the tank capacity by weight per day. Boiled-off gaseous oxygen shall be vented to atmosphere.
- G. The tank shall be equipped with a pressure build-up system to maintain the normal LOX storage tank operating pressure at the maximum discharge rate and as required to provide a minimum 4.5 psig discharge pressure from the ambient air vaporizers.
- H. The tank shall be furnished with a liquid withdraw system, a vapor return line from the economizer system, a differential pressure indicator/transmitter, a pressure indicator/transmitter, and both top and bottom fill capability. The differential pressure/transmitter shall measure the differential pressure between the liquid space and the head space. Fill lines shall be sized for a minimum fill rate of 100-gpm and shall be fitted with quick connect couplings for tanker truck delivery of LOX.
- I. A fill station shall be provided at the Truck Unloading Area as shown on the drawing. The fill station shall be securable by locked fence or lockable valves to prohibit operation by unauthorized staff. Fill station shall include the following at a minimum:
  - 1. A CGA connection appropriate for truck unloading
  - 2. Drivers Information Panel
  - 3. Check Valve
  - 4. Drain location with valve
  - 5. Bottom and Top Fill connections and valves
  - 6. Any additional appurtenances considered standard or required for the function of the fill station by the LOSVS Seller.
- J. Internal piping and fittings shall be Type 304 stainless steel and of all welded connections. Valves shall be of all bronze construction, designed and manufactured specifically for use in cryogenic systems. All liquid valves shall have extended stems and bonnets. All piping sections in which liquid oxygen could be trapped by manual or automatic closing of valves shall be protected by safety relief valves. All LOX piping from the tank to vaporizers shall be vacuum insulated piping system.
- K. Details of the control system and list of instruments to be furnished as the package, including instruments that may be furnished by the installation contractor, are specified in Division 40 of these specifications.
- L. The tank shall be provided with hazardous material signage arrangements painted on both ends and both sides following field painting. Each signage arrangement shall be a 10-inch by 10-inch diamond shaped background painted white. The health sign shall be painted blue, the flammability sign shall be painted red, and the reactivity sign shall be painted yellow. All signs shall be 5-inch high. In the diamond-shaped

sign arrangement, the health sign shall be identified at the left, the flammability sign shall be identified at the top, the reactivity sign shall be identified at the right, and the bottom shall be used to identify special hazard. The following numerical grading shall be given to the signs:

M.

Health - "3", Flammability - "0", Reactivity - "0" and "OXY" shall be identified as a special hazard. Example:



Hazard	Value	Description
Health	3	Can cause serious or permanent injury
Flammability	0	Will not burn under typical fire conditions
Instability	0	Normally stable, even under fire conditions
Special	OX	Possesses oxidizing properties

## 2.02 LIQUID OXYGEN VAPORIZATION SYSTEM

- A. Ambient air vaporizers shall be provided for the LOX vaporization system including all related safety devices, appurtenances and equipment required for operation. The vaporization system shall be capable of providing a continuous supply of gaseous oxygen at the maximum rated single VPSA unit flow rate without defrosting for an 8-hour period. The quantity of vaporizers shall be determined by the Supplier to match the flow rate of a single VPSA plant for the indicated duration period.
- B. The design flow rate of the vaporizer system shall be equivalent to the flow rating of a single VPSA system. The quantity and size of vaporizers shall be determined by the LOSVS manufacturer. All LOSVS components other than the truck fill station must fit within the designated LOX Area footprint as shown on the Drawings.
- C. The design of the vaporizers shall be based on the following conditions:
1. Total Production capacity: Equivalent to the flow rating of a single VPSA unit.
  2. Minimum Period of Operation for continuous vaporization at rated flowrate at minimum outdoor ambient temperature and capacity of vaporizer shall be 8 hours.
  3. Normal Operating Pressure (psig): 45
  4. Maximum Allowable Working Pressure (psig): 450
  5. Working Temperature (° F): - 320 to 120
  6. Discharge Gas Temperature (° F): Within 20-degrees of ambient
  7. Discharge Gas Pressure (psi): 4.5

- D. Each vaporizer shall be of all aluminum construction designed per ANSI B31.3, with Type 6061 aluminum alloy welded base frame and Type 6063 aluminum alloy internal and external finned extrusions. Connections between fins and support frames shall be by mechanical means. Welded connections will not be accepted. Thermal expansion and contraction of materials shall be taken into account when designing and fabricating the connections. Lifting lugs shall be furnished on each vaporizer.
- E. Anchor bolts and supporting structure shall be sized by a licensed Professional Engineer of record by the Seller and supplied by the Installation Contractor. Each vaporizer and its structural support system shall be designed to withstand all code required wind, snow, seismic and other loads.
- F. LOX ambient vaporizers must be fabricated and manufactured by the same company as the LOX storage tank manufacturer.

#### 2.03 PRESSURE REDUCING ASSEMBLY AND DISCHARGE

- A. The discharge of the LOX ambient vaporizers will combine with the tank economizer discharge into a single header which will connect to a Pressure Reducing Assembly. The Pressure Reducing Assembly shall include an electrically actuated system isolation valve, pressure gauges on the upstream and downstream sides, and a three-way parallel branch pipeline which includes the following items:
  - 1. a pressure control valve with isolation valves on branch one,
  - 2. a redundant pressure control valve with isolation valves on branch 2, and
  - 3. a bypass pipeline with a normally-closed isolation valve on branch 3.
- B. The three parallel branch pipelines shall join to a common oxygen gas discharge pipeline supplying the main oxygen production pipeline.

#### 2.04 SYSTEM VALVES

- A. Provide valves rated for cryogenic application for all valves that may contact the liquid oxygen flow. Provide extended stems and bonnets for all valves carrying cryogenic liquid. All stainless steel components shall be AISI Type 316 stainless steel unless otherwise noted.
- B. Cryogenic Globe Valves
  - 1. Manufacturers: The following or equal:
    - a. Herose 01341
    - b. Or Approved Equal
  - 2. Design
    - a. Extended stem and bonnet.
    - b. Rated to a working pressure of 275 psig.
    - c. Capable of service between the temperatures of minus 320 degrees Fahrenheit and plus 150 degrees Fahrenheit.
    - d. Cleaned for liquid oxygen service.
    - e. End connections: Butt welded

3. Materials

- a. Seat: PCTFE
- b. Body, Packing Gland, and Bonnet: Stainless steel
- c. Stem: Stainless Steel.
- d. Packing Spring and Washer: Stainless steel.

C. Cryogenic Liquid Oxygen Service Check Valves

1. Manufacturers: The following or equal:

- a. Herose 05414
- b. Or Approved Equal

2. Valve Design

- a. Rated for a minimum pressure of 300 psig.
- b. Capable of service between the temperatures of -325 degrees Fahrenheit and +150 degrees Fahrenheit.
- c. Cleaned for liquid oxygen service
- d. End connections: Butt welded

3. Materials

- a. Body, cap and arm: Stainless steel

D. Cryogenic Temperature Safety Relief Valves

1. Manufacturers: The following or equal:

- a. Rego 9400 Series

2. Materials

- a. Body, seat retainer, adjusting screw, and pipe-away adapter: Stainless steel
- b. Spring: Stainless steel
- c. Seat: PTFE
- d. Clean and package for oxygen service.
- e. Pressure rating: 600 psig, minimum
- f. Pressure relief setting: 150 psig
- g. Temperature rating: -320 to +165 degrees Fahrenheit
- h. Size: 1/4 inch
- i. Provide with candy cane riser tube for each valve.
- j. Minimum capacity at relief pressure: 150 scfm

## 2.05 GASEOUS OXYGEN PRESSURE REGULATORS

### A. Manufacturer: The following or equal:

1. Fisher Controls Company

### B. Design

1. External pilot-operated regulator type with integrally mounted actuator suitable for use in gaseous oxygen system
2. Size: NPS 1
3. Suitable for connections to 1-inch Class 150 stainless steel flanges sized as indicated on the Drawings.
4. Performance Requirements
  - a. Provide regulators suitable for service under upstream pressures equal to and less than 150 psig.
  - b. Output pressure operating range: 10 to 30 psig
  - c. Normal pressure set point: 22 psig or as required
  - d. Maximum pilot supply pressure: 150 psig
  - e. Maximum allowable pressure: 150 psig
  - f. Include an integral filter for the pilot, which will remove particles of diameter greater than 50 microns.
  - g. Provide pressure gauge immediately downstream near the regulator, with the same range as specified for the regulator.
  - h. Required flow rate range: 3 to 200 scfm
  - i. Normal upstream pressure operating range: 50 to 70 psig
  - j. Setpoint shall be capable of being set/changed in the field.
  - k. Provide a travel indicator to indicate the position of the actuator on a scale of 0 to 100 percent.

### C. Materials and Components

1. Main valve body: CF8M Stainless Steel
2. Trim type: Linear
3. Trim material: S41600 stainless steel
4. Trim disk/seat material: NBR
5. Main spring range: 60 to 125 psig
6. Actuator material: Type 304 stainless steel
7. Actuator diaphragm: NBR 17E44
8. Pilot spring range: 3 to 40 psig
9. Pilot body and spring case material: Aluminum
10. Pilot trim material: NBR/stainless steel
11. Pilot diaphragm material: NBR
12. Pilot tubing and fittings materials: Stainless steel



2.06 LIQUID OXYGEN PIPELINE SYSTEM

- A. The liquid oxygen piping between the storage tank and vaporizers shall be a vacuum insulated piping (VIP) system designed and provided by the Seller and installed by the Installation Contractor. The Seller will be responsible for providing supervision of the VIP installation. All VIP shall have flanged connections. Piping integral to the LOX storage tank and supported by the tank including sensors and valves shall be furnished and installed by the Seller. All other piping not noted above shall be provided and installed by the Installation Contractor. All components will be oxygen cleaned in accordance with CGA G-4.1.

2.07 VACUUM INSULATED PIPE

A. Inner Carrier

- 1. Shall be designed and manufactured in accordance with ASME B31.3 - Chemical Plant and Petroleum Piping and latest applicable addenda with X-ray and pressure testing.
- 2. Inner pipe material shall be 304/L Stainless Steel pipe with a minimum wall thickness of 5S per ASTM A312, welded, schedule suitable for the inner line pressure per B31.3.
- 3. Inner pipe fittings, including elbows, tees and reducers, shall be Type 304 stainless steel, ASTM A403/SA403. The fittings shall comply with ASTM B16.9.
- 4. Expansion Bellows shall be located on the outer line. The expansion bellows will be designed to absorb thermal contraction of the inner pipe when operating at low temperatures. Bellows material shall be Stainless Steel, grade 321 or 316L.

B. Vacuum Jacket

- 1. Shall be designed in accordance with ASME Code for Unfired Pressure Vessel, Section VIII for an internal vacuum and external atmospheric pressure with the assembly at ambient temperature.
- 2. Material shall be 304/L stainless steel, ASTM A312 welded pipe, schedule 5 with a bright annealed finish. Jacket sizes are as follows:
  - a. 1/2-inch pipe size inner X 2-inch pipe size jacket
  - b. 1-inch pipe size inner X 3-inch pipe size jacket
  - c. 1-1/2-inch pipe size inner X 3-1/2-inch pipe size jacket
  - d. 2-inch pipe size inner X 4-inch pipe size jacket
  - e. 3-inch pipe size inner X 5-inch pipe size jacket
- 3. Jacket elbows shall be a mitered design. Jacket tees shall be a branch tee design. Elbows and tees will be manufactured from the standard jacket material, 304/L stainless steel, ASTM A312 welded pipe, schedule 5 with a bright annealed finish.

C. Vacuum Annulus

1. The inner carrier shall be supported within the jacket by a support system designed to absorb thermal loads on the inner pipe when partially or completely filled with product, to minimize heat leakage, withstand loading (a, b, and c below) during shipping and loading, and (d) during and after installation.
  - a. Three "G" load applied vertically downward.
  - b. Three "G" load applied vertically upward.
  - c. Two "G" load applied horizontally, longitudinally, or laterally combined with one "G" load vertically downward.
  - d. Meet uniform building code for Zone 4 seismic requirements.
2. The inner line shall be "super insulated" with alternate layers of aluminum foil or double aluminized Mylar and cryogenic grade spacer paper.
3. Each spool shall have molecular sieve and a hydrogen converter installed in the vacuum annulus for the purpose of removing the majority of vacuum contaminants released by out gassing.
4. Each spool shall be equipped with a combination evacuation/relief valve port complete with a Hastings DV-6R vacuum transducer for monitoring the vacuum level without breaking the vacuum annulus.
5. Heat shall be applied during the pumping to accelerate outgassing. Means shall be employed on the vacuum pumping system to prevent oil from back-streaming into the spool vacuum space. Spools shall be sealed at less than 10 microns.
6. All welds shall be leak-tested with a helium mass spectrometer calibrated to a sensitivity of  $1 \times 10^{-9}$  standard cc/second and shown to be leak free.

D. Pressure Ratings

1. Carrier Pipe Design Pressure: 200-psig
2. Annular Relief Setting: 5-psig

E. Manufacturing facility shall have ISO-9001 approved quality system. The quality system must be audited and registered by a certified ISO-9000 inspection agency.

F. Manufacturing facility shall have an ASME "U" stamp certification which indicates the approved implementation of systems and requirements related to the manufacture of ASME pressure vessels.

## 2.08 INSTRUMENTATION AND CONTROL

### A. Instrumentation General Requirements

1. The LOX Storage and Vaporization System Seller shall furnish all instrumentation required for the proper control, monitoring and operation of the LOX Storage and Vaporization Control System.
2. Instrumentation shall meet the requirements of Section 40 90 04 – Primary Sensors and Field Instruments.
3. Instrument Submittals: All instrumentation submittals shall meet the requirements of Section 40 90 04 – Primary Sensors and Field Instruments.
4. Instrumentation shall have a design 20-year service life.
5. All wetted materials shall be selected to be compatible with the process fluid and shall resist corrosion, degradation, and mechanical failure when constantly exposed to the process fluid. Wetted materials shall be selected such that constant exposure to the process fluid shall not adversely impact the performance of the instrument. Instruments shall perform to the stated accuracies, uncertainties and tolerances when constantly exposed to the process fluid for the expected service life of the instrument.
6. The Seller shall be responsible for selecting all instruments for the proper operation of the system. The Seller shall be responsible for specification of all process connections, calibration ranges, design temperatures, design pressures, signal outputs and any other required specifications for the instruments to be installed in the process and connected to the LOX Storage and Vaporization Control System.
7. Provide all required mounting hardware for installing and operating instruments, including but not limited to mounting brackets, fittings, welding, wiring, terminal blocks, power suppliers, signal converters, nuts, bolts and any other required equipment and accessories.
8. All instrumentation, piping, taps, valves, manifolds, mounting hardware and other appurtenances to be placed in oxygen service shall be cleaned for oxygen service in accordance with the Seller's standards and CGA 4.1 Cleaning Equipment for Oxygen Service (latest revision). Packaging of oxygen-clean equipment to maintain cleanliness shall be the responsibility of the Seller.

### B. Instrument Installation

1. Install instrumentation on skids utilizing the below requirements prior to delivery to the site. Installation of instrumentation on site, if applicable, is the responsibility of the Installation Contractor under the supervision of the Seller.
  - a. Provide labor, materials, tools, equipment, supplies and services, and auxiliary devices including, but not limited to,

brackets and mounting hardware to install the instrumentation.

- b. Unless readily accessible for viewing and calibration from floor elevation, do not mount direct reading or electrical transmitters on process piping. Mount on instrument racks or stands or in enclosures near the sensor at a level that permits viewing from floor elevation.
- c. Install the instrumentation and auxiliary devices to be accessible for maintenance. Provide space between instruments and other equipment and piping for ease of removal and servicing. Generally, install instrumentation to be accessible from floor level or grade. Permanent ladders or platforms may be required for instrumentation which must be installed in overhead locations.
- d. Follow additional installation requirements as specified in the individual instrument sections and as recommended by the manufacturer.
- e. Installation of oxygen-clean instrumentation, piping, taps, valves, manifolds, mounting hardware and other appurtenances shall be under the supervision of the Seller to ensure the preservation of cleanliness.

C. Instrument Tagging

- 1. Each instrument shall be assigned a unique alphanumeric identification tag. No two instruments shall share the same tag. The Seller shall provide their standard instrument tagging consistently in all submittals. The Seller shall coordinate with the Installation Contractor to convert and correlate the Seller's tagging nomenclature to PVSC's nomenclature for incorporation into PVSC's asset management system.

D. Minimum Required Instrumentation: The LOX Storage and Vaporization System shall have the following minimum instrumentation.

- 1. Liquid Oxygen Storage Tank

No.	Instrument Service Description	Instrument Type
1	Liquid Oxygen Storage Tank Level	Differential Pressure Transmitter
2	Liquid Oxygen Storage Tank Level	Differential Pressure Gauge
3	Liquid Oxygen Storage Tank Pressure	Differential Pressure Transmitter
4	Liquid Oxygen Storage Tank Pressure	Pressure Gauge

2. Pressure Reducing Assembly

No.	Instrument Service Description	Instrument Type
1	Liquid Oxygen Vaporizer Temperature Switch	Temperature Switch
2	Liquid Oxygen Vaporizer Temperature	Temperature Element (RTD) and Temperature Transmitter
3	Pressure Regulation Manifold Upstream Pressure	Pressure Transmitter
4	Pressure Regulation Manifold Upstream Pressure	Pressure Gauge
5	Pressure Regulation Manifold Downstream Pressure	Pressure Gauge
6	Pressure Regulation Manifold Downstream Pressure	Pressure Transmitter

E. Control System Architecture Requirements

1. General Architecture

a. Liquid Oxygen Storage and Vaporization (LOX) Control System

- (1) Provide a dedicated LOX Control System
- (2) The LOX Control System shall have the ability to monitor, control and operate the LOX system as a standalone unit.

b. Oxygen Production Remote Control Panel (OPRCP)

- (1) The LOX Control System shall be connected to the Oxygen Production Remote Control Panel provided under Section 11 55 10 - Vacuum Swing Adsorption Oxygen Generation system..
- (2) Interfaces to all control panels shall use Ethernet/IP communication protocol over fiber optic cable.

c. The LOX Control System shall be an industrial, ruggedized control system using the following components:

- (1) LOX Main Control Panel
- (2) Remote Input/Output Panels (RIO Panels), as required
- (3) Programmable Logic Controller (PLC), consisting of power supplies, processors, Input/Output (I/O) modules,

communication modules and any other required equipment for proper operation of the PLC.

- (4) Network Switches
  - (5) Media Converters, as required to translate digital communication protocols
  - (6) Uninterruptible Power Supplies (UPS)
  - (7) Human Machine Interfaces (HMI) in the form of a touchscreen panel-mounted industrial PC
  - (8) HMI Software
- d. The LOX Control System shall interface to process control elements (instruments, sensors, solenoids, valves, blowers, motors, VFDs, etc.) using hardwired signals of the following types. Digital communication interfaces with process control elements are not permitted.
- (1) Analog Inputs (4-20 mADC)
  - (2) Analog Outputs (4-20 mADC)
  - (3) Discrete Inputs (120VAC or 24VDC as required)
  - (4) Discrete Outputs (120VAC or 24VDC as required)
- e. Network and Digital Communication
- (1) All network and digital communications networks shall use Ethernet/IP communication protocol.
  - (2) All network and digital communication interfaces shall use single-mode fiber optic cable to connect equipment, control panels and devices.
    - (a) Fiber optic patch panels shall be used to terminate single-mode fiber optic cables entering control panels and enclosures.
    - (b) Single mode fiber optic patch cables shall be used to make final connections between patch panels and equipment within a control panel or enclosure.
    - (c) Single-mode fiber optic cables, patch panels, connectors and accessories shall meet the requirement of Section 40 93 50 - Fiber Optic Cables and Accessories.
  - (3) For digital interfaces connecting equipment within the same building or the same LOX unit, copper Ethernet/IP cables may be used. Copper ethernet cables shall be a minimum of Cat 6 cables. Cat 6 cable runs shall not exceed 300 feet of cable length.

Cat 6 cables shall meet the requirements of Section 26 05 19 - Wires Cables - 600V and Below.

(4) Provide separate networks for process control and SCADA communication:

(a) Process Control Network: The process control network shall be limited to all equipment within a single LOX unit and shall provide a dedicated process network switch connection the associated PLC, HMI and digital interfaces to RIO panels.

(b) SCADA Network: The SCADA network shall include connections to the LOX unit, the OPRCP and the existing plant SCADA system. The SCADA network shall have its own dedicated network switch that is separated from the Process Control Network.

f. Referenced Specification Sections: The Specification Sections listed herein contain additional requirements for the LOX Control Systems. The LOX Control System shall meet all requirements of the Division 40 Specifications.

<b>Component / Equipment</b>	<b>Section</b>	<b>Section Title</b>
Electrical Requirements (cables, wires, conduits, raceways)	Division 26	Electrical Specifications
General System Integration, Control System and Architecture Requirements	40 90 00	Instrumentation for Process Control - Basic Requirements
HMI Graphics Requirements Control Strategy Requirements	40 90 08, 40 96 52	Control Strategies, Configuration Requirements – Human Machine Interface and Reports
Fiber Optic Cables Patch Panels Connectors Other related accessories	40 93 50	Fiber Optic Cable and Accessories
HMI Workstations HMI Software Network Communication Devices	40 90 03, 40 90 11	Operator Interface Terminal, Operator Workstation and Programming Workstation, Process Control System Network Hardware and Software

<b>Component / Equipment</b>	<b>Section</b>	<b>Section Title</b>
PLC Systems	40 90 02	Programmable Logic Controller Hardware and Software
Control Panels RIO Panels Enclosures Panel-mounted equipment UPS	40 90 05, 40 90 06	Control Panels and Enclosures, Panel Instruments and Devices

2. LOX Control Panel

- a. Provide a LOX Control Panel constructed of type 316 stainless steel with a NEMA 4X enclosure rating. The LOX Control Panel shall be located adjacent to the liquid oxygen storage tank and shall be supported separately on a type 316 stainless steel structure.
- b. The LOX Control Panel shall contain the PLC, I/O modules, power supplies (120VAC and 24VDC as required), network switches, UPS, and heater.
- c. All control panels and enclosures shall meet the requirements of Section 40 90 05 - Control Panels and Enclosures.

3. RIO Panels

- a. Remote I/O panels can be used and are encouraged for signals that require long cable runs back to the LOX Control Panel and where final control elements are grouped and located in concentrated locations.
- b. All final control elements shall be hardwired to I/O modules located in Remote I/O Panels.
- c. Remote I/O panels shall be provided with digital communication modules for transmitting signals to the LOX Control Panel. Digital communication protocol shall be Ethernet/IP.
- d. Provide individual and dedicated power supplies.
- e. All RIO panels and enclosures shall meet the requirements of Section 40 90 05 – Control Panels and Enclosures.

4. PLC

- a. PLC systems shall be the latest Allen Bradley CompactLogix 5380 processors (5069-L340ERM) meeting the requirements of Section 40 90 02 - Programmable Logic Controllers – Hardware and Software.



- b. PLC processors (CPUs) shall have sufficient onboard controller memory and processor speed to support monitoring LOX system signals and actual program execution in microseconds.

5. Human Machine Interfaces (HMI)

- a. Provide an individual HMI for the LOX unit.
- b. The HMI shall consist of a Windows-based industrial PC workstation running the latest version of the Windows operating system.
- c. Provide HMI software that performs advanced control, monitoring, data analytics and alarm prioritization for the associated LOX system.
- d. HMI software shall be the latest version of GE Automation Proficy iFIX.

6. Historian

- a. Provide a Historian for historical data collection.
- b. The LOX Historian shall be installed on the Remote Operator Workstation.
- c. Historian shall have advanced graphing, trending and reporting functions built into the software.
- d. The Historian shall have the ability to export data to an external database or Excel spreadsheet.
- e. Historian shall be the latest version of GE Proficy Historian.

7. Plant SCADA Interface

- a. The Oxygen Production Remote Control Panel specified in Section 11 55 10 Vacuum Pressure Swing Adsorption Oxygen Generation System provides an interface to the plant SCADA system.
- b. As a minimum, the following signals shall be provided to the plant SCADA system for the LOX System via the Oxygen Production Remote Control Panel:
  - (1) LOX Storage Tank Level
  - (2) LOX Storage Tank Pressure

F. Control System Input/Output

- 1. Refer to Section 40 90 07 - Input-Output List for details on format of information to be provided for each I/O point.
- 2. I/O shall be coordinated with the PLC input and output requirements specified in Section 40 90 02 - Programmable Logic Controllers – Hardware and Software.

3. The Oxygen Generation, Storage and Vaporization system shall at a minimum have the following I/O points available for monitoring and control for each of the following subsystems. Provide I/O list listing all equipment with the actual monitoring and control I/O points provided.

a. Liquid Oxygen Storage Tank

No.	I/O Description	I/O Type
1	Liquid Oxygen Storage Tank Level	AI
2	Liquid Oxygen Storage Tank Pressure	AI

b. Liquid Oxygen Vaporizer

No.	I/O Description	I/O Type
1	Liquid Oxygen Vaporizer Low Discharge Temperature	DI
2	Liquid Oxygen Vaporizer Discharge Temperature	AI
3	Liquid Oxygen Regulator Upstream Pressure	AI
4	Liquid Oxygen Regulator Downstream Pressure	AI
5	Liquid Oxygen Regulator Manifold Isolation Valve Open	DI
6	Liquid Oxygen Regulator Manifold Isolation Valve Closed	DI
7	Liquid Oxygen Regulator Manifold Isolation Valve Open Command	DO
8	Liquid Oxygen Regulator Manifold Isolation Valve Close Command	DO

- c. Driver Information Panel - Provide the following signals for connection to a type 316 stainless steel NEMA 4X Driver Information Panel provided by the Installation Contractor located adjacent to the liquid truck unloading station and supported on a type 316 stainless steel structure.

No.	I/O Description	I/O Type
1	Liquid Oxygen Storage Tank Level	AO
2	Liquid Oxygen Storage Tank Pressure	AO

- G. Control Narrative: The LOSVS shall be operated via the activation of the pressure control valves. When the pressure of the production pipeline drops below the operator adjustable setpoint for system activation, the pressure control valve shall open and discharge GOX to the production pipeline. The activation of an electrically actuated isolation valve shall have an interlock based upon an operator adjustable temperature set point, to prevent unvaporized LOX from being discharged to the production pipeline in the case of vaporizer freezing. The main control panel shall

relay discharge valve status, all sensors readings, and a temperature fault to the OPRCP.

## 2.09 PAINTING AND CLEANING

- A. Vessel shall be painted white per manufacturer's standard paint system.
- B. Prior to coating, all weld splatter and other irregularities shall be removed by chipping or grinding, and all sharp corners grounded to 1/16 inch minimum radius. All oil and other contaminants shall be removed by solvent washing or steam cleaning.
- C. All tanks and piping interior to be in contact with gaseous and liquid oxygen shall be properly clean with no trace of oil and dirt. Upon thorough cleaning of interior, seal the openings to ensure no re-contamination during transport and shipping.

## 2.10 IDENTIFICATION

- A. The vessel provided shall have a nameplate securely attached at a readily visible location. The nameplate shall be engraved with the following minimum information, in units specified:
  - 1. PVSC equipment number
  - 2. Manufacturer Size and Model Number
  - 3. Equipment Serial Number
  - 4. Rated Pressure (psig)
  - 5. Rated Capacity (gallons or scfh)
  - 6. Manufacturer's bearing identification numbers, if applicable

## PART 3 - EXECUTION

### 3.01 SHOP TESTING

- A. The LOX storage tank shall be hydrotested. The vacuum anulus shall be leak tested with mass spectrometry. All manifold welding shall be examined.

### 3.02 STARTUP AND FIELD TESTING

- A. Furnish the services of a factory representative who has complete knowledge of the proper installation, startup and operation of the LOSVS, to inspect the final installation, certify the installation in writing, and supervise a test run of the system. If there are difficulties in operation of the system due to the manufacturer's fabrication or Installation Contractor's installation, additional service shall be provided at no additional cost to the Owner.
- B. The Installation Contractor shall be responsible for scheduling, ordering and supplying liquid oxygen on site for all required field, performance and startup testing. The Installation Contractor shall coordinate with manufacturer on the amount of liquid oxygen required for the testing.

- C. After the installation of the LOSVS has been completed and approved by the manufacturer's representative and the system operated for a sufficient period to make all desirable corrections and adjustments, the system shall be given a field performance test in the presence of the Owner Representative to determine that operation is satisfactory and in compliance with this Section and that all safety and protective devices are in proper adjustment. During this test period, the system shall be operated for not less than 8-hours, during which time readings of all essential data shall be taken and recorded at 1-hr intervals. A field performance test report, including a test data sheet, shall be submitted to the Owner.
  - D. Submit a Startup Testing Plan to the Engineer for approval at least 30-days prior to testing the equipment. Testing shall include the following:
    - 1. Test the tank fill line to demonstrate that the liquid flow rate meets the minimum specified value.
    - 2. Test each storage tank under actual start-up and operating conditions to demonstrate that operation is satisfactory, that the pressure building system and economizer system are operating properly, that tank pressure is maintained consistently, and that the liquid oxygen boil-off rate does not exceed the specified value. The test data shall indicate, at a minimum, the time and corresponding tank level, pressure and temperature.
    - 3. Test each vaporizer under actual start-up and operating conditions to determine that the operation is satisfactory, that the design vaporization rate is maintained at the design discharge pressure, and that the duration of vaporization to freeze at the design flow rate does not exceed the specified values. The test data shall indicate, at a minimum, the time and corresponding gas flow rate, gas pressure, gas temperature, and vaporizing and defrosting cycle times.
  - E. In the event the equipment fails to meet the requirements specified herein, corrective measures shall be taken, or the equipment shall be removed and replaced with units that meet these specifications and retested at no additional cost to the Owner.
  - F. Electrical, Instrumentation and Control System
    - 1. Testing, startup and commissioning of the Electrical and Instrumentation & Control System shall be in accordance with Division 26 and Division 40 of these specifications.
- 3.03 TRAINING
- A. Provide a minimum of six 4-hour training sessions on safe liquid oxygen storage and vaporization technology, in accordance with Section 01 79 00 – Demonstration and Training.
    - 1. Liquid Oxygen/Gaseous Oxygen Properties: Physical characteristics and behavior of oxygen. Discussion of flashpoint, triple point, critical points, and thermodynamics of oxygen.

2. Liquid Oxygen/Gaseous Oxygen Handling: Discuss safety and practical procedures for the handling and transportation of liquid and gaseous oxygen.
3. Liquid Oxygen/Gaseous Oxygen Process Equipment and Materials: Special equipment and materials need to handle liquid and gaseous oxygen. Discuss items such as cryogenic control valves and storage tank materials, process piping and construction.
4. Liquid Oxygen/Gaseous Oxygen Production and Purity: Discuss technology behind the production and transportation of liquid and gaseous oxygen. Discuss purity and the various items that affect purity. Discuss dew point control and testing.
5. Liquid Oxygen/Gaseous Oxygen Regulations: Regulations pertaining to production, transport, storage and handling of liquid and gaseous oxygen.
6. Applicable Fire Safety and Fire Codes.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 26 05 00

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: General requirements for providing basic electrical materials and methods.
- B. Overall Application of Specifications: This Section applies to all Division 26 sections and to other sections that include requirements for electrical equipment. Irrespective of where the electrical requirements are specified, provide all materials necessary for a complete operational system.

1.02 DEFINITIONS

- A. Corrosive Areas: The following areas are designated corrosive areas:
  - 1. Outdoors

1.03 SYSTEM DESCRIPTION

- A. Design Requirements: Design requirements are specified in the applicable sections.
- B. Performance Requirements: Performance requirements are specified in the applicable sections.

1.04 SUBMITTALS

- A. General: Furnish all submittals, including the following, as specified in Division 01.
- B. Product Data and Information: Furnish a complete list of electrical equipment and materials to be furnished that shows the manufacturer, catalog number, size, type, capacity, voltage rating and other pertinent information related to each item on the list.
  - 1. Furnish catalog data on the manufacturer's standard equipment and materials. Clearly indicate on the catalog data the equipment and devices specifically being proposed.
  - 2. Identification: Furnish a complete listing of system and equipment identification labels with legends.

C. Seller's Shop Drawings: Furnish shop drawings on items manufactured for the Contract.

1. Furnish a connection diagram and schematic for each piece of electrical equipment. A manufacturer's standard connection diagram or schematic showing more than one method of wiring is not acceptable unless, the intended method is clearly marked.
2. Furnish diagrams that show connections to field equipment. Clearly differentiate between manufacturer's wiring and field wiring.
3. Furnish raceway layout drawings that show conduits, boxes, and panels which contain the conductors to be provided. Include schedules listing conduit sizes and conductor content and identification.

D. Working (Installation) Drawings

1. Electronic copies of working (installation) drawings shall be submitted to the Engineer for review, in quantities as specified.
2. The Seller shall prepare working (installation) drawings showing all details of construction, such as dimensioned equipment and conduit layouts, lighting layouts, interconnection wiring diagrams and similar drawings depicting the construction and installation work to be performed. Such drawings shall show all conduit and electrical equipment supports, hangers, foundations, conduit and cable schedules, lighting fixture layouts and circuiting, lighting, power, control, instrumentation, and signal wiring.
3. The working drawings shall be prepared based on certified manufacturer's shop drawings of equipment furnished under this and any other section of the specifications affecting work, equipment and materials to be furnished under this Contract. It shall be the responsibility of the Seller to obtain all related shop and working drawings to properly prepare his working (installation) drawings within the intent of the Specifications.
4. The Seller shall promptly prepare and submit the working drawings on sheets 24 inches by 36 inches with a ½-inch margins on three sides and a 2 inch marginal space for binding on the left side and searchable PDFs at full page size.
5. Drawings shall be numbered consecutively and shall accurately and distinctly present the following:
  - a. All working and installation dimensions
  - b. Arrangement and section views
  - c. Details, including complete information for making connections between work under this and other sections of the Contract.



- d. Units of equipment in the proposed positions for installation and the details of attachments and connections required, with dimensional locations referred to each other and to the structures.
  6. Each drawing shall contain a dated title block in the lower right-hand corner including the name of this project, the contract number and a descriptive title of equipment or work covered by the drawing.
  7. In submitting working drawings for review, all associated drawings relating to complete assembly of various parts necessary for a unit, shall not be submitted until the assembly of drawings is complete, so that these may be checked in relation to the assembly proposed.
  8. Acceptance of a working drawings will constitute acceptance of the subject matter thereof only and not of any other structure, material or apparatus shown or indicated.
  9. All items of electrical equipment constituting an operating system and any mechanical units involved therein or necessary for the functioning of such systems shall be submitted at the same time and shall include elementary wiring diagrams showing circuit functioning and necessary interconnection wiring diagrams for field installation.
- E. Maintenance Manuals: Furnish maintenance manuals, and in addition to the requirements specified in Division 01, include the following information for equipment items:
1. Functional description, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and catalog numbers of replacement parts.
  2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
  3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
  4. Servicing instructions and lubrication charts and schedules.

#### 1.05 QUALITY ASSURANCE

- A. Codes: Provide all electrical Work in accordance with applicable local codes, regulations and ordinances. If there is a conflict between the requirements specified in the Contract Documents and the codes, follow the more stringent requirements as determined and approved.

- B. Testing: As a minimum, provide standard factory tests for each type of equipment. Other tests may be specified in the applicable equipment section.
  - 1. Furnish a copy of the certified factory test reports.
- C. Labeling: Provide electrical equipment and materials that are listed and approved by Underwriters Laboratories or other OSHA recognized testing laboratories with the testing agency's label attached.
- D. Standard Products: Unless otherwise indicated, provide electrical materials and equipment which are the standard products of manufacturers regularly engaged in the production of such materials and equipment. Provide the manufacturer's latest standard design that conforms to these Specifications. Provide the products of the same manufacturer when two or more units of the same class of material and equipment are required.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 01.
- B. Shipping and Packing: Provide materials and equipment suitably boxed, crated or otherwise completely enclosed and protected during shipment, handling, and storage. Clearly label such boxes, crates or enclosures with manufacturer's name, and name of material or equipment enclosed.
- C. Acceptance at Site: Conform to acceptance requirements as required in Division 01.
  - 1. Repair or replace all materials and equipment damaged by handling and storage as directed at no additional Contract cost.
- D. Storage and Protection: Protect materials and equipment from exposure to the elements and keep them dry at all times. Handle and store to prevent damage and deterioration in accordance with manufacturer's recommendations.

#### 1.07 PROJECT CONDITIONS

- A. General: Furnish all electrical elements and devices to form a complete workable system as required by the Contract Documents, regardless of whether all system components are specifically stated in the Specifications or shown.
- B. Schematics: Verify arrangement, equipment locations, and prepare circuit and raceway layouts before ordering materials and equipment.
- C. Coordination of Work: Coordinate the Work so that the electrical equipment may be installed without altering components, other equipment or installations.
- D. Departure from Design: If departures are deemed necessary, provide details of such departures and the reasons for requesting approval as soon as practicable. Do not make any departures without written approval.

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION

### 3.01 ELECTRICAL INSTALLATIONS

- A. General: Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Electrical Installation requirements include all necessary instrument, power and control wiring and raceways integral to any skid furnished under this Contract. This shall include terminal blocks and internal wiring to these terminal blocks for equipment requiring external connection. All skid mounted equipment terminal boxes for external connection shall be installed at the edge of the equipment within 5 feet from the ground. The terminal boxes for external connection shall be located to permit convenient access. All internal conduits and raceways shall be furnished and installed to junction boxes with the exception of motor power feeds, which will be direct connected. Comply with the following requirements:
1. Coordinate electrical systems, equipment, and materials installation with other components.
  2. Coordinate the installation of required supporting devices and sleeves to be set in cast-in-place concrete and other structural components.
  3. Furnish systems, materials, and equipment to provide the maximum possible headroom.
  4. Furnish systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Where coordination requirements conflict with individual system requirements, refer conflict to the Engineer for resolution.
  5. Furnish systems, materials, and equipment level and plumb, parallel and perpendicular to other components.
  6. Furnish electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
  7. Furnish systems, materials, and equipment providing right-of-way priority to systems required to be installed at a specified slope.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 26 05 19

WIRES AND CABLES - 600V AND BELOW

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Requirements for providing all conductors and cables rated at 600 volts and below in accordance with the Contract Documents.
- B. Related work specified in other sections includes, but is not limited to, the following:
  - 1. Section 26 05 00 - Basic Electrical Materials and Methods
  - 2. Section 26 05 53 - Electrical Identification

1.02 REFERENCES

- A. Codes and standards referred to in this Section are:
  - 1. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire
  - 2. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
  - 3. ANSI/TIA/EIA 568-B - Commercial Building Telecommunications Cabling Standard
  - 4. NFPA 70 - National Electrical Code (NEC)
  - 5. ICEA - Insulated Cable Engineers Association
  - 6. UL 2196 - Tests for Fire Resistive Cables

1.03 SUBMITTALS

- A. General: Furnish all submittals, including the following, as specified in Section 26 05 00 - Basic Electrical Materials and Methods.
- B. Product Data and Information: Furnish manufacturer's catalog data for each type of conductor and cable furnished.

1.04 QUALITY ASSURANCE

- A. General: Furnish conductors and cables in accordance with applicable IEEE and NEMA standards and meeting the applicable requirements of the NEC and UL listed.

- B. Tests: Furnish factory tested cables prior to shipment in accordance with ICEA standards for the insulation specified.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle conductors and cables in accordance with the manufacturer's instructions and as specified in Section 01 66 00 - Product Storage and Handling Requirements.
- B. Storage: Store cable reels on concrete, 2x4 wood laggings or other hard surface.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.
  - 1. Conductors and Cables
    - a. Southwire Company
    - b. The Okonite Company
    - c. Prysmian Group
  - 2. Instrumentation Cable
    - a. Belden
    - b. Dekoron Wire and Cable
    - c. The Okonite Company
  - 3. Local Area Network and Data Highway Cable
    - a. Belden
    - b. Alpha Wire
  - 4. Multiconductor Cable
    - a. The Okonite Company
    - b. Southwire Company
  - 5. Wire Connectors
    - a. Thomas & Betts/ABB Group
    - b. 3M/Electrical Products Division
    - c. Ideal Industries

6. Color Coding Marker and tape
  - a. Brady Corporation
  - b. Thomas & Betts/ABB Group
7. Removable Conduit Sealing Compound
  - a. Gardner Bender
  - b. Ideal Industries

## 2.02 MATERIALS

- A. Conductors: Provide soft drawn or annealed copper conductors with 98 percent minimum conductivity, meeting requirements of ASTM B3 (solid) or ASTM B8 (stranded). Use stranded conductors except solid No. 12 and No. 10 AWG may be used in lighting fixture and convenience outlet wiring.
- B. Insulation: Provide conductors and cables with insulation as follows:
  1. Power, control and lighting
    - a. Single Conductor: Provide insulation as follows:
 

(1)	NEC Type	Insulation Material
(2)	XHHW-2	Cross-Linked Polyethylene
    - b. Multiconductor Cables: Insulate individual conductors with 15 mils of polyethylene (PE) or polyvinyl chloride (PVC) and 4-mil nylon jacket. Wrap the conductors with tape binder and an outer jacket not less than 45 mils of PVC. Use ICEA Method 1 for color coding wires.
  2. Instrumentation Wiring: The manufacturers' name and catalog number shown below are for the purpose of establishing quality and general configuration.
    - a. Two conductor or single pair: Stranded No. 18 AWG conductors, 300 volt FEP insulation, twisted conductors, tinned copper drain wire, overlapped metalized tape overall shield providing 100 percent shield coverage, and outer jacket of FEP. Belden Cat. No. 88760.
    - b. Three Conductor: Stranded No. 18 AWG conductors, 300 volt FEP insulation, twisted conductors, tinned copper drain wire, overlapped metalized tape overall shield providing 100 percent shield coverage, and outer jacket of FEP. Belden Cat No. 83653
    - c. Multiple Pairs or Triads: Provide individually shielded pairs or triads of stranded No. 18 AWG conductors with overall shield. Insulate each wire for 300 volts with 15 mils of FEP and a 4-mil nylon jacket. Assemble pairs or triads with tinned copper drain wire and metalized tape shield providing 100 percent shield coverage. Cable pairs or triads together with tinned copper drain wire and overall metalized tape shield.

3. Local Area Network Cable: The manufacturers' name and catalog number shown below are for the purpose of establishing quality and general configuration.
    - a. Category 6: Provide cable having third party verification to TIA/EIA 568-C.2 Category 6 requirements and constructed of four pair of solid No. 23 AWG solid copper wire, polyolefin insulation, film tape separator, and outer jacket of black PVC. Belden Cat. No. 2412.
  4. Data Highway Cable: The manufacturers' name and catalog number shown below are for the purpose of establishing quality and general configuration.
    - a. Twinaxial: Provide stranded No. 20 AWG tinned copper conductors, 78 ohm nominal impedance, 300 volt polyethylene insulation, tinned copper drain wire, overlapped metalized tape overall shield providing 100 percent shield coverage and 55 percent tinned copper braid shield and outer jacket of blue PVC. Belden Cat. No. 9463.
- C. Printed Data on cable outer jacket: Provide the following information printed on the surface of all wires and cables at regular intervals throughout the entire length.
1. Manufacturer or trade name
  2. Size of conductor
  3. Type of insulation
  4. Voltage classification

## 2.03 WIRE CONNECTIONS AND CONNECTING DEVICES

- A. Connectors for No. 10 AWG and Smaller: Provide insulated compression type butt connectors.
- B. Connectors for No. 8 AWG and Larger: Provide UL listed compression type tube connectors for parallel or butt splices. Termination lugs shall be long barrel type to allow double crimping. Provide companion preformed plastic insulating covers or tape to provide insulation equal to conductor insulation.
- C. Miscellaneous Connectors: Provide preinsulated spring connectors for lighting and receptacle splices and pigtails.
- D. Solderless Lugs: Provide solderless terminal lugs for stranded and multiple solid conductors at connection to terminals or use UL listed crimp tool compression style lugs.
- E. Control Wire Terminations: Provide spade lug or pressure type control conductor connection terminations for control wiring terminations. Provide lug bolting at devices or bus bars with a flat washer, a Belleville washer and a locknut.



## 2.04 COLOR CODING

- A. General: Use a vinyl-impregnated cloth tape resistant to oil, dirt, and heat for conductor color coding. Cables shall include continuous color coding from the factory prior to shipment.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Applicability: Installation requirements are applicable to wires and cables provided as part of any skid furnished under this Contract.
- B. General: Swab raceways to be used to clear debris and remove moisture before conductor installation. Install conductors in raceways with no splices between boxes.
- C. Pulling Equipment: Pull conductors using proper equipment without exceeding the manufacturer's recommendation for maximum pulling tension. Protect conductor insulation jacket at all times from twists, kinks, scrapes, punctures and other damage. Replace damaged conductors at no cost to the OWNER. Pull wires and cables into raceways without the use of lubricants, except where such use is necessary and approved by the cable manufacturer and the ENGINEER. Use UL listed lubricating compound compatible with the conductor insulating jacket and with the raceway.
- D. Use lines of nylon or polypropylene, propelled by carbon dioxide, or compressed air, to snake or pull wire and cable into conduits. Do not use flat steel tapes or steel cables.
- E. Conductor Support: Support conductors in vertical risers with woven grips to prevent loading on conductor connectors.
- F. Seals: Provide a removable seal between the conductor and conduit for conduits entering buildings or from areas where the temperature change may cause condensation or moisture. Seal the conduits after the conductors are in place.
- G. Identification: Identify all cables as specified in Section 26 05 53 - Electrical Identification
- H. Color Coded Tape: Apply color coded tape at all terminations and splices with overlapping turns for a minimum length of two inches, starting two inches back from the termination point. Provide color coded tape in all boxes and manholes.
- I. Provide color coding throughout the entire network for service, feeder, branch, control and low energy signal circuit conductors. Use the following color code for conductors.

COLOR CODING					
SYSTEM	PHASE A	PHASE B	PHASE C	NEUTRAL	GROUND
250V and Less	Black	Red	Blue	White	Green
Between 250V and 600V	Brown	Orange	Yellow	Gray	Green
Control and low-energy signal	Red	---	---	White	Green
Gas and Fire Detection Systems	Pink	---	---	---	---
Instrumentation	Red/Black	---	---	---	---
DC circuits	Blue	---	---	---	White with blue stripes

- J. Terminations: Leave a minimum of six inches of free conductor at each connected outlet and a minimum of nine inches at unconnected outlets.
- K. NEC Requirements: Install wiring in accordance with applicable provisions of National Electrical Code, local codes having jurisdiction, and as indicated in the contract document.
- L. Conductor Sizing: Where conductor size is not shown, size conductors in accordance with the NEC, local codes having jurisdiction, and the following:
1. Size for branch lighting circuits so that the greatest voltage drop between lighting panel and center of load does not exceed two percent at rated load.
  2. Size conductors to limit the maximum conductor temperature to less than 75 degrees C, except where specifically stated otherwise.
  3. Use minimum conductor sizes as follows:
    - a. Power and lighting branch circuits, No. 12 AWG
    - b. 120-volt control circuits, No. 14 AWG
    - c. Instrumentation and signal wiring, 2 or 3 conductors No. 16 AWG twisted and stranded shielded
  4. Size conductors for the load to be served.
- M. Splicing: Install continuous cables without splices in all raceway systems.

- N. Instrumentation wiring: Install instrumentation wiring as follows:
1. Wherever possible provide continuous instrumentation wiring without splices from device to instrument. Where connections are required, make all connections in terminal boxes.
  2. Terminate instrumentation wiring at terminal blocks only.
  3. Where instrumentation wire is required to be connected in a terminal box, provide an isolated terminal for each shield.
  4. Shielded cable shall have the shield grounded at one point for each loop; preferably at the point of origin.
  5. Install clear, heat-shrink, seamless tubing over exposed shields and drain wires in all terminal boxes, junction boxes, panels and devices.
  6. Signal wires shall not be run in conduit containing wire used for any other purpose.
  7. Maintain a minimum 24 inch separation distance between conduits containing instrumentation/signal cables and conduit containing power wiring.

### 3.02 CONDUCTOR IDENTIFICATION

- A. Labeling: Label each wire at both termination points and at each splice point in junction boxes. Carry individual conductor or circuit identification throughout, with circuit numbers or other identification clearly stamped on terminal boards and printed on directory cards in distribution cabinets and panelboards.
- B. Identification: Where the total number of control and signal wires is three or more and no terminal board is provided, identify each wire in junction boxes and cabinets by means of plastic slip-on wire marker.
- C. Plastic Tags: In manholes, identify each wire by laminated plastic tag located so it can be easily seen.
- D. Color Coordination: Connect circuit conductors of the same color to the same phase throughout the installation.

### 3.03 WIRE AND CABLE CONNECTIONS TO EQUIPMENT

- A. General: Provide electrical connections to all equipment in strict accordance with the approved wiring diagrams, the Contract Documents, or as approved. Repair or replace any damaged equipment resulting from erroneous connections at no additional cost to the Owner.

### 3.04 CONNECTOR AND TERMINAL LUG INSTALLATION

- A. UL Requirements: Install all connectors and terminal lugs in accordance with UL requirements and manufacturer's recommendations.

3.05 QUALITY ASSURANCE

- A. Tests: Test all 600-volt power and lighting conductors after installation on the skid.
- B. Test Results: Make all tests and submit certified test results. Replace any cables that fail the tests.
- C. Continuity Test: Perform continuity test to demonstrate proper cable connection.

END OF SECTION

## SECTION 26 05 26

### GROUNDING

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. Section Includes: Requirements for providing a complete grounding system in accordance with the Contract Documents. Bond skid mounted equipment that is provided under this Contract and provide coordination drawings identifying grounding and bonding connection points for installation of the equipment. Grounding includes but is not limited to: electric equipment enclosures, raceway systems, transformers, motor control centers, panelboards, grounding conductors, bonding jumpers, process pipe connections, and skid metal frames.
- B. Related work specified in other sections includes, but is not limited to, the following:
  - 1. Section 26 05 00 - Basic Electrical Materials and Methods
  - 2. Section 26 05 19 - Wires and Cables - 600V and Below
  - 3. Section 26 05 33 - Electrical Raceway Systems
  - 4. Section 26 23 16 - Electrical Equipment Enclosures

##### 1.02 REFERENCES

- A. Codes and Standards: The following codes and standards are referred to in this Section:
  - 1. NFPA 70 - National Electrical Code (NEC)
  - 2. ANSI - American National Standards Institute
  - 3. IEEE - Institute of Electrical and Electronics Engineers
  - 4. UL - Underwriters Laboratory
  - 5. ANSI/SCTE 77 - Standard for Underground Enclosure Integrity

##### 1.03 SUBMITTALS

- A. General: Furnish all submittals, including the following, as specified in Section 26 05 00 - Basic Electrical Materials and Methods.
- B. Product Data and Information: Furnish manufacturer's catalog data for the following:
  - 1. Grounding and grounded conductors
  - 2. Grounding connectors, clamps, and bushings
  - 3. Bonding jumpers
- C. Shop Drawings: Furnish shop drawings identifying grounding and bonding connection points for installation of the equipment.

#### 1.04 QUALITY ASSURANCE

- A. Codes and Standards: Furnish grounding and bonding in accordance with applicable ANSI, IEEE Standards, the NEC and local codes. Provide a grounding system consisting of UL listed components.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Section 01 66 00 - Product Storage and Handling Requirements.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.

- 1. Grounding Conductors

- a. The Okonite Company
- b. Southwire Company
- c. General Cable Technologies Corporation

#### 2.02 MATERIALS

- A. General: Provide conductor sizes as shown or required by the NEC.
- B. Materials: Provide conductors in accordance with the requirements specified in Section 26 05 19 - Wires and Cables - 600V and Below.
- C. Bare conductors: Provide bare tinned copper conductor where buried in earth, embedded in concrete, or exposed.
- D. Insulated Conductors: Provide copper conductor with green color insulation rated at 600 volts where installed in conduits or other enclosed raceways.

#### 2.03 CONNECTORS

- A. Grounding Clamps and Bolted Connectors: Provide grounding clamps and bolted connectors suitable for devices or cables being connected.
- B. Bolted Connectors: Provide bolted connectors for grounding to ground buses and equipment.
- C. Grounding Bushings: Provide grounding bushings for conduits where conduits are not effectively grounded by firm contact to the grounded enclosure.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Applicability: Installation requirements are applicable to grounding and bonding provided as part of any skid furnished under this Contract.
- B. General
  - 1. Install conductors to preclude exposure to physical damage.
  - 2. Install connections firm and tight.
  - 3. Arrange conductors and connectors without placing strain on the connections.
  - 4. Bring loops or taps up for connection to equipment or other items to be grounded.
  - 5. Install an insulated grounding conductor in all conduits. Terminate on terminals.
  - 6. When raceways are used to contain and protect grounding conductors, install in accordance with Section 26 05 33 - Electrical Raceway Systems and NEC.
  - 7. Where conductors are installed in nonmetallic raceway, provide the grounding conductor in addition to the neutral wire, sized in accordance with NEC or as scheduled.
- C. Equipment Grounding: Ground each piece of electrical equipment using a conductor in the raceway feeding the equipment in accordance with NEC.
  - 1. Unless specified otherwise, connect transformer enclosures and neutrals to the grounding system. Connect the neutral ground connection at the transformer terminal. Make the connection from the ground grid to the ground bus and enclosures of motor control centers, panelboards, and industrial control panels.
- D. Grounding Conductors: Furnish connection points to connect the grounding conductors between the equipment and the grounding system. Where a ground bus is furnished in the equipment, connect the grounding conductor to the ground bus.
- E. Miscellaneous Grounding: Provide grounding for the following:
  - 1. Ground receptacles, switches, and their metal plates through positive ground connection to the yoke/strap, outlet box, and grounding system grounding wire installed in the conduit.
  - 2. Ground controllers, motor frames, surge capacitors, arrestors, lighting fixtures, metal structures, exposed noncurrent carrying metal, mechanical equipment, and similar items.

3. Ground motor shaft protection for motors operating on adjustable frequency drives where provided.

END OF SECTION



SECTION 26 05 33

ELECTRICAL RACEWAY SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Requirements for providing electrical raceway systems in accordance with the Contract Documents.
- B. Related work specified in other sections includes, but is not limited to, the following:
  - 1. Section 09 90 00 - Paints and Coatings
  - 2. Section 26 05 00 - Basic Electrical Materials and Methods

1.02 REFERENCES

- A. Codes and standards referred to in this Section are:
  - 1. ANSI C80.1 - Standard for Electrical Rigid Steel Conduit
  - 2. ANSI C80.3 - Standard for Steel Electrical Metallic Tubing
  - 3. NFPA 70 - National Electrical Code (NEC)
  - 4. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
  - 5. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit
  - 6. UL 1 - Standard for Flexible Metal Conduit
  - 7. UL 6 - Standard for Electrical Rigid Metal Conduit - Steel
  - 8. UL 360 - Standard for Liquid-Tight Flexible Steel Conduit
  - 9. UL 651 - Standard for Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
  - 10. UL 797 - Standard for Electrical Metallic Tubing - Steel
  - 11. Intertek ETL SEMKO PVC-001 - High Temperature H2O PVC Coating Adhesion Test Procedure

1.03 SUBMITTALS

- A. General: Furnish all submittals as specified in Section 26 05 00 - Basic Electrical Materials and Methods.

#### 1.04 QUALITY ASSURANCE

- A. Codes: Provide all materials and workmanship in accordance with the requirements of the National Electrical Code and local codes having jurisdiction.
- B. Regulatory Requirements: Provide UL listed components.
- C. Installers of PVC coated rigid steel conduit are to be factory certified.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Section 01 66 00 - Product Storage and Handling Requirements.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.
  - 1. Rigid Steel Conduits
    - a. Allied Tube & Conduit
    - b. Wheatland Tube Company/JMC Steel Group
    - c. Republic Conduit Manufacturing
  - 2. PVC Coated Steel Conduits Fitting and Boxes
    - a. Robroy Industries - Plasti-Bond/Perma-Cote/KorKap
    - b. Thomas & Betts Corporation/ABB Group - Ocal
  - 3. Liquidtight and Flexible Steel Conduit
    - a. Electri-Flex Company
    - b. The International Metal Hose Company
    - c. Southwire Company
    - d. Anamet Electrical, Inc.
    - e. Thomas & Betts/ABB Group
  - 4. Conduit Fitting and Connectors
    - a. Appleton /Emerson Industrial Automation
    - b. Cooper Crouse-Hinds/Eaton
    - c. O-Z/Gedney/Emerson Industrial Automation

5. Boxes and Enclosures
  - a. Raco/Hubbell
  - b. Cooper Crouse-Hinds/Eaton
  - c. Hoffman
  
6. Strut Channel and Fittings
  - a. Cooper B-Line/Eaton
  - b. Thomas & Betts /ABB Group Enduro
  - c. Unistrut Corporation
  
7. Terminal Blocks
  - a. Phoenix Contact
  - b. Entrelec
  - c. Weidmuller
  
8. Corrugated Innerduct
  - a. Panduit
  - b. Carlon
  - c. AFC

## 2.02 RACEWAYS

- A. General: Provide minimum 3/4-inch raceways.
  
- B. Raceway Requirements: Provide raceways meeting the following requirements:
  1. Provide rigid steel, heavy wall, hot-dip galvanized conduit in accordance with the requirements of UL-6 and ANSI C80.1.
  
  2. Provide PVC coated rigid steel in accordance with the requirements for rigid steel raceway herein and with 40 mils bonded PVC exterior coating meeting requirements of UL-6 and NEMA RN1. Provide PVC coated rigid steel conduit that is listed and performance verified to ETL PVC-001 for 200 hours. Provide a nominal 2 mil urethane interior coating and a clear urethane coating over the galvanized threads.
  
  3. Provide liquidtight flexible single strip steel, hot-dip galvanized conduit with PVC jacket in accordance with the requirements of UL 1. Provide a continuous copper bonding conductor wound spirally between convolutions on the inside of the conduit meeting requirements of UL 360 for conduit sizes 1-1/4-inch and smaller.
  
  4. Provide flexible steel conduit constructed of continuous interlocked, zinc coated steel strip in accordance with the requirements of UL 1. Provide in a minimum 1/2 inch electrical trade size.

5. Provide corrugated, non-metallic innerduct. Orange, UL Listed, flexible optical fiber/communication raceway recognized per NEC Articles, 770 and 800 for optical fiber and telecommunications cables. Comply with UL 2024, TIA-569, UL 94 V-0.

## 2.03 FITTINGS

- A. General: Provide fittings of similar material as raceways.
- B. Fittings Requirements: Provide fittings meeting the following requirements:
  1. Provide threaded connectors for all rigid metal conduits. Set screw or indenter type fittings are not acceptable.
  2. Provide solvent cement connections for all rigid nonmetallic conduits.
  3. Provide gland compression type fittings for all electrical metallic tubing. Provide insulated type connectors.
  4. Provide insulated connectors for liquidtight flexible conduit.
  5. Expansion/Deflection Fittings
    - a. Provide a deflection and expansion coupling for rigid metal conduits that have a  $\frac{3}{4}$  inch movement in all directions from normal and a 30 degree angular deflection. Provide coupling that includes internal bonding jumper.
    - b. Provide a nonmetallic expansion coupling for nonmetallic conduits that have a 4-inch maximum expansion.
  6. Bushings
    - a. Provide insulated nonmetallic bushings rated 105 degrees C for all installations where bonding is not required.
    - b. Provide insulated metallic grounding and bonding bushings rated 150 degrees C where bonding is required.
  7. Drain Fittings
    - a. Drain fittings shall be a combination device designed to provide ventilation to minimize condensation and drains accumulated condensate.
    - b. The combination drain/breather fitting shall be 3/8 inch male thread size with 316 stainless steel body.
    - c. Drain fittings shall be by Crouse Hinds, Appleton Electric or equal to be approved by the Engineer.

## 2.04 WALL AND FLOOR PENETRATIONS

### A. Watertight

1. For conduit penetrations in new exterior walls or floors provide watertight sealing sleeves consisting of a steel sleeve with pressure ring and clamps.
2. For conduit penetrations in existing walls or floors, provide watertight sealing bushings consisting of a neoprene sealing ring between two PVC coated steel pressure discs. Provide 316 stainless steel captive screws for sealing ring compression.

## 2.05 BOXES AND CABINETS

### A. Outlet Box Requirements

1. Provide galvanized cast iron boxes for galvanized rigid steel metal conduit systems.
2. Provide nonmetallic boxes and covers in PVC conduit systems.
3. Provide PVC coated boxes and covers in PVC coated conduit systems. Provide corrosion-resistant fiberglass reinforced polyester boxes with 316 stainless steel hardware in corrosive areas as defined in Section 26 05 00 -Basic Electrical Materials and Methods or as shown., where PVC coated boxes are not available.
4. Provide pressed steel boxes and covers in electrical metallic tubing conduit systems.
5. Provide watertight gasketed covers held with nonferrous screws for all cast metal boxes.

### B. Junction and Pull Box Requirements

1. Provide fabricated sheet metal boxes when cast metal box weight exceeds 50 pounds. Construct box from 1/8-inch thick galvanized sheet steel with sides return channel flanged around cover opening. Provide angle or channel supporting frame. Provide continuously welded and ground smooth seams. Provide mounting lugs and threaded conduit hubs.
2. Provide cast steel or fabricated 10-gauge type 316 stainless steel for boxes either partially or fully encased in concrete. For partially encased boxes provide sides return channel flanged around cover opening. For fully encased boxes provide flush covers. Provide continuously welded and ground smooth seams. Provide mounting lugs and threaded conduit hubs.
3. Provide watertight gasketed covers held with 316 stainless steel captive screw slot bolts.

4. Provide two padlocking hasps for boxes containing medium voltage cables.
5. Provide steel barriers in all boxes that isolates instrumentation wiring from all other wiring systems
6. Provide boxes rated for the installed location meeting the requirements of Section 26 05 00 - Basic Electrical Materials and Methods.

C. Terminal Box Requirements

1. Provide minimum 12 gauge painted steel fabricated box with mounting lugs, floor stand, and hinged doors.
2. Provide the door with continuous piano hinge and 3 point lockable latch. Provide print pocket on inside of door.
3. Provide back plate fabricated from 12 gauge minimum steel with white enamel finish for mounting terminals and wire troughs.
4. Provide wire troughs consisting of plastic ducts with snap slot design and removable covers. Run all wiring within wire troughs.
5. Furnish a schedule of terminals with the following information
  - a. Source
  - b. Type of Signal
  - c. Function
6. Provide removable jumpers to allow operation of the equipment.
7. Separate analog terminals from all other terminals.
8. Provide the number of terminals as shown. Where the number of terminals are not shown, provide sufficient terminals for each wire entering the terminal box plus 20 percent but not less than 10 spare terminals.
9. Terminals
  - a. All catalog numbers refer to Phoenix Contact type for the purpose of establishing the standard of quality and general configuration desired.
  - b. Provide symmetrical type steel mounting rails, NS-35.
  - c. Analog Signals: Provide terminals in enclosed housing suitable for wires from 24 to 10 AWG rated 500 volts with gray body, knife disconnect and test connection socket on both sides of disconnect, Phoenix Contact Type UK 5-MTK-P/P.
  - d. Control and Alarm Signals: Provide terminals suitable for wires from 24 to 10 AWG rated 18 amperes at 600 volts, blue body, Phoenix Contact Type UK 5 N BU.

- e. 120-Volt Power Wiring: Provide terminals suitable for wires from 18 to 10 AWG rated 30 amperes at 600 volts, hot (black body), neutral (white body), ground (green body) , Phoenix Contact Type UK5N BK, UK5N WH & UK5N GN, respectively.
10. Enclosures: Provide enclosures rated for the installed location meeting the requirements of Section 26 05 00 - Basic Electrical Materials and Methods.

## 2.06 SUPPORTING DEVICES

- A. Raceway Supports: Provide raceway supports meeting the following requirements:
- 1. Do not use perforated straps or plumbers' tape for conduit supports.
  - 2. Provide expansion bolts or inserts for fasteners in concrete, toggle bolts for hollow masonry or frame construction, and preset inserts for prestressed concrete.
  - 3. Conduit Straps and Backs
    - a. For metallic conduits, provide galvanized steel or malleable iron conduit straps and backs with 316 stainless steel hardware.
    - b. For PVC coated conduits, provide PVC coated malleable iron conduit straps and backs with 316 stainless steel hardware.
  - 4. Conduit Hangers
    - a. For metallic conduits, provide galvanized steel adjustable conduit hangers or clevis hangers with 316 stainless steel hardware.
    - b. For PVC coated conduits, provide PVC coated adjustable conduit hangers with 316 stainless steel hardware.
  - 5. Beam Clamps
    - a. For metallic conduits, provide malleable iron beam clamps with steel bolt with 316 stainless steel hardware.
    - b. For PVC coated conduit, provide PVC coated malleable iron beam clamps with 316 stainless steel hardware.
  - 6. Trapeze Hangers
    - a. For metallic conduits provide 12 gauge 1-1/2-inch square galvanized steel channels with 316 stainless steel channel hardware for securing conduits.
    - b. For PVC coated conduit, provide either PVC coated 12 gauge 1-1/2-inch square steel channels or 1-5/8-inch square fiberglass channels. Provide

PVC coated straps with 316 stainless steel hardware for securing conduits.

- c. Provide additional channels welded together to limit the deflection to 1/240th of span.

7. Threaded Rod

- a. Provide threaded rod with a minimum size as follows:
  - (1) Conduit Hangers
    - (a) 3/4-inch to 1-1/2-inch conduit: 1/4-inch threaded rod
    - (b) 2-inch to 3-1/2-inch conduit: 3/8-inch threaded rod
    - (c) 4-inch and larger: 1/2-inch threaded rod
  - (2) Trapeze Hangers: Provide threaded rod of sufficient size to support the load. Provide a minimum of 3/8-inch threaded rod.
- b. For Metallic Conduit Systems: Provide continuous, threaded galvanized steel rod.
- c. For PVC Coated Conduit Systems: Provide continuous, threaded 316 stainless steel rod.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Applicability: Installation requirements are applicable to electrical raceway systems provided as part of the factory installed assemblies included in the Procurement Contract.
- B. General: Install electrical equipment and material of the size, type, and general routing as shown or required.
- C. Coordination with Reinforcing: Install raceway, fittings, boxes and cabinets free from direct contact with reinforcing steel.
- D. Alignment: Provide fasteners, anchor bolts, anchorage items, and supports as required to insure proper and rigid alignment. Attach equipment with fasteners sized according to size and weight of the equipment and the thickness of the supporting surface.
- E. Grounding: Make metallic raceways electrically and mechanically continuous and ground as required. Install conduits continuous between outlets, boxes, cabinets and panels.



### 3.02 INSTALLATION

General: Unless otherwise indicated, install conduits exposed, parallel or perpendicular to building floors, ceilings and walls, to avoid interference with other work. In architecturally finished areas, conceal conduits within finished walls, ceilings and floors. Cut conduits square and deburr the cuts to the same degree as the conduit manufacturer. Fasten conduit securely to outlets, junction, pull, and terminal boxes. Provide caps and seals to prevent the entrance of foreign material and moisture during installation and before pulling wire.

1. Where conduit size is not shown, provide conduits one size larger than indicated in Table 4, Chapter 9 of the NEC.
2. Support raceways concealed above suspended ceilings from the slab above suspended ceiling in same manner as exposed raceways. Do not support raceways from suspended ceiling supports.
3. Keep conduit at least six inches away from high temperature piping, ducts, flues and surfaces. For mounting on concrete and masonry surfaces, provide a minimum of 1/4 inch air space between conduit and mounting surface. Support and fasten conduit to building structural members spaced in accordance with electrical codes. Support conduit at least every eight feet or less in accordance with NEC requirements.
4. When two or more exposed conduits are in the same general routing, provide parallel installation with symmetrical bends and for three or more provide trapeze hangers. Size trapeze hangers with space for 25 percent additional conduits.
5. Make changes in direction with bends or fittings. Use factory-made bends or elbows wherever possible. Make field bends and offsets with a hand bender or conduit-bending machine. Provide a bending radius not less than 36-inches for conduits containing medium voltage cables.
6. Run conduit in buildings with no more than the equivalent of three 90-degree bends between pull points. Provide no more than 125 feet of conduit runs between pull points. Provide pull boxes where shown, specified or wherever required to install conductors and to meet the above requirement.
7. Install pull and junction boxes in accessible locations with working space in front of and around the installation. Obtain approval from the ENGINEER to locate boxes in finished areas.
8. Install an expansion fitting when a conduit crosses a structural expansion joint.
9. Unless otherwise approved, install conduits to cross at right angles to building structural expansion joints.

10. Where approved for encased installation, install conduits in slabs as close to the middle of concrete slabs as practicable without disturbing reinforcement. Do not use conduit with an outside diameter exceeding one-third of the slab thickness. Do not place conduits closer than three diameters on centers, except at cabinet locations where the slab thickness is increased.
  11. Pitch conduits to outlet boxes to avoid trapping moisture. Where dips are unavoidable in exposed conduit runs, install drain fitting at low point.
  12. Provide conduit seals as required for raceway through hazardous areas.
- B. Conduit Material Types: Provide conduit as follows:
1. Provide galvanized rigid steel conduits in all installations concealed in structures, concrete encased within structures or under structures.
  2. Provide galvanized rigid steel conduits for all instrumentation, and electronic equipment signal wiring in all exposed or concealed noncorrosive installations.
  3. Corrosive Locations
    - a. Corrosive locations are defined in Section 26 05 00 - Basic Electrical Materials and Methods.
    - b. Provide PVC coated rigid steel conduit for all exposed installations in corrosive locations.
- C. Connections to Equipment
1. Provide double locknuts and grounding bushing for all boxes, enclosures and cabinets located in dry areas.
  2. Provide watertight hub fittings for all boxes, enclosures and cabinets located below grade or in wet, damp or corrosive areas.
  3. Provide rigid conduit connection where equipment is fixed and not subject to adjustment, mechanical movement, or vibration. Provide union fittings to permit removal of equipment without cutting or breaking conduit.
  4. Provide liquidtight flexible conduit connection where equipment is subject to adjustment, mechanical movement, or vibration.
  5. Provide flexible steel conduit connections to lighting fixtures installed in accessible suspended ceilings.
  6. Coat all threads in steel conduit runs with zinc dust in oil or other corrosion-preventive compound before making connections.
- D. Penetrations: Make concealed penetrations for single conduits not more than 1/4-inch larger than the diameter of the conduit. Make penetrations through walls, ceilings and floors other than concrete for exposed conduits not more than 1/4-inch

larger than the diameter of the conduit. Fill the voids around conduit with caulking compound and finish the surface the same as the wall, ceiling or floor.

1. Where a conduit enters through a concrete roof or membrane waterproofed wall, floor, or ceiling, provide a watertight sealing sleeve that can be tightened from one or both sides. If the sealing sleeve is not placed with the concrete, core drill the proper size hole to provide a mechanically watertight installation.
  2. Where a conduit enters through a concrete non-waterproofed wall, floor or ceiling, provide a galvanized steel sleeve and fill the space between the conduit and sleeve with a plastic expandable compound. If the sleeve is not placed with the concrete, drill the hole not less than 1/2-inch and not more than one inch larger than the sleeve, center the sleeve and grout the sleeve for the total depth of penetrated concrete with non-shrink grout, polyurethane, or silicone sealant.
- E. Spare Conduit: Provide spare conduits for future use as shown or required. Provide a minimum 200 pound strength nylon pull line in each spare conduit and identify the origin and termination of the conduit at each end. Terminate spare conduits in equipment, boxes or by couplings plugged flush with the inside of building surfaces.
- F. Conduits Containing Instrumentation Wiring: Maintain a minimum 24 inch separation distance between conduits containing instrumentation/signal cables and conduit containing power wiring.
- G. Boxes: Provide boxes of the proper dimensions for the size and quantity of conductors enclosed.
1. For boxes mounted on steel, concrete and masonry surface, provide a minimum 1/4-inch non-metallic spacer to hold the box away from the surface.
  2. Provide pressed metal boxes in all partition constructed walls.
  3. Provide separate support for boxes and bolt units to buildings with expansion anchors, toggle bolts or appropriate screws. For lighting fixture outlet boxes, provide supports adequate to support the weight of the fixture to be mounted on the box.
  4. Remove debris including dust, dirt, wire clippings, and insulation from the interior of boxes. Replace boxes with open conduit holes. Repair or replace damaged boxes as directed.
  5. Unless otherwise indicated, mount outlet boxes flush with the finished wall or ceiling with the long axis vertical. Unless otherwise shown or specified, provide mounting heights measured from the finished floor to centerline of the outlet box as follows:
    - a. For switches: 3'-2". Mount the box for lighting switches on the strike side of the door.

- b. For duplex convenience outlets: Finished areas 12 inches and unfinished areas 2 feet
- c. For clock receptacles outlets: 8 feet
- d. For fixtures and equipment: As shown
- e. For desk telephone outlets: 12 inches
- f. For wall telephone outlets: 48 inches

3.03 CLEANING AND PAINTING

- A. Coatings, Touch Ups: Touch up all PVC coatings on conduit, fittings and boxes where scratched, marred or otherwise compromised during handling and installation per the manufacturer's instructions.

END OF SECTION

SECTION 26 05 53

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Requirements for providing materials for the identification of electrical equipment, components, conduits, cables and wiring, and furnishing and installing safety signs.
- B. Related work specified in other sections includes, but is not limited to, the following:
  - 1. Section 26 05 00 - Basic Electrical Materials and Methods

1.02 REFERENCES

- A. Codes and standards referred to in this Section are:
  - 1. ANSI C2 - National Electrical Safety Code (NESC)
  - 2. ANSI Z535.1 - Safety Colors
  - 3. ANSI Z535.2 - Environmental and Facility Safety Signs
  - 4. ANSI Z535.3 - Criteria for Safety Symbols
  - 5. OSHA - Occupational Safety and Health Administration
  - 6. UL- Underwriters Laboratories

1.03 SUBMITTALS

- A. General: Furnish all submittals, including the following, as specified in Division 01.
- B. Product Data and Information: Furnish manufacturers' catalog data for safety signs, nameplates, labels, and markers.
  - 1. Furnish manufacturers' instructions indicating applicable conditions and limitations of use, storage, handling, protection, examination and installation of product.

1.04 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Section 01 66 00 - Product Storage and Handling Requirements.

1.05 SPARE PARTS

- A. General: Furnish the following spare parts.
  - 1. One safety sign of each size and wording.

- B. Packaging: Package spare parts in containers bearing labels clearly identifying the contents. Provide all spare parts with information needed for reordering. Deliver spare parts in original factory packaging.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.
  - 1. Brady Corporation
  - 2. Seton
  - 3. Thomas & Betts/ABB Group

### 2.02 MATERIALS AND COMPONENTS

- A. General: Provide identification materials listed and classified by UL or tested by an OSHA approved Nationally Recognized Testing Laboratory.
- B. Laminated Plastic Nameplates: Provide engraved, three layer, laminated plastic nameplates with black letters on white background and fastened with corrosion-resistant screws. Do not use mounting cement for fastening nameplates.
  - 1. Provide nameplates with 1-inch high lettering for switchgears, switchboards, motor control centers, control panels, relay panels, contactor panels, panelboards, and similarly grouped equipment, transformers and disconnect switches.
  - 2. Provide nameplates with 1/2-inch high lettering for individual components of a group such as main breakers, switchgear units, switchboard units, motor control center units, and similar devices.
  - 3. Provide nameplates with 1/4-inch high lettering for remote motor controllers, control stations, relays, and similar equipment.
  - 4. Provide nameplates for each motor identifying service or function with lettering of an appropriate size to suit each motor.
  - 5. Provide approved laminated directories of circuits with typewritten designations of each branch circuit in each panelboard.
  - 6. Provide smaller lettering for a neat, legible nameplate where the amount of lettering causes excessively large nameplates.
- C. Wire Markers: Identify wire bundles and each individual wire.
  - 1. Wire bundles: Provide a brass or rigid fiber identifying tag attached with nylon self-locking cable ties.

2. Wire identification markers: Provide a printed white, heat-shrink, seamless tubing type with black bold lettering for wires size No. 10 AWG and smaller. Provide a printed self-laminating white, vinyl type with black bold lettering for wires No. 8 AWG and larger.
- D. Safety Signs: Provide safety signs in accordance with OSHA standards meeting the requirements of ANSI C2, ANSI Z535.1, ANSI Z535.2, and ANSI Z535.3.
1. Provide safety signs manufactured from vinyl having a minimum thickness of 60 mils with red and black letters and graphics on a white background.
  2. Size: 10 inches by 14 inches except signs 7-inch by 10-inch may be provided where the larger size cannot be applied.
  3. Mount safety signs using corrosion-resistant screws. Do not use mounting cement.

### PART 3 - EXECUTION

#### 3.01 PREPARATION

- A. Surface Preparation: Degrease and clean surfaces to receive nameplates, labels, and marking paint.

#### 3.02 INSTALLATION

- A. General: Install nameplates on the front of equipment, parallel to the equipment lines and secured with corrosion resistant screws. Caulk all screw holes with clear silicone caulk prior to attaching nameplates on NEMA 4X enclosures. Where drilling will adversely affect the environmental rating, provide adhesive suitable for environment.
1. Install laminated nameplates identifying:
    - a. Each electrical equipment enclosure
    - b. Individual equipment and devices
- B. Wire Markers: Identify wire bundles and each individual wire with identification tags as follows:
1. Wire Bundles: Install an identifying tag engraved with the conduit number where conduits enter motor control centers, switchgear, switchboards, control panels, terminal boxes, and the like.
  2. Wire identification markers: Provide wire identification markers on each wire at all termination points.
    - a. On power and lighting circuits: The branch circuit or feeder number as indicated on drawings.

- b. On control circuits terminated in motor control centers, switchgears, control panels and alike: The field device and terminal number of the opposite end connection.
      - c. On control circuits at each field device: The panel or compartment number and terminal number of the opposite end connection.
    - 3. Oversize wire markers so that after heat shrinking the wire marker can be rotated on the wire. Rotate wire markers so that wire identification number is visible.
  - C. Conduit Markers: Paint colored marking bands on each conduit that is longer than 6 feet at intervals of 20 feet on centers to identify the wiring voltage system contained in the conduit or for identifying the different conduit systems as follows:
    - 1. 4160-Volt System
    - 2. 480-Volt System
    - 3. 208/120-Volt System
    - 4. 240/120-Volt System
    - 5. 24-Volt DC System
    - 6. Data/SCADA Network
    - 7. HVAC Controls
    - 8. Analog Instrumentation
  - D. Safety Signs: Provide safety signs as follows or as shown including existing locations and equipment not signed per current industry standards and being modified or reused under this Contract:
    - 1. Type DS-1
      - a. Wording: “DANGER - BATTERY CHARGING AREA, NO SMOKING”
      - b. Location: Within 3 feet of all station battery racks
    - 2. Type DS-2
      - a. Wording: “DANGER - ELECTRICAL EQUIPMENT, AUTHORIZED PERSONNEL ONLY”
      - b. Location: At each entrance to electrical rooms, and enclosed outdoor electrical equipment
    - 3. Type DS-3
      - a. Wording: “DANGER - HIGH VOLTAGE, KEEP OUT”
      - b. Location: At each entrance to electrical rooms, and enclosed outdoor electrical equipment operating at over 600 Volts; also, on the sides of fences or walls which enclose outdoor equipment operating at over 600 Volts



4. Type DS-4
  - a. Wording: "DANGER - HIGH VOLTAGE"
  - b. Location: Outside all equipment operating at over 600 Volts
  
5. Type DS-5
  - a. Wording: "DANGER - POWERED FROM POWER MULTIPLE SOURCES"
  - b. Location: Outside all equipment that operates from multiple power sources
  
6. Type DS-6
  - a. Wording: "NOTICE - KEEP DOOR CLOSED"
  - b. Location: On all doors with another safety sign installed.
  
7. Type DS-7
  - a. Wording: "CAUTION - CONTROLS & INTERLOCKS POWERED FROM MULTIPLE SOURCES"
  - b. Location: On all control panel doors

END OF SECTION

NO TEXT ON THIS PAGE

## SECTION 26 05 60

### ELECTRICAL REQUIREMENTS FOR SHOP-ASSEMBLED EQUIPMENT

#### PART 1 - GENERAL

##### 1.01 SUMMARY

A. Section Includes: Requirements for providing and testing shop-assembled equipment. Shop-assembled equipment panels and other items may be specified under the driven equipment sections and may require external field connection to ancillary devices and other system components for interlocks and alarms. This equipment includes but is not limited to the following:

1. Miscellaneous control equipment and control panels
2. Pump and fan equipment
3. Temperature control systems

B. Related work specified in other sections, but is not limited to, the following:

1. Section 26 05 00 - Basic Electrical Materials and Methods
2. Section 26 05 19 - Wires and Cables - 600 Volts and Below
3. Section 26 05 26 - Grounding
4. Section 26 05 33 - Electrical Raceway Systems
5. Section 26 05 53 - Electrical Identification
6. Section 26 05 80 - Electric Motors
7. Section 26 27 26 - Wiring Devices
8. Section 26 29 53 - Control Components and Devices

##### 1.02 REFERENCES

A. Codes and standards referred to in this Section are:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)
2. UL 486A - Wire Connectors and Soldering Lugs for Use with Copper Conductors
3. UL 508A - Industrial Control Panels
4. NEC Article 409 - Industrial Control Panels
5. NFPA-70E - Standard for Electrical Safety in the Workplace

##### 1.03 SYSTEM DESCRIPTION

A. Design Requirements: Provide the shop assembled equipment using components and appurtenances meeting the requirements specified in Division 26. Provide shop

assembled equipment constructed and labeled to meet the requirements of all referenced and otherwise applicable codes and standards.

#### 1.04 SUBMITTALS

- A. General: Furnish all submittals, including the following, as specified in Section 26 05 00 - Basic Electrical Materials and Methods.
- B. Product Data and Information: Furnish manufacturer's data on all equipment and devices in the assembly, including voltages, number of phases, current ratings, capacities and other relevant data.
- C. Shop Drawings: Furnish shop drawings for the shop-assembled equipment, including the following:
  - 1. Layout drawings of the assembly showing accurately scaled basic equipment sections, auxiliary compartments and combination sections. Show special relationships of assemblies to associated equipment, including plan and front views of the equipment. Furnish a device summary.
  - 2. Furnish wiring diagrams for assemblies that show connections to electrical power. Clearly differentiate between shop-installed and field installed wiring.
  - 3. Furnish construction drawings for equipment requiring field assembly. Clearly differentiate between shop-assembled and field assembled elements of the assembly.
  - 4. A manufacturer's standard connection diagram or schematic showing more than one method of connection is not acceptable unless, the intended method is clearly identified.
  - 5. Furnish short circuit ratings on control panels and data demonstrating the rating is appropriate for the available fault current in accordance with NEC Article 409 and UL 508A.
- D. Quality Control: Furnish manufacturer's test reports and certified performance records of all equipment installed. Furnish field test reports after equipment is installed.

#### 1.05 QUALITY ASSURANCE

- A. Codes: Comply with local codes and all other applicable codes.
- B. Regulatory Requirements: Comply with applicable Regulatory Agency requirements.
- C. Certification: Certify that the panels' construction complies with the following:
  - 1. List and label panel in compliance with UL-508A.

2. Label panel with its' designed and constructed Short Circuit Current Rating (SCCR) indicating compliance with UL 508.

1.06 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Section 01 66 00 - Product Storage and Handling Requirements.

PART 2 - PRODUCTS

2.01 FABRICATION

- A. General: Provide shop-assembled equipment as standard products manufactured by companies regularly engaged in the manufacture of such equipment.
- B. Provide panels constructed as follows:
  1. Minimum of #12 AWG copper control wires at 120V
  2. Minimum of #14 AWG copper control wires at 24V
  3. Where main terminal and/or intermediate distribution blocks are used, provide blocks suitable for copper cables with ampere ratings at the rated voltage and related UL Short Circuit Current Rating (SCCR)/Ampere Interrupting Current Rating (AIC) as specified herein.
  4. Isolate or barrier 120/24V(LV) controls from 208 through 600V (HV) line voltage equipment and wiring.
  5. Isolate all HV equipment and wiring in the main control panel using wireways and internal sub-enclosures to allow the opening of the main control panel under "Work Permit" conditions to access low voltage component enclosures without being exposed to the (HV) equipment and wiring.
  6. Provide a main control panel main breaker listed per UL-489.
    - a. Less than 400A: thermal magnetic fixed trip or adjustable where available for the particular size furnished.
    - b. 400A and larger: electronic solid-state adjustable trip.
  7. Where 3-phase magnetic motor starters are included, provide in combination with a motor circuit protector sized for the applicable horsepower.
  8. Provide a warning label to read "WARNING-CONTROL VOLTAGE MAY BE PRESENT AFTER OPENING MAIN DISCONNECT" where control voltages are present from an external source.

9. Provide minimum Short Circuit Current Ratings (SCCR) as follows:
    - a. LV control enclosures - 5KAIC
    - b. HV enclosures as follows:
      - (1) 208V, 3-phase - 22KAIC
      - (2) 480V, 3-phase 35KAIC
  10. Provide infinite bus short circuit calculation from upstream transformer and increase minimum SCCR ratings to satisfy the requirements at no additional cost.
- C. Factory Assembled Requirements: Provide control panels for shop-assembled equipment as complete factory assembled units that require only external connections for installation including main disconnect and all electrical features necessary for the proper operation of the units.
- D. Controls
1. Motors 1/2 Hp and Larger
    - a. Provide motors suitable for 480-volt, 3-phase, 60-hertz operation, with all controls at 115 volts or less.
    - b. Provide a combination circuit breaker along with all required control transformers, relays, timers, heaters and other necessary incidentals to form a complete functioning unit.
    - c. Provide NEMA Size 1 or larger starters.
  2. Motors less than 1/2 Hp
    - a. Provide motors suitable for 120-volt, single-phase operation.
    - b. Provide manual motor starter with neon push-to-test pilot light.
  3. Provide all controls and equipment as specified in Section 26 30 00.
- E. Control Components: Install principal control components in NEMA 250 rated enclosures as follows:

AREA	ENCLOSURE
Above grade indoor	NEMA 12 - Industrial
Corrosive areas as defined in Section 26 05 00 or as shown.	NEMA 4X - Watertight and corrosion-resistant (stainless steel) with stainless steel external hardware. Provide all external operators made of the same materials as that of the enclosures

F. Miscellaneous Controls

1. Provide float switches, pressure switches, limit switches, thermostats and other auxiliary control devices to satisfy the intended service.
2. Provide contacts rated at 10-amperes, 120 volts, 60-hertz ac, unless otherwise specified.
3. Provide limit switches that function in accordance with contact development charts.

G. Panel Accessories

1. Provide panels with auxiliary heaters, fans or integral air conditioners as specified for specific equipment.
2. Provide corrosion inhibitors and breather assemblies to prevent corrosion and condensation within NEMA 4 and 4X rated panels.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Applicability: Installation requirements are applicable to shop-assembled equipment provided as part of the factory installed assemblies included in the Procurement Contract.
- B. General: Install shop-assembled equipment as indicated, in accordance with manufacturer's written instructions.
- C. Coordination: Coordinate cabling and wiring as necessary to interface installation of shop-assembled equipment.
- D. Torque Requirements: Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals in accordance with UL Standard 486A.
- E. Grounding Connections: Make equipment grounding connections for the shop-assembled equipment as specified and shown. Tighten connections in accordance with UL Standard 486A to assure permanent and effective grounding.
- F. Adjustments: Make all necessary adjustments to the equipment to provide complete and satisfactory operation upon completion of the Contract.
- G. Power Supplies: Provide an external power supply where required for panel integral air conditioners.

3.02 CLEANING AND PAINTING

- A. Shop Painting: Paint the shop-assembled equipment enclosures meeting the requirements of Section 09 90 00 - Paints and Coating.

END OF SECTION



SECTION 26 05 80

ELECTRIC MOTORS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Requirements for electric motors as specified. This Section does not cover the dual shaft blower motors. The requirements for the dual shaft blower motors are included in Section 11 55 10 - Vacuum Swing Adsorption Oxygen Generation System.
- B. Related work specified in other sections includes:
  - 1. Section 26 05 00 - Basic Electrical Materials and Methods
  - 2. Section 26 05 26 - Grounding
  - 3. Section 26 05 33 - Electrical Raceway Systems
  - 4. Section 26 05 53 - Electrical Identification

1.02 REFERENCES

- A. Codes and standards referred to in this Section are:
  - 1. AFBMA 10 - Metal Balls
  - 2. NEMA CP1 - Shunt Capacitors
  - 3. NEMA MG1 - Motors and Generators
  - 4. NEC - National Electrical Code

1.03 SUBMITTALS

- A. General: Furnish all submittals, including the following, as specified and Section 26 05 00 - Basic Electrical Materials and Methods.
- B. Product Data and Information: Furnish manufacturer's catalog data for each motor.
- C. Shop Drawings: Furnish shop drawings for each motor detailing arrangement, wiring, conduit boxes, and motor application.
- D. Quality Control: Furnish test reports for motors as follows:
  - 1. Certified standard commercial test reports for motors 5 hp through 200 hp.
  - 2. Actual shop test reports for motors over 200 hp.
- E. Operations and Maintenance Manuals: Furnish operation and maintenance manuals for all motors as specified in Section 01 78 23 - Operation and Maintenance Manuals.

1.04 QUALITY ASSURANCE

- A. Codes: Comply with local codes and all other applicable codes.
- B. Regulatory Requirements: Comply with requirements of the Regulatory Agencies having jurisdiction over this Project.

1.05 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Section 01 66 00 - Product Storage and Handling Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.
  - 1. GE Industrial Motors (a Wolong company)
  - 2. ABB
  - 3. Siemens
  - 4. Nidec|U.S. Electrical Motors
  - 5. TECO/Westinghouse Corp.

2.02 MATERIALS

- A. General: Provide motors and accessories with the equipment as specified under the equipment sections.
- B. Motor Requirements: Unless otherwise specified, provide motors as follows:
  - 1. Polyphase motors of the high energy efficiency and high power factor type.
  - 2. Motor nameplate horsepower as specified for the driven equipment.
  - 3. Motors that operate continuously over the entire load range of the driven equipment without loading motor in excess of nameplate rating and its specified temperature limit.
  - 4. For motors rated ½ hp to 200 hp operating at 460 volts, 3-phase, 60-hertz, provide squirrel cage induction type.
  - 5. For motors rated over 200 hp, operating at 460 volts or higher voltages, 3-phase, 60-hertz, provide squirrel cage induction or synchronous type, as specified.
  - 6. For motors less than ½ hp, provide 115-volt, single phase, 60-hertz type.

7. Motors that are suitable for continuous operation with a line voltage variation within  $\pm 10$ -percent of rated voltage.

8. Motors that operate continuously in a 40 degrees C ambient.

C. Frequent Start Requirements: Provide motors for frequent starting as specified.

## 2.03 MECHANICAL PROTECTION

A. Indoor Locations

1. For motors located in dry, clean and well ventilated areas provide open drip-proof type.

2. For motors located below grade, provide totally-enclosed, fan-cooled type with removable drain plug.

3. For motors located in wet, damp or dusty areas, provide totally enclosed, fan-cooled type with removable drain plug.

4. In corrosive areas as defined in Section 26 05 00 - Basic Electrical Materials and Methods or as shown, provide totally enclosed, fan-cooled type with removable drain plug.

B. Outdoor Locations: For motors located outdoors, provide a totally enclosed, fan-cooled type with removable drain plug.

## 2.04 BOXES

A. General: Provide oversized conduit boxes on motors to facilitate conductor installation and auxiliary components as required.

1. Provide separate boxes for motor power leads, accessory terminals and RTD leads.

2. Make conduit box NEMA enclosure ratings compatible with motor enclosures.

3. Where shown, provide additional space in the power terminal box for the mounting and wiring of the current transformers furnished under the motor protection system.

## 2.05 NEMA DESIGN AND INSULATION

A. Design Classification: Provide NEMA Design B, unless otherwise specified with NEMA Class F moisture resistant insulation and NEMA Class B, 80 degrees C temperature rise at rated nameplate load.

## 2.06 WINDINGS

A. General: Provide copper windings unless otherwise specified.

2.07 BEARINGS

- A. Ball and Roller Bearings: Use antifriction ball or roller type bearings at manufacturer's option, unless otherwise specified.
- B. Regreasable Bearings: Use regreasable bearings with support side thrust loadings, with an AFBMA B-10 bearing life rated at least 100,000 hours, based on a reliability of 90 percent.

2.08 SERVICE FACTOR AND LOADINGS

- A. Service Factor: Provide 1.15 service factor for sinusoidal voltage waveforms.
- B. Shaft Loading: Provide steady state shaft loading not to exceed 100 percent of full load rating under maximum load, excluding the service factor, unless otherwise specified.

2.09 SPEED

- A. General: Provide motor speed as specified for the driven equipment.

2.10 TORQUE

- A. General: Provide breakdown torque of 200 percent or more of motor full load torque.
- B. Locked Rotor: Provide locked rotor torque of 80 percent or more of motor full load torque.
- C. Inertia: Provide necessary  $WK^2$  data for special loads to coordinate with motors.
- D. Special Motors: Supply special motors where torque requirements exceed standard design.

2.11 SLIDE RAILS AND SOLE PLATES

- A. General: Provide slide rails and sole plates as required for proper installation.

2.12 SINGLE PHASE FRACTIONAL HORSEPOWER MOTORS

- A. Small Motor Requirements: Provide capacitor or open split phase start, for smaller than 1/2 hp motors unless otherwise specified.

2.13 THREE-PHASE MOTORS

- A. Induction Motors: Provide horizontal or vertical squirrel cage induction motors for continuous duty with full voltage starting except as otherwise specified.

2.14 EFFICIENCY

- A. General: Provide motor meeting the requirements as stated in Table of Full Load Efficiency of Energy Efficient Motors in NEMA MG1-12.

2.15 POWER FACTOR

- A. General: Provide motors having the following minimum power factor ratings:

Motor Power Factor - Minimum		
Percent		
Horsepower	At 1800 RPM Power Factor	At 1200 RPM Power Factor
1	74.3	69.7
1-1/2	76.5	62.0
2	70.3	70.1
3	79.9	73.7
5	83.8	75.8
7-1/2	82.4	78.2
10	85.0	76.4
15	85.0	81.1
20	84.6	81.9
25	84.5	82.0
30	84.2	82.5
40	84.2	83.3
50	85.0	84.9
60	86.8	85.7
75	86.6	86.0
100	88.3	86.4
125	89.3	85.8
150	88.5	87.5
200	88.5	87.9

2.16 NOISE

- A. General: Limit motor machine noise to sound power levels listed in NEMA MG 1-12.

2.17 ACCESSORIES

- A. Identification: Provide identification meeting the requirements with Section 26 05 53 - Electrical Identification.
- B. Space Heaters: Provide motor space heaters to prevent moisture condensation when the motor is not operating. Provide space heaters suitable for 115-volt, single phase, 60-hertz operation.
- C. Resistance Temperature Detectors (RTDs): Where specified or shown, provide motor bearing and winding RTDs of the 100-ohm platinum, three-wire type.
- D. Thermal Detectors: Where specified or shown, provide motor winding temperature switches or thermal devices.

## 2.18 SOURCE QUALITY CONTROL

- A. Shop Tests: Perform actual job motor shop tests for motors over 200 hp. Include standard commercial and additional tests listed below, and special tests listed in other sections.
- B. Standard Commercial Tests: Perform the following tests in accordance with NEMA standards.
  - 1. No load running current and speed
  - 2. Locked rotor current
  - 3. Dielectric routine tests
  - 4. Motor efficiency tests
  - 5. Motor power factor tests
- C. Additional Testing: Perform the following additional tests in accordance with NEMA standards.
  - 1. Winding resistance
  - 2. Bearing inspection
  - 3. Power factor at full, 3/4 and 1/2 load
  - 4. Efficiency at full, 3/4 and 1/2 load
  - 5. Motor starting torque

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Applicability: Installation requirements are applicable to electric motors provided as part of any skid furnished under this Contract.
- B. General: Install motors in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 01. Make all necessary adjustments to equipment to provide a complete operational system.

### 3.02 CLEANING AND PAINTING

- A. Painting: Clean and touch up marred surfaces to match the original finish.

END OF SECTION

SECTION 26 14 00

MEDIUM VOLTAGE MOTOR CONTROL CENTERS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Section Includes: Requirements for providing medium voltage motor control centers with reduced voltage soft starters suitable for installation in a pre-engineered electrical enclosure.
- B. Arrange the equipment for convenient and ready accessibility from the front for inspection and maintenance of devices, terminals and wiring.

1.02 REFERENCES

- A. The following is a list of codes and standards that may be referenced in the section:
  - 1. Institute of Electrical and Electronic Engineer (IEEE)
    - a. C37.46, High-Voltage (>1000 V) Expulsion and Current-Limiting Power Class Fuses and Fuse Disconnecting Switches
    - b. C37.90, Standard for Relays and Relay Systems Associated with Electric Power Apparatus
  - 2. National Electrical Manufacturers Association (NEMA)
    - a. ICS 1, General Standards for Industrial Control Systems
    - b. ICS 2, Industrial Control Devices, Controllers and Assemblies
    - c. ICS 6, Enclosures for Industrial Controls and Systems
  - 3. Underwriters Laboratories (UL)
    - a. UL 347, High Voltage Industrial Control Equipment
    - b. 486A-486B, Wire Connectors
- B. Related work specified elsewhere may include but is not limited to:
  - 1. Section 01 45 00 - Quality Control
  - 2. Section 09 90 00 - Paints and Coatings
  - 3. Section 26 05 00 - Basic Electrical Materials and Methods
  - 4. Section 26 05 53 - Electrical Identification
  - 5. Section 26 23 16 - Electrical Equipment Enclosures

### 1.03 QUALITY ASSURANCE

- A. Comply with applicable portions of Section 26 05 00 and other referenced specifications.
- B. Provide components that are the standard product of a manufacturer regularly engaged in the production of the required materials and equipment.
- C. The manufacturer shall be responsible for the design, construction, and proper operation of all components.
- D. Comply with applicable standards, codes and regulations.
- E. Design to provide satisfactory performance under the specified operating conditions.
- F. Provide components that are listed by UL or other Nationally Recognized Testing Laboratories as defined by the Occupational Safety and Health Administration.
- G. Provide a complete medium voltage motor control center assembly that is UL approved and certified.

### 1.04 SUBMITTALS

- A. General: Provide all submittals, including the following, as specified in Section 26 05 00 - Basic Electrical Materials and Methods.
- B. Product Data and Information: Provide manufacturers' catalog data and bill of material for the medium voltage motor control center assemblies. Identify major components and accessories of the system including rating data, type, model, service voltages, number of phases, current ratings and interrupting capacities.
- C. Shop Drawings: Provide shop drawings customized to the project for medium voltage motor control centers that include the following:
  - 1. Outline drawings showing dimensions, arrangement, elevations, identification of components and a nameplate schedule for all units.
  - 2. Interconnecting wiring diagrams, where required.
  - 3. Individual schematic and wiring diagrams for each compartment.
  - 4. One-line diagrams.
  - 5. Obtain and enter full performance details on all motors and other equipment being served on the shop drawings.
  - 6. Provide details showing connections between main and tie switches and corresponding main buses.
  - 7. Provide instruction booklets and time-current curves for each circuit breaker and relay supplied.



8. Provide microprocessor-based metering system and motor protection relay address, memory map and instruction booklets.
  - D. Operation and Maintenance Manuals: furnish operation and maintenance manuals as specified in Section 01 78 23 - Operation and Maintenance Manuals.
  - E. Manufacturer's Certificate of Proper Installation
- 1.05 DELIVERY, STORAGE AND HANDLING
- A. Deliver, store, and handle all products and materials in accordance with the manufacturer's instructions and as specified Section 01 66 00 - Product Storage and Handling Requirements.
  - B. Shipping and Packing: Provide all structures, equipment and materials rigidly braced and protected against weather, damage, and undue strain during shipment.
  - C. Storage and Protection: Store all equipment and materials in a dry, covered, heated and ventilated location. Provide any additional measures in accordance with manufacturer's instructions.
- 1.06 WARRANTIES
- A. Provide a 5-year manufacturer's warranty to commence upon final receipt of the Manufacturer's Certificate of Proper Installation.
- 1.07 SPARE PARTS
- A. General: Provide the following spare parts:
    1. Two complete sets of replacement power fuses for each size and rating
    2. Complete set of replacement fuses for all control power transformers
    3. Complete set of replacement fuses for low voltage circuits
    4. One current transformer of each type and rating
    5. One microprocessor based motor protection relay of each type
    6. Two of each type of control or latching relay
    7. Two complete replacements of all LED type indicating lenses and lamps used in the installation
    8. One control station of each type provided
    9. One hand crank for breaker withdrawal and insertion

10. One insulated handle fuse pulling tools
11. Three 12-ounce spray cans of the final finish for touch-up

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Medium Voltage Motor Control Centers
  1. Eaton Corporation
  2. Schneider Electric
  3. ABB/GE Electrification Products
  4. Or Equal
- B. Microprocessor based relay systems
  1. SEL 710-5 Motor Protection Relay with touchscreen
  2. Or Equal
- C. Power Meters
  1. Electro Industries NEXUS 1500+
  2. Or Equal

### 2.02 MATERIALS

- A. Basic Construction: Provide totally enclosed, dead-front, rigid, NEMA 1 self-supporting and freestanding structures, arranged for front mounting as shown.
  1. Construct the units from welded structural steel and full finished sheet steel with a minimum thickness of 12 gauge.
  2. Form, reinforce and arc-weld together to provide rigid, self-supporting structures giving a complete dead front assembly.
  3. Provide structures with a bottom design that permits tack-welding or bolting to the supporting floor channels. Provide steel floor channels suitable for embedding into the concrete floor for leveling and anchoring of motor control center.
  4. Provide controller enclosures with separate low voltage and high voltage compartments.
  5. Arrange and barrier the compartments to allow personnel entry to the low voltage compartment without being exposed to high voltage.
  6. Rigidly support the primary buses with insulating material of high dielectric and mechanical strength.

7. Provide tin plated copper primary buses rated as shown on the Contract Drawings extending the full width of the completed assembly, including transition bay.
  8. Provide tin plated and bolted connections to the primary buses.
  9. Brace the primary buses to mechanically and thermally withstand the full effect of short circuit currents equivalent to the interrupting ratings of the interrupter switches furnished with the motor control center.
  10. Provide a 1/4-inch by 2-inch, tin plated copper ground bus extending the full width of the complete assembly. Ground bus shall also be supplied in upper compartments of 2-high starters and be bus connected to the ground bus supplied in the lower compartments.
  11. Provide lugs on the ground bus for terminating copper ground cables.
  12. Provide buses in the end units of the completed assembly, capable of being easily extended in the future.
  13. Provide individual flanged doors on the compartments with latches and hinges capable of holding the door closed during maximum fault conditions.
  14. Provide access to cable compartments via removable steel plates.
  15. Provide cable compartments of sufficient size to terminate medium voltage cables.
  16. Provide solderless, high-voltage terminal lugs.
- B. Motor Control Center Enclosure
1. Provide motor control centers suitable for installation in a Pre-Engineered Electrical Enclosure per Section 26 23 16 - Electrical Equipment Enclosures.
- C. Medium Voltage Interrupter Switches
1. General: Provide fused medium voltage interrupting switches of the load break type with separate main, make and break contacts and quick make-quick break operation independent of the handle speed.
  2. Provide the switch with two positions, open and closed, with an intermediate position impossible. Provide the operating mechanism with sufficient power to overcome the magnetic blow out forces when closing the switch into a fault. Provide the switch with separate main, make and break contacts, providing maximum endurance when closing during a fault or load interruption. Provide spring loaded arcing contacts on the making and breaking to provide the first in and last out features.
- D. Bus: The horizontal main bus shall be located in its own separate 12 inch high top mounted enclosure and isolated from the starters. To allow for ease of maintenance

or extension of lineups without disassembling starters, the main bus shall be front, top and side accessible.

1. Starters shall be connected by an insulated vertical bus.
  2. All bus bars shall be tin-plated copper and insulated. Bus shall be rated for continuous current as indicated on the drawings.
  3. Provide a 1/4"x 2-inch ground bus throughout the entire lineup. Ground bus shall also be supplied in upper compartments of 2 high starters and be bus connected to the ground bus supplied in the lower compartments.
  4. Provide a control power transformer of the dry type with proper rating at 120 volts to serve the energy demands for operating each starter and auxiliary devices as shown. Protect with current limiting fuses.
- E. Reduced Voltage Auto-Transformer Starter: Provide non-reversing reduced-voltage induction motor starters consisting of an isolation switch, current limiting fuses, main contactor, auto transformer, shorting contactor, and run contactor.
1. Rating
    - a. Input Power: 4160 volts, 3-phase  $\pm 10$  percent, 60 Hz
    - b. Overload Rating: 500 percent of starter FLA for 30 seconds and 125% continuous
    - c. Short Circuit Amps: 50 kA
  2. Provide fused type NEMA Class E2 starters as defined by NEMA Industrial Control Standard ICS2-324.
  3. Provide current limiting power fuses of the self-protecting type with visible fuse condition indicators suitable for motor or transformer service as required.
  4. Provide starters equipped with current-limiting power fuses having an integral interrupting rating of 200 MVA at 4160 Volts.
  5. Provide fuses for motor service that are sized not to operate on running or starting loads, but to give prompt and effective circuit opening in the event of a fault. Coordinate fuses with the microprocessor based relay.
  6. Provide contactors of the drawout vacuum type, magnetically operated, rated 400 amperes continuous when enclosed.
  7. Provide contactors with insulating barriers between the poles and auxiliary contacts required for the low voltage control circuit. Provide all contacts as required plus a minimum of two spare auxiliary contacts.
  8. Provide door interlocks to keep doors from being opened with power applied.
  9. Design the electrical components for front accessibility only.

10. Provide shorting and running contactors of the vacuum type, fixed-mounted style rated as required for the load served.
11. Provide a NEMA medium duty auto transformer with 50-65-80% taps.
12. The isolating switch shall be an externally operated manual three-pole drawout type, such that in the open position it grounds and isolates the starter from the line connectors with an isolating shutter leaving no exposed high-voltage components. Integral mechanical interlocks shall prevent entry into the high-voltage areas while the starter is energized and shall block accidental opening or closing of the isolating switch when the door is open or the contactor is closed. The isolating switch handle shall have provisions for padlocking in the open position. The isolating switch shall have a mechanical blown fuse indicating device. The isolation switch shall be designed for a minimum of 10,000 operations.
  - a. Provide a switch with the following ratings:
    - (1) Maximum Voltage: 5.5 kV
    - (2) BIL Rating: 60 kV
    - (3) Continuous Current: 600 amperes
13. Include the capability to test the power and control when the isolating switch is in open position.
14. Provide dry contacts rated at 10 amperes at 120 Volts AC and that indicate the following functions:
  - a. Running
  - b. Motor Overload Trip

F. Infrared Scanning Windows

1. Provide infrared scanning windows on each vertical section that will allow for examination of the internal equipment without opening the enclosure.

G. Wiring

1. Provide internal wiring runs for interconnecting units with stranded switchboard wire having 600-volt rated, flame-resistant, type SIS insulation. Provide No. 14 AWG wire for control interconnections and No. 10 AWG wire for current transformer connections. Provide power connections as required for the service.
2. Provide wire markers at each end of all wires.
3. Where wiring connections are made to equipment mounted on hinged doors, provide connections with extra flexible wires suitably cabled together and cleated.

4. Provide wiring of all control connections to individual terminal blocks at each motor starter and contactor. Locate terminal blocks for front access.
5. Provide sufficient terminals for all devices external to the motor control center.
6. Construct all current-carrying connections to the main buses of copper with suitable capacity and conform to the requirements of the main bus insofar as bracing, insulation, temperature limits and the like are concerned.
7. Connect current transformers in such a way that the transformers may be removed and changed without damaging the connection.
8. Provide flexible cable insulated for 5 kV service for control power transformer leads.

#### H. Instrument Transformers

##### 1. Current Transformers

- a. Provide dry type current transformers, suitable for indoor service and rated as shown.
- b. Provide sufficient thermal and mechanical capacity to withstand the maximum momentary current rating of the equipment.
- c. Provide solderless, clamp-type, shorting terminal blocks for secondary connections.
- d. Properly identify the polarity of all current transformers with standard marking symbols.
- e. Provide window-type current transformers for ground-sensing where shown.
- f. Provide current transformer with accuracy suitable for the instruments and meters specified using the normal burdens of the various devices, and not less than ANSI Standard requirements.
- g. Provide ring type lugs for current transformer terminations.

##### 2. Potential Transformers

- a. Provide a dry type, suitable for indoor service, rated single-phase, 60-hertz, 120 volts.
- b. Provide control power transformers that fit into the motor control center unit.

- c. Rate the control power transformers as required for operation and control of the starters, contactors, and auxiliary loads, including motor heating element.
- d. Provide transformers that can withstand a secondary short circuit for at least one second.
- e. Provide transformers meeting the requirements of the ANSI Standard accuracy classifications.
- f. Provide transformers that can withstand an impulse test voltage of 60 kV.
- g. Provide two primary bushings with full insulation.
- h. Provide current-limiting type, primary fuses.
- i. Provide secondary fuses for the protection of potential transformers.

I. Grounding

- 1. Ground current and control power transformer secondaries with a copper conductor not smaller than No. 10 and connecting to the ground bus.
- 2. Provide connections to the bus that can be easily disconnected and isolated for proof testing.
- 3. Provide each ground wire as a continuous run without intervening splices or terminal blocks.
- 4. Ground secondary circuits of metering and relaying transformers at one point only.
- 5. Effectively ground meter, relay and instrument transformer cases.

J. Microprocessor-Based Motor Protection Relay (MPR) System: Provide a microprocessor-based motor and protection system with each starter consisting of the following features:

- 1. Protective Functions: Constantly monitor the true RMS current into the motor to provide maximum motor protection and utilization with functions as shown on the Contract Drawings and as follows:
  - a. Phase Undervoltage (IEEE Device 27P)
  - b. Underload trip with start and run time delays (IEEE Device 37)
  - c. Current unbalance protection (IEEE Device 46)
  - d. Phase reversal: (IEEE Device 47)
  - e. Thermal Model (IEEE Device 49)
  - f. Stator Thermal Protection (IEEE Device 49S)
  - g. Breaker Failure (50BF)

- h. Instantaneous Overcurrent Protection (IEEE Device 50)
- i. Motor time overcurrent protection (IEEE Device 51)
- j. Zero Sequence Ground Fault (IEEE Device 50G/51G)
- k. Locked Rotor Current: (IEEE Device 51)
  
- l. Jam trip with start and run time delays
- m. Phase Overvoltage (IEEE Device 59P)
- n. Phase Directional Element (IEEE Device 67P)
- o. Over and Underfrequency (IEEE Device 81O and 81U)
  
- 2. Control Functions: Provide the following control functions by means of internal, microprocessor-based timers or relays:
  - a. Limitation on number of starts per time period (IEEE Device 66)
  - b. Anti-backspin time delay (IEEE 2)
  
- 3. Separate Form C (NO/NC) trip and alarm outputs contacts rated 10 amperes at 115-Volt AC or 30-Volt DC resistive.
  
- 4. Provide test switches for all voltage and current inputs, ABB Flexitest™ or equal with clear plastic cover.
  
- K. Power Meters: Provide Electro Industries NEXUS 1500+ power meters. Include Modbus TCP over ethernet and fiber optic communication capabilities. Provide data switches to network the power meters together.
  
- L. Push Buttons, Selector Switches and Indicating Lights: Provide push buttons, selector switches and indicating lights including legend plates having the same type, appearance, shape and catalog number throughout each motor control center. Provide LED, push-to-test type indication lights.
  
- M. Control Components: Provide control components including elapsed time meters, control relays, latching relays, time-delay relays, reset timers, repeat-cycle timers, alternators, phase-failure and undervoltage relays and ground-fault protection relays.
  
- N. Wiring Schematic: Provide a schematic wiring diagram of each unit and affix it to the inside of the door of that unit.
  
- O. Identification
  - 1. Provide identification of the motor control center and its components as specified in Section 26 05 53 - Electrical Identification.
  - 2. Install nameplates for devices located on doors so they are readable to a person 5'-8" tall standing 3'-0" in front of the equipment.
  - 3. Locate nameplates so that they are readily associated with items labeled.
  - 4. Where nameplates are installed on removable relay or device doors, install a nameplate within the relay or device.



5. Where nameplates are located on other compartments than those served, add additional engraving to identify units served.

## 2.03 FACTORY TESTING

- A. Factory tests shall include all tests required by ANSI, NEMA, and IEEE for demonstrating compliance with the specifications including the following:
  1. Inspect all bus connections for resistance as recommended in NETA ATS standard. Compare bus connection resistance to value of similar connections.
  2. Verify torque on all bolts for bus bar connections:
    - a. Bus bar and terminal connections shall be inspected to ensure that all joints have proper torque tightness.
    - b. Torque values for all types of joints involved shall be in accordance with manufacturer's recommendations.
  3. Check support and bracing:
    - a. Bus bar support insulators and barriers shall be inspected to ensure that they are free from contamination.
    - b. Insulators shall be checked for cracks and signs of arc tracking. Mounting hardware shall be inspected and all joints checked for proper torque value.
  4. Test all electrical and mechanical interlock systems for proper operation and sequencing:
    - a. Closure attempt shall be made on locked-open devices.
    - b. Opening attempt shall be made on locked-closed devices.
  5. Test vacuum verification equipment and verify performance in accordance with the specifications.
  6. Inspect accessible insulators for evidence of physical damage or contaminated surfaces.
  7. Verify proper barrier and shutter installation and operation.
  8. Verify appropriate contact lubricant on moving current carrying parts and surfaces. Verify appropriate lubrication on moving and sliding surfaces.
  9. Exercise all active components.
  10. Inspect all mechanical indicating devices for proper operation.

11. Verify proper operation of motor control center heaters. Ensure filters and/or vents are clear.
12. Perform minimum electrical tests as follows:
  - a. Insulation resistance tests at 2500V DC on each bus section, phase-to-phase and phase-to-ground for 1 minute.
  - b. Overpotential test voltages in accordance with manufacturer's recommendations or NETA ATS. Test results are evaluated on a go/no-go basis by slowly raising the test voltage to the required value. The final test voltage shall be applied for 1 minute.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. **Applicability:** Installation requirements are applicable to medium voltage motor control centers provided as part of the factory installed assemblies included in the Procurement Contract.
- B. **General:** Install medium voltage motor control centers in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1.
- C. **Conformance:** Install medium voltage motor control centers as indicated, in accordance with manufacturer's written instructions and in accordance with recognized industry practices; comply with requirements of NEMA standards, NEC, and applicable ANSI Publications.
- D. **Coordination:** Coordinate with other work, including cabling and wiring, as necessary.
- E. **Torque Requirements:** Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals in accordance with UL Std 486A.
- F. **Fuses:** Provide fuses in each unit as required.
- G. **Grounding Connections:** Make equipment grounding connections for the motor control centers as indicated. Tighten connections in accordance with UL Standard 486A for permanent and effective grounding.
- H. **Adjustments:** Make all necessary adjustments to the equipment to provide complete and satisfactory operation.

### 3.02 FIELD QUALITY CONTROL

- A. Inspections: Inspect, adjust and check the installation for physical alignment, cable terminations and ventilation.
- B. Tests: Perform the following field tests:
  - 1. Close and open each isolation switch, starter and disconnect switch to test operation.
  - 2. Energize the motor control center and test for hot spots.
  - 3. When site conditions permit, energize and de-energize each equipment item served by each motor control center, testing the complete control sequence of each item.

### 3.03 MANUFACTURER'S FIELD SERVICES

- A. Provide services in accordance with Section 01640, Manufacturers' Field Services. Manufacturer's field services shall respond to the Commission's request for correction of problems during startup and warranty power within 4 hours.
- B. Provide services needed to furnish Manufacturer's Certificates of Proper Installation per Section 01 45 00 - Quality Control.
- C. Manufacturer-Provided Training: Comply with Section 01 79 00 – Demonstration and Training.
  - 1. The manufacturer shall provide a minimum of 16 hours of training for the medium voltage motor control center.
  - 2. Training shall be for proper operation, maintenance and repair of the motor control center, and shall include microprocessor-based relays and metering, communication network, and microprocessor relay software.
  - 3. Training shall be for the proper operation, maintenance and repair of the systems, all accessories and components, including:
    - a. Safe work practices and PPE
    - b. Overview of equipment lineup and arrangement
    - c. Protective devices, sequence of operations, troubleshooting, fault indications and clearing faults
    - d. Normal operating procedures
    - e. Emergency operating procedures

f. Maintenance procedures, frequency of maintenance, use and application of special tools

- (1) Removing contactors
  - (2) Voltage testing
  - (3) Lockout/tagout
- Overview and maintenance of auxiliary equipment

3.04 CLEANING AND PAINTING

A. Shop painting: Paint medium voltage motor control centers in accordance with Section 09 90 00 - Paints and Coating.

END OF SECTION

SECTION 26 22 00

GENERAL PURPOSE DRY TYPE TRANSFORMERS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Requirements for furnishing and installing ventilated, dry-type transformers.
- B. Related work specified in other sections includes:
  - 1. Section 09 90 00 - Paints and Coatings
  - 2. Section 26 05 00 - Basic Electrical Materials and Methods
  - 3. Section 26 05 26 - Grounding
  - 4. Section 26 05 33 - Electrical Raceway Systems

1.02 REFERENCES

- A. Codes and standards referred to in this Section are:
  - 1. ASTM D 635 - Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
  - 2. NEC - National Electrical Code
  - 3. NEMA ST 20 - Dry Type Transformers for General Applications
  - 4. 10 CFR 431 - Energy Efficiency Program for Certain Commercial and Industrial Equipment

1.03 SUBMITTALS

- A. General: Furnish all submittals, including the following, as specified in Section 26 05 00.
- B. Product Data and Information: Furnish manufacturer's data including:
  - 1. KVA ratings
  - 2. Service voltages
  - 3. Impedance and X/R ratio
  - 4. Number of phases
  - 5. Taps
  - 6. Insulation class
  - 7. Sound level
  - 8. Dimensions

- 9. Weights
- 10. Mounting details
  
- C. Quality Control: Furnish the following as specified in Section 01 45 00 - Quality Control.
  - 1. Test Reports
    - a. Certified production reports for sound-level and temperature in accordance with NEMA ST 20
  - 2. Manufacturer's Installation Instructions
  
- D. Operations and Maintenance Manuals: Furnish 6 copies of manufacturer's operations and maintenance manuals.

#### 1.04 QUALITY ASSURANCE

- A. UL Label: Provide UL listing label or mark.
- B. Energy Efficiency: Provide transformers with minimum efficiency meeting the requirements of 10 CFR 431.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Section 01 66 00 - Product Storage and Handling Requirements.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.
  - 1. ABB
  - 2. Cutler Hammer
  - 3. Square D Company

#### 2.02 MATERIALS

- A. General: Provide dry-type transformers suitable for indoor use.
- B. Insulation: Provide transformers above 15 kVA with 220-degree C temperature insulation materials. Provide transformers 15 kVA and below with a minimum of 185-degree C insulation materials.
- C. Flame Retardant Materials: Provide transformers with flame retardant materials that will not support combustion as defined in ASTM D 635.

2.03 FABRICATION

- A. Transformer Taps: Provide transformers rated over 15 kVA with at least two 2-1/2 percent full capacity taps above and below nominal in the primary winding. Provide transformers rated 15 kVA and below with two five percent taps or with four 2-1/2 percent taps below rated voltage on the primary winding.
- B. Windings: Provide primary and secondary windings fabricated from copper conductors.
- C. Voltage and KVA Ratings: Provide three-phase or single-phase transformers with primary and secondary voltages and kVA ratings as specified.
- D. Connections
  - 1. Three phase: Primary - 3-wire Delta; Secondary - 4-wire, solidly-grounded wye.
  - 2. Single Phase: Primary - 2-wire; Secondary - 3-wire with mid-point solidly-grounded.
- E. Continuous Operations: Provide transformers suitable for continuous operation at the rated kVA with a normal life expectancy as defined in NEMA ST 20 and the performance obtained without exceeding 115 degrees C average temperature rise by resistance or 145 degrees C hot spot temperature rise in 40-degree C maximum ambient and 30-degree C average ambient. Do not provide transformers that exceed 185-degree C maximum coil hot spot temperature.
- F. Electrostatic Shields: Provide electrostatic shields between windings.
- G. Construction: Provide transformers with core mounting frames and enclosures of welded and bolted construction with sufficient mechanical rigidity and strength to withstand shipping, erection and short circuit stresses.
- H. Sound Levels: Do not provide transformers that exceed the following sound levels:

Transformer kVA	Average Sound Level in dB NEMA ST 20
0 – 09	40
10 - 50	45
51 – 150	50

- I. Lifting Lugs and Jacking Plates: Provide lifting lugs and jacking plates as required on the transformer.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Install all transformers and provide guards as specified by the latest NEC and ANSI standards, and in accordance with manufacturer's instructions.
- B. Clearances: Provide clearance around the transformer meeting the manufacturer's recommendation.
- C. Supports: Provide suitable supports for all transformers. Mount transformers on one inch of Korfund, or equal sound-absorbent material.
- D. Primary Disconnect: Provide primary disconnect circuit breaker or disconnect switch as shown or required.

3.02 CLEANING AND PAINTING

- A. Shop Painting: Paint transformers meeting the requirements of Section 09 90 00 - Paints and Coating.

END OF SECTION



SECTION 26 23 16

ELECTRICAL EQUIPMENT ENCLOSURES

PART 1 - GENERAL

1.01 SCOPE

- A. This section covers the design, furnishing, and installation of environmentally controlled, pre-fabricated, metal electrical equipment enclosures as specified herein.
- B. Provide an enclosure as part of each packaged Vacuum Pressure Swing Adsorption (VPSA) plant. Each enclosure shall contain all necessary power distribution equipment required for the operation of the respective VPSA system.
- C. Each enclosure shall include an HVAC system as specified herein. The enclosure shall be furnished complete and pre-wired for all enclosure HVAC units along with all lighting and receptacles.
- D. Enclosures shall be suitable for housing electrical equipment as specified in the following specifications:
  - 1. Section 26 14 00 - Medium Voltage Motor Control Centers
  - 2. Section 26 22 00 - General Purpose Dry Type Transformers
  - 3. Section 26 24 16 - Panelboards
  - 4. Section 26 24 19 - Motor Control Centers

1.02 GENERAL

- A. Equipment provided under the appropriate section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.
- B. The electrical equipment enclosures shall be manufactured and assembled in their entirety as much as possible at the manufacturer's factory. Electrical equipment specified herein to be located within the enclosure shall be shipped to the enclosure manufacturer for installation of electrical equipment prior to the shipment of the completed enclosure to the extent practical. Modular assembly of the main enclosure body in the field is not acceptable although accessory components to the enclosure may be shipped separately and field installed.
- C. Workmanship and Materials
  - 1. Seller shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage, or other failure. Materials shall be suitable for service conditions.

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

D. Abbreviations

1. Reference to standards and organizations in the Specifications shall be by the following abbreviated letter designations:
  - a. AISI American Iron and Steel Institute
  - b. AISC American Institute of Steel Construction
  - c. ANSI American National Standards Institute
  - d. ASCE American Society of Civil Engineers
  - e. ASTM American Society of Testing and Materials
  - f. AWS American Welding Society
  - g. IEEE Institute of Electrical and Electronics Engineers
  - h. NEC National Electrical Code
  - i. NEMA National Electrical Manufacturers Association
  - j. UL Underwriters' Laboratories

1.03 SUBMITTALS

- A. Complete drawings, details, and specifications shall be furnished in accordance with Section 01 33 00 - Submittals and requirements stated herein.
- B. Shop Drawing Submittal Drawings and data shall include, but shall not be limited to, the following:
  1. Outline plan view showing general arrangement, center of gravity, weight, floor and wall opening size and locations for cable entry.
  2. Base plans showing anchor bolt locations and base details.
  3. Elevation views, general arrangement in elevation, recommended tie down locations, wall opening sizes and locations and exterior HVAC equipment locations.
  4. Total weight and lifting instructions, height, mounting, and floor space required.
  5. Design Criteria including drawing legend and bill of materials.
  6. Floor, wall, and roof sectional views.
  7. Structural data, calculations, and conformity to seismic requirements.
  8. Surface finish/paint specifications.

9. HVAC unit catalog cuts, installation and wiring diagrams, performance data, filter data, options and accessories, operation and maintenance manuals, along with calculations including heat rejection data for all electrical equipment contained within the enclosure and overall building heating and cooling load calculations to support the selection of AC unit sizing. HVAC testing and balancing reports shall also be submitted.
10. Portable emergency eyewash catalog cuts, options and accessories, and operation and maintenance manuals.
11. Equipment identifications, dimensions and weights for the equipment to be installed in the enclosures provided under other sections of these specifications.
12. Electrical calculations, equipment ratings, wiring diagrams, grounding plans and catalog cuts for that equipment supplied to serve the enclosure.
13. Door and door hardware catalog cuts.
14. Enclosure coatings and paint catalog cuts and specifications including color sample/chart.
15. One-line diagrams and panelboard schedules for the enclosure services, and other miscellaneous diagrams.

C. Shop Testing

1. Testing plan for certified shop testing
2. Certified shop test results

D. Operation and Maintenance Data and Manuals

1. Operation and maintenance manuals shall be submitted in accordance with Section 01 78 23 - Operation and Maintenance Manuals.
2. The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with the enclosure and its equipment when delivered.

1.04 QUALITY ASSURANCE

- A. Each enclosure shall be designed, built and tested in accordance with the latest applicable editions of NEMA, ANSI, UL, AISC, ASCE, ASTM, AWS, NFPA and IBC.
- B. The enclosure manufacturer shall have experience in the design and be regularly engaged in manufacturing custom enclosures for installations of the type and sized specified.

- C. The enclosure manufacturer shall ensure the enclosure, distribution and control equipment are properly coordinated and are connected and function as intended, as specified herein or as shown on the Drawings. The enclosures specified under this Section as well as the distribution and control equipment specified under the various Division 26 sections shall be obtained from the same distribution equipment manufacturer.
- D. The Drawings show an overall size and arrangement of each enclosure and the distribution and control equipment requirements. The drawings are for purposes of guidance and for showing the functional features and spacing required. The drawings do not show all components required and the enclosure construction shall incorporate all specified requirements for proper functionality and operation.
- E. Seismic Requirements: The enclosure and the distribution and control equipment within shall be designed, constructed, installed, and certified in accordance with the requirements of ASCE 7-22 with Seismic Design Category D, Risk Category IV, and Component Importance Factor of 1.5.
- F. Calculations
  - 1. The enclosure structural calculations shall be prepared and submitted for review by the Engineer in accordance with the structural requirements specified herein and submitted. Calculation shall be certified, signed and sealed by Professional Engineers registered in the state of New Jersey.
  - 2. The enclosure heating and cooling calculations shall be prepared and submitted for review by the Engineer in accordance with the HVAC requirements specified herein and submitted. Calculations shall be certified, signed and sealed by a Professional Engineer registered in the state of New Jersey. All calculations shall be in accordance with the procedures listed in ANSI/ASHRAE/ACCA Standard 183. Heating and cooling load calculations shall be provided using an industry recognized software calculation program such as Elite CHVAC, Carrier Block Load or shall be in accordance HAP or Trane Trace.
  - 3. The enclosure lighting level calculations shall be prepared and submitted for review by the Engineer in accordance with the requirements specified herein. Calculations shall be certified, signed and sealed by a Professional Engineer registered in the state of New Jersey.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. Shipping, handling and storage with Section 01 66 00 - Product Storage and Handling Requirements.
- B. Enclosures shall be equipped to be handled by a crane.
- C. The enclosure manufacturer shall submit any special or specific handling requirements. Abide by all manufacturer installation requirements.

## PART 2 - PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

- A. The electrical equipment enclosures shall be manufactured and/or sourced by the manufacturers of the electrical equipment specified in Section 26 14 00 – Medium Voltage Motor Control Centers, without exception.

### 2.02 DESIGN AND CONSTRUCTION

#### A. Layout

1. Each enclosure shall have a separate Electrical Room and Control Room. Power distribution equipment shall be installed in the Electrical Room. The Control Room shall be dedicated to the VPSA control functions as described in Section 11 55 10 – Vacuum Swing Adsorption Oxygen Generation System.
2. The Control Room shall be provided with a window to allow observation of the VPSA process equipment.
3. Working space around all equipment shall be in accordance with the National Electrical Code.
4. Outside dimension shall be determined by the enclosure supplier.

#### B. General Construction

1. The electrical enclosures shall consist of an all-weather, insulated walk-in enclosure having a sheltered operating and maintenance aisle and located as shown on the Drawings.
2. The enclosures shall be delivered to the VPSA manufacturer's site with all equipment installed, as a pre-designed, factory assembled and tested unit.
3. The enclosures shall be factory fabricated metal enclosures with provisions for environmental control as shown on the drawings and as specified herein.

#### C. Service Conditions

1. The equipment within the enclosures shall perform satisfactorily when the respective enclosure is installed at their ultimate location outdoors.
2. The enclosures shall be suitable for the ambient design conditions described herein and at an approximate elevation of 25 feet above sea level.

D. Structural Design, Construction, and Materials

1. The basic design and construction of the enclosures shall be as described in the following paragraphs. The dimensions and arrangements shall be as shown on the Drawings.

a. Base and Lifting

- (1) The base shall be all welded construction of ASTM A-36 structural steel members, sized and arranged for proper strength and durability, and shall be able to withstand the stress and loads which will result when lifting the completed factory fabricated enclosure.
- (2) The base structural members shall not interfere with or obstruct the areas designated for routing of power cables or control wiring.
- (3) All welding shall be performed by certified welders and be in accordance with the requirements of AWS D 1.1.
- (4) Deflection during lifting shall not exceed .25 inches per 10 feet. Base shall be designed for mounting on concrete slabs.
- (5) The base shall have removable lifting/jacking devices to facilitate handling and installation. The normal lifting for transportation and installation shall be by means of a crane making a single point lift using suitable rigging.
- (6) The base shall have two (2) stainless steel grounding pads located at opposite corners of the structure. The ground pads shall be mechanically bonded to the base steel and to a 4/0 AWG bare copper ground loop located under the floor plate. Each ground pad assembly shall include two 3/8"-16 UNC threaded brass studs to permit connection of a NEMA 2-hole cable lug.
- (7) Base shall include all structural framing to support the enclosure, and the enclosure floor. The base shall be suitable for anchoring to a concrete foundation as shown on the Drawings. Seller shall ensure the enclosure supplier is responsible for coordinating foundation anchoring and surrounding platform connection requirements.

b. Floor

- (1) The floor shall be a minimum of 1/4 inch steel plate welded to the perimeter members and to the cross members of the base.

- (2) The floor loading shall be rated not less than 250 pounds per square foot distributed load, or a 1300 pound concentrated load in a 2.5 square foot area located anywhere in the enclosure.
- (3) Floor shall be provided with cutouts where required for power and control cable entry/exit from equipment. Cutout locations shall be coordinated with the actual equipment and cable installation. All cutouts shall be provided with stainless steel cover plates.
- (4) Floor directly below the medium-voltage equipment shall be provided with support channels which will anchor and raise the equipment enclosure to allow for cubicle door swing of bottom cubicle to clear insulated working mats. Channels shall be welded to the floor and shall not interfere with breaker lifting truck operations.

c. Framing and Walls

- (1) The entire enclosure shall be framed with minimum 3-inch square ASTM A500 structural grade steel tubing to provide moment resisting welded connections at base to walls, side walls to end walls, and walls to roof to minimize overall deflection, twisting, and elastic instability during lifting and transporting.
- (2) All wall openings, such as doors, windows, louvers, etc., shall be similarly framed with 3-inch square steel tubing. All frame connections shall be welded.
- (3) The exterior and interior walls shall be 16-gauge minimum paint quality G90 galvanized steel formed vertical panels. The nominal thickness of the wall, including the required frame structure shall be 3-inches. Wall panels shall be interlocking with a maximum width of 16-inches.
- (4) Interior walls, supporting panels, and structural, shall be designed so that interior loads of 400 pounds per linear foot of wall length may be attached to the wall without compromising the designed wind loads.
- (5) Should damaged exterior wall panels need to be replaced, the tubular frame design will facilitate replacement without disrupting the integrity of the roof and adjoining wall panels or adjacent walls.
- (6) Wall design shall include framing suitable to support wall-mounted HVAC units, louvers, dampers, heaters, and portable eyewashes where applicable.

d. Roof and Ceiling

- (1) The exterior roof shall be 12-gauge minimum paint quality G90 galvanized steel panels, manufactured in interlocking panels in 14-inch widths with 4-inch ridge depths. Roof panels shall be interlocking with a maximum width of 16-inches. The roof design load shall be rated 85 PSF, minimum. The roof shall have a one directional slope with a pitch of 1-inch per foot and shall be designed to support interior or exterior loads of 100 pounds per linear foot of truss length without compromising the roof design load. Roof slope orientation shall pitch down towards the enclosure side opposite breaker rear access doors.
- (2) The interior height, from floor to ceiling, shall be a minimum of 132 inches and the truss shall be constructed so that conduits or cable tray can be routed within the interior space, as applicable.
- (3) Roof trusses shall consist of formed 12 gauge (up to 12 Ft. Wide) or 10 gauge steel sections. Trusses shall be sloped to provide the specified roof pitch and have a 1-1/2" upper and lower horizontal flange for attachment of equipment.
- (4) The ceiling shall consist of formed 16-gauge minimum paint quality G90 galvanized steel panels attached to the trusses or to purlins. The ceiling assembly shall be designed to retain the insulation and to provide a smooth ceiling surface.
- (5) Enclosure shall include provisions for channeling water runoff from the roof away from equipment and personnel door locations. Provide continuous gutters and leaders at the low side of the roof to conduct rainwater away from the building.
- (6) Roof design shall be suitable for support, anchorage, and hanging of HVAC ductwork, filter housings, and fans where applicable. Roof design shall include framing if required for proper support for hanging the HVAC equipment.

2. Doors

a. Personnel Doors

- (1) The enclosure shall have three (3) 36 by 84 inch personnel-access single doors. The Electrical Room and Control Room shall each have one exterior door and a connecting door between the two rooms.
- (2) All exterior doors shall open outward and have a minimum swing of 105 degrees with closer.



- (3) The connecting door shall open into the Control Room in the direction of egress from the Electrical Room.
- (4) The doors shall be steel 18-gauge minimum double-wall construction insulated with R-6 thermal insulation.
- (5) Doors shall be reinforced for closer and rim exit type panic hardware and hinge preps for three 4" x 4" hinges per door.
- (6) Each door shall have a vision panel with insulated safety glass.
- (7) Door openings shall be sealed with a neoprene gasket.
- (8) Water flashing and a drip shield above each door shall be provided for each door.
- (9) All door hardware shall be 316 stainless steel.
- (10) All doors shall be key lockable with identical keying and removable lock cores.
- (11) All active entry/exit doors shall have hardware devices as follows, or equal:
  - (a) Exit devices: BHMA A156.3 as manufactured by Yale, Won Duprin or approved equal.
  - (b) Lock Cylinders: Tumbler type; brass, bronze, stainless steel or nickel-silver alloy. Lock cylinders shall be coordinated with OWNER's existing key system. All locks shall be keyed alike.
  - (c) Keys: Provide at least one compatible blank key for each lock furnished.
- (12) Exterior doors shall have a warning sign which states "DANGER – HIGH VOLTAGE – KEEP OUT".

b. Equipment Access Door

- (1) The enclosure shall have equipment access doors to provide rear access to each vertical section of medium voltage equipment.
- (2) All doors shall be hinged and shall open outward with a minimum swing of 90 degrees.
- (3) Doors shall be 14-gauge minimum G90 galvanized steel, gasketed and insulated with a 3-point latching system.

- (4) Water flashing and a drip shield above each door shall be provided for each door.
- (5) All door hardware shall be 316 stainless steel.
- (6) All doors shall have opening handles with hasps suitable for application of padlocks.
- (7) A wall-mounted sloped roof type overhang shall be provided above each access door which extends out from the enclosure the width of the door.
- (8) Rear doors shall be provided with engraved identification nameplates which match their respective medium voltage equipment designations. Doors shall have a warning sign which states "DANGER – HIGH VOLTAGE – KEEP OUT".

3. Window

- a. The Control Room exterior window shall be minimum 48" x 48" with insulated safety glass and shall be non-operable.
- b. The window shall be provided with adjustable, white horizontal blinds.

4. Weatherproofing

- a. All joints shall be designed to minimize the loss of conditioned or pressurized air and to prevent entry of rain, sleet, snow or moisture.
- b. All wall seams and areas where metal to metal contact is made shall be liberally caulked with butyl rubber caulking.
- c. All roof seams shall be sealed with ethylene propylene copolymer tape to insure water resistance.

5. Insulation

- a. Insulation providing a minimum of R-19 value shall be provided in the walls. Insulation shall be spray applied polyurethane foam.
- b. Insulation providing a minimum R-30 value shall be provided in the roof and floor and shall be of the spray applied polyurethane foam. Spray foam shall be protected with thermal barrier.

6. Painting

- a. All coatings on metal surfaces shall be severe duty type for use in corrosive/marine environments.

- b. All metal surfaces shall be thoroughly cleaned and prepared in according with the paint manufacturer's recommendation and coated with one coat of epoxy primer Amercoat 370 (4-6 mils DFT), or equal.
- c. Finish coat for all finished surfaces shall be a hi-build aliphatic polyurethane. Base coats for surfaces shall be as specified herein.
  - (1) Interior - The interior wall and ceiling panels shall be finished with a single coat of minimum 7 mils thickness with white epoxy. One quart of interior epoxy shall be shipped with the enclosure for future touch-up needs.
  - (2) Exterior - The exterior wall and roof panels shall be finished with two coats of minimum 7 mils thickness each with of ANSI 61 Gray epoxy Amercoat 450H, or equal. The color shall be off-white or similar neutral color. The base exterior shall be sandblasted smooth, free from scale and rust, primed and coated with 3 mils of ANSI 61 Gray epoxy and finished with hi-build aliphatic polyurethane to match the exterior. The bottom of the base shall be coated with corrosion resistant black mastic/bituminous undercoating for protection against the environment. One quart of exterior epoxy shall be shipped with the enclosure for future touch-up needs.
  - (3) Floor - The floor shall be thoroughly cleaned, epoxy primed, and coated with a gray non-skid, scuff resistant epoxy coating.

#### E. HVAC

- 1. Each room of the enclosure shall be cooled and heated independently with separate room temperature controls.
- 2. Each room of the enclosure shall be provided with N+1 redundancy for both cooling and heating. The duty unit(s) shall split the air conditioning and heating loads evenly, and the stand-by unit(s) shall operate automatically in case of failure of a duty unit.
- 3. The heating and air conditioning systems shall be designed to maintain the enclosure interior temperature between 85 degrees F (summer - cooling) and 55 degrees F (winter - heating), based on outdoor design temperatures of 94.3 Fdb/74.4 Fwb summer, and 12.8 Fdb winter. AC equipment shall be capable of providing required calculated cooling capacity at up to a maximum outdoor temperature of 99.3 Fdb.
- 4. Air conditioning and heating equipment shall be provided complete with all mounting brackets, drain tubing, controls, wiring, and appurtenances as recommended by the equipment manufacturers for a complete system installation.

5. HVAC equipment provided and as installed shall comply with the applicable requirements of the 2018 New Jersey Energy Code and Mechanical Code.
6. System controls shall be capable of connecting to the existing HVAC/Building Automation Systems plantwide network and shall have programming capability for expanding alarm output points and sensor communication to the SCADA plantwide network (in future). Communications interface(s) shall be provided as required to convert between the communications protocol of the provided equipment controllers and the communications protocol of the existing HVAC/Building Automation Systems plantwide network (Lonworks) and the communications protocol of the SCADA plantwide network. All other control devices, components, controllers, programming, software, or hardware required for full connection of the HVAC systems to the existing plantwide HVAC/Building Automation Systems network and for expanding alarm output points and sensor communication to the SCADA plantwide network (in future) shall be provided.
  - a. At a minimum, the following alarms/monitoring points shall be provided:
    - (1) High room temperature
    - (2) Low air temperature (freezestat)
    - (3) Dirty filter/high filter pressure loss
    - (4) Blower/fan failure
    - (5) Ventilation system failure
    - (6) System shutdown due to smoke alarm and/or clean agent fire suppression system activation
    - (7) Equipment energized/de-energized status
  - b. All instruments and control devices necessary to provide the minimum alarms/monitoring points described above shall be provided.
7. HVAC equipment installation shall be in accordance with NFPA requirements for compatibility with a clean agent fire suppression system. All HVAC wall penetrations, including, but not limited to, those for louvers and AC unit supply and return openings, shall be properly sealed. Proper sealing shall also be provided between the AC unit and the exterior enclosure wall and the AC unit wall cavity. System controls shall be capable of connecting to the fire alarm system as required to provide shutdown of the AC units and supply and exhaust fans.

8. Air-Conditioning

- a. The air conditioning units shall be of the industrial grade, exterior packaged wall mount type.
- (1) The units shall be capable of providing multiple stages of cooling and shall have controls for operating in a high sensible cooling mode when space humidity is low.
  - (2) The air conditioning units shall be provided with a room temperature/humidity sensor and a lead/lag or multi-unit controller as manufactured by Bard, model LC6000, or approved equal.
    - (a) The controller shall stage each unit to maintain setpoint, rotate lead and lag designated units and provide summary alarm dry contacts for remotely signaling a system alarm.
    - (b) The controller shall have an ethernet port to provide connection of the units to the existing plantwide HVAC/Building Automation System network and plantwide SCADA network (in future).
  - (3) Air conditioning units shall operate on non-CFC refrigerant and shall be high efficiency type.
  - (4) Air conditioning units shall be provided with a factory applied protective coating of Heresite or equal on all airstream components and exposed heat transfer components. Additionally, the remainder of the air conditioning units in their entirety, including all other copper and unit surfaces, cabinet, and attached components and appurtenances, shall be given a coating, factory or otherwise, of Heresite or equal. The coatings shall be suitable for a corrosive sea-coast and hydrogen sulfide environment.
  - (5) The air conditioning units shall be provided with 2" pleated filters. The filters shall have a minimum efficiency reporting value (MERV) based on the ASHRAE 52.2 guidelines of at least MERV 8. Each unit shall be provided with two sets of spare replacement filters.
  - (6) The air conditioning units shall be provided with a low ambient kit and control programming to allow the units to provide cooling operation down to 0 degrees F ambient temperature.

9. Heating

- a. Each enclosure shall be provided with electric type heaters to heat the enclosure in the winter.

- b. Combination air condition/heating units are acceptable.

F. Electrical

1. Lighting and Receptacles

- a. Interior lighting shall consist of surface mounted, 120 V, enclosed and gasketed type, 4-foot, 4000K LED industrial grade fixtures that provide 40 foot candles of light at floor level. Fixtures shall be Lithonia Type FEM LED, Columbia Type LXEM, or approved equal.
- b. Interior lighting shall be controlled by three-way motion activated switches located at each personnel door with motion detector control integrated into to the switch. Lighting shall function such that if the lights are on and no motion is detected for a period of time within the enclosure, the interior lights will shut off until new motion is detected. When new motion is detected, the lights will come on and stay on for a set period of time. The timer that controls the lights on condition will be constantly reset by the presence of motion.
- c. Interior emergency lighting shall be a 120 V self-contained battery powered LED exit sign unit with two directionally variable LED illuminating heads. A fixture shall be provided above each personnel exit door. Fixtures shall be Lithonia Type LHQM LED, Sure Lites Type APC, or approved equal.
- d. Interior emergency lighting shall switch on automatically upon loss of AC power and provide 1.5 hours of continuous illumination, and then recharge when AC power is resumed.
- e. Exterior lighting shall be provided above each personnel door and on each side opposite to the personnel doors for a total of four per enclosure.
- f. Exterior light fixtures shall be wall mounted, 120 V, 7,000 lumens (minimum), 4000K LED, full cutoff, integral photocell control for dusk-to-dawn operation and shall be suitable for use in wet locations. Fixtures shall be Holophane Type HLWPC2, Hubbell Type LNC3, or approved equal.
- g. Interior duplex receptacles shall be rated 120VAC, 20A, specification grade. Receptacles shall be located near each personnel door as well as one at the midpoint of the interior aisleway, as a minimum.
- h. Exterior duplex receptacles shall be the same as interior type but shall include integral GFCI protection rated for outdoor applications and a weatherproof while in-use receptacle cover. Receptacles shall be located near each personnel door.

2. Grounding System

- a. Each enclosure shall be provided with a 1/4-inch x 2-inch copper ground bar running the entire interior perimeter of the building.
- b. A #4/0 green insulated copper ground cable shall be provided from the ground bar to each exterior ground pad.
- c. A suitably sized green insulated copper ground cable shall be provided from the ground bar to all electrical equipment located within the enclosure.

3. Interior Wiring

- a. A 4" x 4" metal wireway, with hinged cover shall be provided around the enclosure perimeter at the junction of the walls and ceiling. This wireway shall contain all enclosure facilities wiring.
- b. All enclosure lighting and power wiring shall be single or multi conductor, stranded copper, with XHHW-2 600V insulation with a minimum size of No. 12 AWG.
- c. Control, instrumentation, and alarm wiring shall be no smaller than No. 16 AWG. All wiring shall be installed in the 4" x 4" perimeter wireway, EMT conduit, or other approved raceway in accordance with the National Electric Code.
- d. Wiring shall also include the HVAC system equipment, electrical devices such as receptacles, lighting, and medium voltage equipment compartment heaters.
- e. Each enclosure shall be factory wired complete for proper operation of the distribution equipment and the VPSA control systems.

G. Fire Alarm

1. Each room of the enclosure shall have a photoelectric smoke detector designed to restrict entry of dust and air turbulence with drift compensation software filtering that compensates for environmental factors and component aging. Shield the electronics of the unit to protect against false alarms from electromagnetic interference and radio-frequency. Furnish units with a red LED that pulses to indicate power on and glows continuously to indicate alarm.
2. Activation of any smoke detector shall initiate a local audible alarm and shall shut down all HVAC equipment in the enclosure.
3. Each smoke detector shall be provided with auxiliary Form C contacts. The auxiliary contacts shall be wired to remote terminals in a wall-mounted terminal box for connection to SCADA.

H. Fire Extinguishers

1. Each enclosure shall be provided with fire extinguishers, one located adjacent to each exterior door.
2. Extinguishers shall be carbon dioxide Type, UL-rated, 10 lb. nominal capacity in manufacturer's standard enameled container.

I. First Aid Kit

1. Provide Type-IV, Class A, First Aid Kits consistent with ANSI standard Z308.1 and personal protective equipment in compliance with the provisions of the OSHA Bloodborne Pathogens Standard 1910.1030(d)(3).

2.03 SHOP TESTS

- A. After the enclosure has been completely assembled and all equipment has been installed, the manufacturer shall perform a wet spray test, an electrical inspection and a quality control inspection, as well as any other typical tests as defined by the manufacturer or as defined by applicable industry standards.
- B. Perform typical and standard factory tests at the manufacturer plant.
- C. Shop tests shall include functional and visual inspection tests of the equipment for which the enclosure is primarily intended to hold.
- D. In addition to what may be included in typical manufacturer and/or industry standard tests, the following tests shall be explicitly conducted during testing:
  1. Electrical operations consisting of opening and closing of the medium-voltage switches.
  2. Operations testing shall also include interior and exterior lights, receptacles, enclosure heaters and HVAC equipment.
  3. Insulation resistance testing of the 480 Volt and 208/120 Volt AC system power conductors and control circuits between the starters and control panel.
- E. A shop test report shall be submitted to document the production level shop tests as well as witness shop test results. The report shall identify the factory tests performed and the results obtained. All testing shall be in accordance with ANSI and NEMA standards and the manufacturer's standard factory quality control tests and for the shop tests specified herein.



## PART 3 - EXECUTION

### 3.01 SHIPPING

- A. Components that are not fastened to the structure at time of shipment will be securely packed inside the enclosure if possible. Each item will have an identifying tag and will be listed on the packing list.
- B. Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. Painted surfaces that are damaged prior to acceptance of equipment shall be repainted to the satisfaction of Engineer.

### 3.02 INSTALLATION

- A. Assemble enclosure and install in accordance with and under direct supervision of the enclosure manufacturer representative. The equipment manufacturer shall furnish a qualified field installation supervisor during the equipment installation. Such services shall be included in the contract price for the number of days and round trips to the site required for complete and proper electrical enclosure installation.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosure and components.

### 3.03 FIELD INSPECTIONS AND TESTS

- A. An experienced, competent, and authorized representative of the manufacturer shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. The representative shall be present when the equipment is placed in operation and shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Engineer.
- B. The manufacturer's representative shall furnish a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.
- C. After installation, field inspect and test each enclosure for operation and conformance.
- D. The field inspections and tests shall be witnessed by the Engineer.
- E. The inspections and testing shall be performed by the manufacturer's representative. The representative shall verify in presence of Engineer that the enclosure is acceptable to energize. The representative shall provide all equipment and instruments required to perform the inspections and testing.
- F. Perform enclosure inspections and tests in accordance with the enclosure manufacturer's recommended procedures. Perform all checks and adjustments as required for proper operation. Inspect and perform electrical operations testing including interior and exterior lights, receptacles and HVAC equipment.

- G. All costs for these services shall be included in the Contract price.

### 3.04 FIELD SERVICES

- A. Furnish the services of the enclosure manufacturer's factory-trained representative to provide onsite supervision during installation and assembly of each enclosure. The manufacturer's representative shall be on site during the installation of each enclosure and shall verify in presence of ENGINEER that each enclosure was installed and connected in accordance with the manufacturer's installation requirements.
- B. Furnish the services of enclosure manufacturer's factory-trained representative to provide onsite training instructions for the manufacturer's recommended operation and maintenance of the HVAC equipment. The training shall be in accordance with the requirements specified under Section 01 79 00 - Demonstration and Training.
- C. The training instructions shall include both classroom and field hands on training for eight hours of duration covering the HVAC equipment.
- D. Conduct at a time and discretion of the Owner a follow up final training session for eight hours of duration after the initial training session is completed. The purpose of this additional session shall be to address on an on needed basis any Owner's questions that may have arisen during operation of the equipment or to instruct additional staff.
- E. All costs for these services shall be included in the Contract price.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Requirements for providing lighting and distribution panelboards including circuit breakers and cabinets.
- B. Related work specified in other sections includes, but is not limited to, the following:
  - 1. Section 09 90 00 - Paints and Coatings
  - 2. Section 26 05 00 - Basic Electrical Materials and Methods
  - 3. Section 26 05 26 - Grounding
  - 4. Section 26 05 53 - Electrical Identification

1.02 REFERENCES

- A. Codes and standards referred to in this Section are:
  - 1. NEMA PB 1 - Panelboards
  - 2. UL 67 - Panelboards
  - 3. Fed. Spec.  
W-P-115 - Power Distribution Panel
  - 4. UL 486A - Wire Connectors and Soldering Lugs for Use With Copper Conductors
  - 5. NEC - National Electrical Code

1.03 SUBMITTALS

- A. General: Furnish all submittals, including the following, as specified in Sections 26 05 53 - Electrical Identification and 26 05 00 - Basic Electrical Materials and Methods.
- B. Product Data and Information: Furnish the manufacturer's catalog data for panelboards, circuit breakers and accessories.
- C. Operations and Maintenance Manuals: Furnish operation and maintenance manuals for the panelboards as specified in Section 01 78 23 - Operation and Maintenance Manual.

#### 1.04 QUALITY ASSURANCE

- A. Codes: Provide all materials and workmanship meeting the requirements of the NFPA, the National Electrical Code and local codes.
  - 1. Design, fabricate and test the panelboards in accordance with applicable ANSI, IEEE and NEMA standards.
  - 2. Provide panelboards suitable for operation at their standard nameplate ratings in accordance with ANSI standards.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Section 01 66 00 - Product Storage and Handling Requirements.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.
  - 1. Panelboards
    - a. ABB
    - b. Square D Company
    - c. Eaton

#### 2.02 MATERIALS

- A. General: Provide factory-assembled fully rated dead-front type, panelboards, suitable for surface or flush mounting with branch circuit breakers and a main circuit breaker or main lugs as indicated.
  - 1. Provide panelboards with a full capacity separate ground bus and connected to a three-phase four-wire or a single-phase three-wire service with insulated neutral buses as indicated.
  - 2. Provide panelboards with the voltage, frequency and current ratings as required conforming to NEMA Standard PB 1, Fed. Spec. W-P-115, UL 67 and the NEC.
  - 3. Provide panelboards with tin plated copper main, neutral and ground buses.
  - 4. Provide panelboard enclosures rated NEMA 12.
  - 5. Where required, label panelboards suitable for use as service entrance equipment

- B. Bracing: Provide main bus bracing exceeding the lowest interrupting rating of any circuit breaker installed.
- C. Fabrication: Fabricate panelboards using galvanized steel, continuously welded. Provide cabinet fronts with doors over the circuit breakers. Provide doors fastened with concealed hinges and equipped with flush type catches.
  - 1. Provide panelboards at least 20 inches wide, 5-3/4 inches deep, with wiring gutters on both sides.
  - 2. Provide all panelboard trims exceeding five square feet in area with an inside permanently secured angle to support the trim during fastening.

## 2.03 COMPONENTS

- A. Circuit Breakers: Provide bolt-on type branch and main circuit breakers.
  - 1. Furnish the frame sizes, trip settings and number of poles as indicated. Mark ampere trip rating on the circuit breakers clear and visible.
    - a. For lighting panelboards, provide 20-ampere, single-pole, 120 or 277 volt circuit breakers unless otherwise shown or scheduled.
    - b. For distribution panelboards, provide 20-ampere, three-pole, 600-volt circuit breaker, unless otherwise shown or scheduled.
  - 2. Provide all breakers with quick-make, quick-break, toggle mechanisms with automatic thermal-magnetic, inverse time-limit overload and instantaneous short circuit protection on all poles, unless otherwise indicated. Indicate automatic tripping by the breaker handle assuming a clearly distinctive position from the manual ON and OFF position. Design the breaker handle to be trip-free on overloads.
  - 3. Interrupting Rating: 22,000 rms symmetrical amperes minimum for circuit breakers on 240 volt systems or less, and 65,000 rms symmetrical amperes for circuit breakers on 277 or 480 volt systems.
  - 4. Provide multipole breakers that utilize a common tripping bar.
  - 5. Provide ground fault interrupter circuit breakers for all circuits serving receptacles located below grade and outdoors and as scheduled. Provide GFCI with higher trip current where used for heat tracing applications.
  - 6. Provide full module size single-pole breakers. Do not install two-pole breakers in a single-pole module.

## 2.04 ACCESSORIES

- A. Directories: Provide directories in accordance with Section 26 05 53 - Electrical Identification.

- B. Circuit Breaker Handle Lock: Where shown provide circuit breakers with handle clamp that holds the circuit breaker handle in the ON position.
- C. Keying: Key all panelboards alike.
- D. Rubber Work Mats: Provide rubber work mats meeting the requirements of Section 26 29 53 - Control Components and Devices.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Applicability: Installation requirements are applicable to panelboards provided as part of the factory installed assemblies included in the Procurement Contract.
- B. General: Install all panelboards in accordance with manufacturer's recommendations and approved shop drawings and in compliance with the requirements of NEMA standards, NEC, and applicable ANSI Publications.
- C. Mounting Height: Mount all panelboards either surface or flush mounted as shown such that the height of the top operating handle does not exceed 6 feet 6 inches from the floor.
- D. Coordination: Coordinate with other Work including cabling and wiring work to interface the installation of the panelboards.
- E. Torque Requirements: Tighten electrical connectors and terminals, including screws and bolts, in accordance with the equipment manufacturer's published torque tightening values for the equipment connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals in accordance with UL 486A.
- F. Circuit Breaker Handle Lock: Install circuit breaker handle clamp on each circuit breaker as shown.
- G. Directory: Provide a laminated typewritten directory with the following information:
  - 1. Circuit number
  - 2. Area served
  - 3. Utilizing equipment

#### 3.02 CLEANING AND PAINTING

- A. Shop Painting: Paint the panelboards as specified in Section 09 90 00 - Paints and Coatings.

END OF SECTION

SECTION 26 24 19

MOTOR CONTROL CENTERS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for providing new motor control centers.

B. Related work specified in other sections includes:

1. Section 09 90 00 - Paints and Coatings
2. Section 26 05 00 - Basic Electrical Materials and Methods
3. Section 26 05 19 - Wires and Cable 600V and Below
4. Section 26 05 26 - Grounding
5. Section 26 05 53 - Electrical Identification
6. Section 26 08 00 - Electrical Testing Requirements
7. Section 26 29 53 - Control Components and Devices
8. Section 40 90 00 - Process Control System General Requirements

1.02 REFERENCES

A. Codes and standards referred to in this Section are:

1. IEEE C37.90 - IEEE Standard for Relay and Relay Systems Associated With Electrical Power Apparatus
2. IEEE C62.41 - IEEE Recommended Practice for Surge Voltages in Low Voltage AC Power Circuits
3. IEEE C62.45 - IEEE Recommended Practice on Surge Testing for Equipment Connected to Low Voltage (1000V and less) AC Power Circuits
4. IEEE 519 - IEEE Recommended Practice and Requirements for Harmonic Control in Electric Power Systems
5. MIL-STD-220A - Method of Insertion-Loss Measurement 12/1/59; with NI and N2 (Fed/mil H-q)
6. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Not More than 2000 Volts AC or 750 Volts DC.
7. NEMA ICS 18 - Motor Control Centers
8. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)

- 9. UL 486A - Wire Connectors and Soldering Lugs for Use With Copper Conductors
- 10. UL 845 - Motor Control Centers
- 11. UL 1283 - Electromagnetic Interference Filters
- 12. UL 1449 - Surge Protective Devices

### 1.03 SYSTEM DESCRIPTION

- A. Design Requirements: Provide equipment capable of operating in an ambient temperature range of 0 to 40 degrees C and humidity of up to 90 percent noncondensing.
  - 1. Provide motor control centers designed for 480-volt, three-phase, three-wire, 60-hertz operation.
  - 2. Provide all control devices in the center suitable for operation at 120-volts, 60-hertz, unless specifically noted otherwise.
  - 3. Provide all control equipment and devices that meet the requirements of the 600-volt insulation class.
  - 4. Provide motor control centers to include the indicated number of 20 or 21-inch deep sections and the components arranged as shown.
  - 5. Arrange the equipment for convenient and ready accessibility from the front for inspection and maintenance of devices, terminals and wiring.
  - 6. Where shown or required, label the motor control center suitable for use as service entrance equipment.

### 1.04 SUBMITTALS

- A. General: Furnish all submittals, including the following, as specified in Division 01 and Section 26 05 00 - Basic Electrical Material and Methods.
- B. Product Data and Information: Provide catalog data for all associated equipment and devices.
- C. Shop Drawings: Furnish shop drawings customized to the project for motor control centers to include the following:
  - 1. Outline drawings showing dimensions, weights, arrangement, elevations, identification of components and a nameplate schedule for all units.
  - 2. Bill of materials including manufacturers' name and catalog number.
  - 3. Interconnecting wiring diagrams, where required.



4. Individual schematic and wiring diagrams for each compartment.
5. Furnish details showing electrical connections between main and tie circuit breakers and corresponding main buses.
6. Furnish instruction booklets and time-current curves for each circuit breaker supplied.
7. Furnish a system harmonic distortion study as follows:
  - a. Obtain all required data for harmonic study.
  - b. Prepare a harmonic distortion study of the plant electrical system to determine voltage and current harmonics at the point of common coupling for worst case speed and load settings.
  - c. Point of Common Coupling: The point of common coupling is defined as at the overcurrent device external of and directly upstream of the adjustable frequency drive assembly.
  - d. Confirm that the submitted adjustable frequency drives limit the electrical disturbances below the 5 percent THD (voltage) and below the harmonic current distortion per Table 10.3 as established by IEEE 519.
8. Furnish the following information on surge protection devices (SPD):
  - a. Verification that surge protection devices comply with UL 1449 and UL 1283 SVR.
  - b. Actual let through voltage test data in the form of oscillograph results for both the ANSI/IEEE C62.41 Category C3 (combination wave) and B3 (ringwave) tests in accordance with ANSI/IEEE C62.45.
  - c. Spectrum analysis of each unit based on MIL-STD-220A test procedures between 50 kHz and 200 kHz verifying that the device's noise attenuation exceeds 50 dB at 100 kHz.
  - d. Test reports from a recognized independent testing laboratory verifying the suppressor components can survive published surge current ratings on both a per mode and per phase basis using the IEEE C62.41, 8 x 20 microsecond current wave. Test data on individual modules are not acceptable.
9. Obtain and enter full performance details on all motors and other equipment being served on the above drawings.

- D. Quality Control: Furnish the following test reports and certificates as specified in Division 01:
  - 1. Certified Shop Test Reports for motor control centers and related components. Provide a minimum of 15 days written notice prior to shop tests.
  - 2. Detailed field test reports of all tests indicating test performed as specified, discrepancies found, and corrective action taken.
- E. Operation and Maintenance Manuals: Furnish operation and maintenance manuals as specified in Division 01.

#### 1.05 QUALITY ASSURANCE

- A. Standards: Provide motor control centers in accordance with NEMA ICS 2, ICS 18, and UL Standard No. 845.
- B. Codes: Provide motor control centers in accordance with the NEC and local codes.
- C. UL Label: Provide a UL Label on each vertical section of each motor control center.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store, and handle all products and materials as specified in Division 01.
- B. Shipping and Packing: Provide all structures, equipment and materials rigidly braced and protected against weather, damage, and undue strain during shipment.
- C. Storage and Protection: Store all equipment and materials in a dry, covered, heated and ventilated location. Provide any additional measures in accordance with manufacturer's instructions.

#### 1.07 SPARE PARTS

- A. General: Furnish the following spare parts:
  - 1. One portable test kit capable of testing all circuit breaker trip device functions
  - 2. One set of contact tips, control power transformers and operating coils for each six or less of each size of motor starter
  - 3. One auxiliary contact unit or one set of auxiliary contact tips for each six or less motor control units
  - 4. Twelve fuses of each size and type
  - 5. Ten percent but not less than two complete control, latching and timing relays of each type used in motor control centers

6. One complete reset and repeat cycle timer of each type and rating used in motor control centers
  7. Three overload relays for each size and type
  8. Six LED indicating lamps and fuses of each size and type
  9. Two complete magnetic starters with motor circuit protector for each size required
  10. Two sets of replacement LED push-to-test indicating light color lenses of each color furnished
  11. Three circuit breaker rating plugs for each size and type furnished
  12. Three static trip devices
  13. Three 12-ounce spray cans of the final finish for touch-up
  14. Twelve cover bolts, spring nuts, and door fasteners of each type
- B. Packaging: Pack spare parts in containers bearing labels clearly designating contents and related pieces of equipment. Deliver spare parts in original factory packages. Identify all spare parts with information needed for reordering.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.
1. Motor Control Centers
    - a. Square D (Schneider Electric) Model 6
    - b. Cutler-Hammer (Eaton) 2100 Series

### 2.02 MOTOR CONTROL CENTER

- A. Basic Structural Components: Provide totally enclosed, dead-front, rigid, NEMA 12 dust tight/oil tight, gasketed, self-supporting and freestanding structures.
1. Construct the various sections from channels not less than 12 gauge, formed into proper shape, suitably reinforced and welded. Grind all internal welds smooth and round off all corners to give a neat and pleasing appearance. Construct doors and covers from a minimum of 14-gauge steel sheets.
  2. Provide steel bottom plates in each compartment section.

3. Cover the rear of each structure with easily removable steel panels for rear access.
  4. Provide both ends of a completely assembled center so that extensions can be easily added in the future.
  5. Provide hinges, screws, bolts, circuit breaker operating mechanisms, nameplate mounting screws and other metallic appurtenances with a non-corrodible metal covering.
  6. Install full height steel barriers on each side of the tie breaker structure to prevent the passage of flames and ionized gases.
  7. Provide each motor control center with a three-phase bus compartment at the top and a conduit and cable compartment at the top and bottom.
  8. Provide the cable compartments that run the full length of the motor control center.
  9. Provide access to cable compartments by means of removable hinged doors.
  10. Provide each structure with a vertical wiring space between the starter cells and side sheet for unit wiring.
  11. Equip the vertical wiring space with cable supports to hold the cables and wiring in place.
- B. Motor Control Center Enclosure: Provide motor control centers suitable for installation indoors.
- C. Bus Requirements: Provide main buses of tin plated copper bars across each structure, sized in accordance with UL temperature rise of 65 degrees C based on a 40-degree C ambient temperature.
1. Provide an 800-ampere minimum, main horizontal bus, unless otherwise shown.
  2. Support all bus bars in each structure by means of bus supports fabricated from an insulating material.
  3. Connect the horizontal bus to the incoming line circuit breakers and from both sides of the tie breaker with copper bars, securely fastened in place.
  4. Provide tin-plated vertical three-phase copper bus of sufficient size to carry loads served.
  5. Insulate main and vertical buses over their entire length. Provide insulated covers over all bolted connections.
  6. Separate the bus bar compartments from breaker and controller cubicles by insulated barriers or steel plates.

7. Provide a 300-ampere uninsulated copper grounding bus with lugs for connections to the plant grounding system in the bottom of each motor control center.
  8. Brace all bus work suitably to withstand a minimum of 65,000 rms amperes symmetrical short circuit current. Substantiate construction by a certified laboratory test covering units of similar construction.
- D. Individual Units: Provide motor control or circuit breaker units in combinations of not less than 12-inch modular heights.
1. Provide units of the plug-in or non-removable type in accordance with the manufacturer's standard for type and size of controller.
  2. Provide plug-in units within-plated, pressure-type line disconnecting stabs of high strength copper alloy. Hold each plug-in unit in place and arrange the units such that they can be removed or remounted readily without access to the rear of the structure.
  3. Provide units that are totally enclosed and effectively baffled to isolate ionized gases that may occur within each unit. In addition, ventilate each unit so that it can be located anywhere within the structure using the same overload heaters for the same load.
  4. Provide automatic shutter mechanism to cover the vertical bus stub area when a unit is removed.
  5. Provide spaces for future equipment in unit structures with blank hinged doors and removable metal barriers for isolation of the vertical buses.
  6. Construct doors to be drip-proof and dust-tight. Provide all doors with hinges and screw fasteners for holding the doors closed. Fabricate each door as a part of the structure and not part of the unit.
  7. Equip the doors for motor control compartments with a motor circuit protector operating mechanism, thermal overload relay reset mechanism, controls and push-to-test LED indicating lights and other required devices as shown.
  8. Equip the doors for branch feeder equipment with a circuit breaker operating mechanism.
  9. Provide mechanical interlocks between the compartment door and circuit breaker operating mechanism to prevent opening of the door unless the breaker is in the OFF position, and to prevent closing the breaker unless the door is fully closed.
  10. Provide circuit breaker operating mechanisms or handles that are padlockable in the OFF position with room for a minimum of three padlocks.
  11. Provide units having devices that are serviceable from the front, without provisions for rear access.

12. Provide control power transformers, relays, timers, alternators and accessories for each unit as shown or specified.

E. Wiring

1. Provide NEMA Class II Type B wiring for the motor control centers, including internal interlock and internal wiring between controller units and devices.
2. Provide internal wiring runs for interconnecting units with stranded switchboard wire having 600-volt rated, flame-resistant, type SIS insulation. Provide No. 14 AWG wire for control interconnections. Provide power connections as required for the service.
3. Provide No. 10 AWG or larger stranded copper wire with NEC Type SIS insulation for all current transformer secondary wiring.
4. Provide wire markers at each end of all wires.
5. Where wiring connections are made to equipment mounted on hinged doors, provide connections with extra flexible wires suitably cabled together and cleated.
6. Provide the wiring of all control connections to individual terminal blocks at each motor starter. Locate terminal blocks for front access.
7. Provide interlocking wiring between units of a motor control center or between units of grouped centers as internal wiring with terminals provided for external connections.
8. Provide sufficient pull apart terminal blocks for all devices external to the motor control center.

F. Magnetic Starters: Provide 480-volt, 3-phase, 60-hertz across-the-line combination motor circuit protector and magnetic starters having individual control power transformers.

1. Provide full-voltage non-reversing; full voltage reversing; full voltage two-speed non-reversing two-winding; and full voltage two-speed non-reversing one-winding starters as required.
2. Provide starter contacts of the replaceable, spring-loaded, wedge type with silver-cadmium oxide-plated contact surfaces. Provide replaceable coils of the epoxy sealed type.
3. Thermal Overload Elements: Provide heaterless overload protection without bimetallic elements. Protection shall be provided by three current sensors monitored by a microprocessor. The overload shall be an intelligent configurable device and shall also include phase loss, unbalance protection, trip class selection, Class II ground fault protection and manual reset. Ground

fault protection shall be adjustable in amps and seconds with the capability of being defeated.

- a. Provide and adjust overload relays to match the associated motor nameplate running current rating. Size the overload relays after approval of the corresponding motor.
  - b. Provide a set of isolated normally-open and normally-closed contacts for each overload relay.
4. Replaceability: Provide starters having component parts that are easily replaceable.
  5. Equip each starter with all required auxiliary contacts.
- G. Motor Circuit Protectors: Provide a motor circuit protector for each combination starter using molded-case, air-break type designed for 600-volt, 60-hertz service with an interrupting capacity of 65,000 rms symmetrical amperes at 480 volts. Provide three-pole motor circuit protectors with magnetic, adjustable-trip units actuating a common tripping bar to open all poles when an overload or short circuit occurs. Provide motor circuit protectors with no thermal elements. Provide magnetic trip units capable of being adjusted from 700 to 1,300 percent of the motor full load amperes.
- H. Contactors: Provide NEMA sized, 30 ampere minimum, contactors for electric heating and other non-motor loads equal to the motor starters except without overload relays or heaters.
- I. Feeder Circuit Breakers: Provide molded-case type, two- or three-pole feeder circuit breakers as shown, with a minimum voltage rating of 600-volt ac.
1. Interrupting Ratings: Provide an interrupting capacity of 65,000 rms symmetrical amperes at 480 volts. Base interrupting rating on the IEEE and NEMA Standard duty cycle for this class of equipment.
  2. Provide circuit breakers trip units as follows:
    - a. Provide individual, thermal-magnetic trip units for all frame sizes smaller than 400 amperes.
    - b. Provide solid-state trip units for all frame sizes 400 amperes and larger.
    - c. Provide trip units that actuate a common tripping bar to open all poles when an overload or short circuit occurs on any one.
    - d. Provide trip elements with inverse time tripping and instantaneous tripping at about ten times the normal trip device rating.
    - e. Provide circuit breakers with trip-free handles.

- J. Main and Tie Circuit Interrupters: Provide all main and tie circuit interrupters rated as shown, of equal construction to the feeder breakers, and with the following additional features:
1. Solid state LSIG trip functions.
  2. Auxiliary normally open and normally closed contacts and tripped alarm contacts
  3. Key interlocks as shown
- K. Control Power Transformers: Provide individual control power transformers for each starter to derive the 120 volts for the unit's control circuit meeting the requirements of Section 26 29 53 - Control Components and Devices. Ground the unfused leg of the secondary to the enclosure.
- L. Push Buttons, Selector Switches and Push-to-Test LED Indicating Lights: Provide push buttons, selector switches and push-to-test LED indicating lights including legend plates having the same type, appearance, shape and catalog number throughout each motor control center meeting the requirements of Section 26 29 53 - Control Components and Devices.
- M. Control Components: Provide control components including elapsed time meters, control relays, latching relays, time delay relays, reset timers, repeat cycle timers, alternators, phase failure and undervoltage relay and ground fault protection relays meeting the requirements of Section 26 29 53 - Control Components and Devices.
- N. Feeder Cable Terminals: Provide closed-end, compression-type, solderless connectors and terminals, suitable for copper conductors for terminating cables in accordance with Section 26 05 19 - Wires and Cables - 600V and Below.
- O. Wiring Schematic: Provide a schematic wiring diagram of each unit and affix it to the inside of the door of that unit.
- P. Identification: Provide nameplates having the same type, appearance and shape throughout each motor control center in accordance with the requirements of Section 26 05 53 - Electrical Identification.
1. The enclosure shall have identifying nameplates in accordance with the requirements of Section 26 05 53 - Electrical Identification.
- Q. Each enclosure shall be equipped with phenolic type terminal blocks suitably labeled for all internal and remote wiring requirements plus 20 percent spare.

## 2.03 ACCESSORIES

- A. Rubber Work Mats: Provide rubber work mats meeting the requirements of Section 26 29 53 - Control Components and Devices.



## 2.04 SOURCE QUALITY CONTROL

- A. Tests: Shop test each motor control center in accordance with IEEE and NEMA standards.
  - 1. Operational Tests: After the equipment has been completely assembled, perform operational tests to determine the general operating conditions and circuit continuity. Also, perform high potential tests and other standard tests for that particular class of equipment.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Applicability: Installation requirements are applicable to motor control centers provided as part of the factory installed assemblies included in the Procurement Contract.
- B. General: Install all equipment in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 01.
- C. Overloads: Adjust the thermal overloads on each phase of the starter units to the actual motor installed.
- D. Cable Connections: Terminate and label all field wiring per the approved diagrams.
- E. Torque Requirements: Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturers' published torque tightening recommendations. Where manufacturers' torquing requirements are not available, tighten connectors and terminals in accordance with UL Standard 486 A.

### 3.02 FIELD QUALITY CONTROL

- A. Inspections: Inspect, adjust and check the installation for physical alignment, cable terminations and ventilation.
- B. Tests: Perform the following field tests:
  - 1. Close and open each circuit breaker and motor circuit protector to test operation.
  - 2. Energize the motor control center and test for hot spots.
  - 3. When site conditions permit, energize and de-energize each equipment item served by each motor control center, testing the complete control sequence of each item.

### 3.03 OPERATION DEMONSTRATION

- A. Manufacturer's Representative: Furnish the services of a qualified, factory-trained service engineer to assist in installation, start-up, field testing, calibration, placing into operation and provide training of each motor control center.
  - 1. Furnish the services of a service engineer when the equipment is placed into operation.
  - 2. Furnish the services of a service engineer at job site as often as necessary until all problems are corrected and the equipment installation and operation are satisfactory.
  - 3. Training: Following completion of installation and field testing provide training for 12 employees of the Owner in the proper operation, troubleshooting and maintenance of the equipment as outlined below. All training will be at the Owner's facilities at a time agreeable to the Owner:
    - a. Operational Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.
    - b. Maintenance Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.
- B. Operation and Maintenance: Furnish operation and maintenance instructions as specified in Section 01 78 23 - Operation and Maintenance Manuals.

### 3.04 CLEANING AND PAINTING

- A. Shop Painting: Paint motor control centers in accordance with Section 09 90 00 - Paints and Coatings.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Requirements for providing wiring devices and appurtenances as indicated, in accordance with the Contract Documents.
- B. Related work specified in other sections includes, but is not limited to, the following:
  - 1. Section 26 05 00 - Basic Electrical Materials and Methods
  - 2. Section 26 05 26 - Grounding
  - 3. Section 26 05 33 - Electrical Raceway Systems
  - 4. Section 26 23 16 - Electrical Equipment Enclosure

1.02 REFERENCES

- A. Codes and standards referred to in this Section are:
  - 1. Fed Spec WC596 - Electrical Power Connector, Plug, Receptacle and Cable Outlet
  - 2. Fed Spec WS896 - Switches, Toggles and Locks, Flush Mounted
  - 3. CSA C22.2-182.1 - Plugs, Receptacles, and Cable Connectors of the Pin and Sleeve Type
  - 4. UL 20 - General-Use Snap Switches
  - 5. UL 498 - Attachment Plugs and Receptacles
  - 6. UL 508 - Industrial Control Equipment
  - 7. UL 894 - Switches for Use in Hazardous (Classified) Locations
  - 8. UL 943 - Ground-Fault Circuit-Interrupters
  - 9. UL 1682 - Plugs, Receptacles, and Cable Connectors of the Pin and Sleeve Type
  - 10. UL 1686 - Pin and Sleeve Configurations

1.03 SUBMITTALS

- A. General: Provide all submittals, including the following, as specified in Division 01 and Section 26 05 00 - Basic Electrical Materials and Methods.

- B. Product Data and Information: Provide manufacturers' catalog data for each device, plate, and cover type.

#### 1.04 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 01.

#### 1.05 SPARE PARTS

- A. General: Furnish the following spare parts.
  1. Five 15-ampere, 125-volt, 2-pole, 3-wire grounding type plugs, NEMA 5-15P nylon housing, Hubbell Cat. No. HBL5266C
  2. Twenty 20-ampere, 125-volt, 2-pole, 3-wire, grounding type plugs, NEMA 5-20P, nylon housing, Hubbell Cat. No. HBL5366C
  3. Ten 20-ampere, 125-volt, 2-pole, 3-wire, grounding type plugs, NEMA 5-20P, corrosion resistant, yellow nylon housing, Hubbell Cat No. HBL 53CM66C
- B. Packaging: Package spare parts in containers bearing labels clearly designating contents. Identify all spare parts with information needed for reordering. Deliver spare parts in original factory packages.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Standard of Quality and General Configuration: Use of manufacturer's name and model or catalog number is for the purpose of establishing quality and general configuration.
- B. Configuration and Rating: Provide NEMA specification grade wiring devices in the type, color, configuration, and electrical rating for the service indicated.
- C. Symbols: See the electrical symbol list shown for identification of all device types.
- D. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.
  1. Hubbell Wiring Device-Kellems
  2. Cooper Wiring Devices by Eaton
  3. Emerson Industrial Automation/Appleton
  4. Meltric Corporation

#### 2.02 LIGHTING TOGGLE SWITCHES

- A. General: Provide toggle switches of specification grade rated 20 amperes, 120-277 volts AC conforming to Fed. Spec. WS 896 and UL Standard 20. Manufacture

switches with back and side wired binding screw type terminals, one piece spring contact arm and terminal plate with silver alloy contacts, one piece steel mounting strap with an assured grounding clip, thermoset body color coded for identification by amperage and a brown toggle. Provide ivory toggles in finished areas.

B. Types

<u>DESCRIPTION</u>	<u>COLOR</u>	<u>HUBBELL CAT. NO.</u>
Single pole	Brown/Ivory	HBL1221/HBL1221I
Two pole	Brown/Ivory	HBL1222/HBL1222I
Three way	Brown/Ivory	HBL1223/HBL1223I
Four way	Brown/Ivory	HBL1224/HBL1224I
SPDT center off		
Momentary contact		HBL1557
Keyed single pole		HBL1221L
Keyed three way		HBL1223L

- C. Accessories: Provide a flush neon "ON" push-to-test LED pilot light in conjunction with switches controlling equipment whose operation is not evident at the switch location. Provide an engraved nameplate to identify equipment controlled.

2.03 AC MANUAL MOTOR STARTING SWITCHES

- A. General: Provide AC manual motor starting switches where overload protection is not required or is provided separately. Provide switches similar in construction to the lighting toggle switches except conforming to UL 508 and rated 30-amperes, 120-277 volts ac.

B. Types

<u>DESCRIPTION</u>	<u>COLOR</u>	<u>HUBBELL CAT. NO.</u>
Single pole	Brown/Ivory	HBL3031/HBL3031I
Double pole	Brown/Ivory	HBL3032/HBL3032I

- C. Accessories: Provide a flush, neon "ON" push-to-test LED pilot light in conjunction with switches controlling equipment whose operation is not evident at the switch location. Provide an engraved nameplate to identify the equipment being controlled.

2.04 CONVENIENCE RECEPTACLES

- A. General: Provide specification grade convenience receptacles conforming to Fed. Spec. WC 596 UL listed, with nylon impact resistant face, one piece metal wrap around mounting strap with assured grounding clip, back and side wired binding screw type terminals, brass power contacts, and a heavy duty heat stabilized thermoset plastic base. Provide brown devices in unfinished areas and ivory devices in finished areas unless otherwise specified.

B. Types

DESCRIPTION	RATING	COLOR	HUBBELL CAT. NO.
Duplex	NEMA 5-20R 20A, 125V, 2P, 3W	Brown/ Ivory	HBL5362/ HBL5362I
Duplex- corrosion- resistant	NEMA 5-20R 20A, 125V, 2P, 3W	Yellow	HBL53CM62

2.05 SPECIAL USE RECEPTACLES

A. General: Provide special use receptacles of specification grade in accordance with applicable Federal Specifications., UL, ANSI, and CSA Standards.

B. Types

DESCRIPTION	RATING	COLOR	HUBBELL CAT. NO.
Duplex-ground fault circuit interrupter (GFCI receptacle is not required if GFCI circuit breaker is provided in panelboard)	NEMA 5-20R 20A, 125V, 2P, 3W	Brown/ Ivory	GF20L GF20IL
Single with Mtg. Box	200A, 600V, 3W, 4P		ADJA20034-250

2.06 BOXES

A. Outlet Boxes: Provide outlet boxes in accordance with the requirements specified in Section 26 05 33 - Electrical Raceway Systems.

2.07 PLATES AND COVERS

A. General: Provide covers and plates for the various areas as follows:

1. Architecturally Finished Areas (Includes Electrical Equipment Enclosure per Section 26 23 16): Provide Type 302/304 stainless steel plates and covers for devices.
2. Areas Below Grade, Corrosive and Wet Areas:
  - a. For switches provide weatherproof, gasketed, covers with external operating handle.

- b. For receptacles provide a weatherproof, gasketed, clear, flame-retardant, jumbo, polycarbonate cover a minimum of 5.4-inches deep, suitable for use with a 10-3 cord that allows the cover to be closed even when the receptacle is in use.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. **Applicability:** Installation requirements are applicable to wiring devices provided as part of the factory installed assemblies included in the Procurement Contract.
- B. **General:** Install all wiring devices in accordance with manufacturer's recommendations and approved shop drawings as specified in Division 01.
- C. **Toggle Switches:** Install toggle switches applicable for the area environment for switching lighting or other branch circuit loads.
- D. **Receptacles:** Install receptacles applicable for the area environment.
- E. **Grounding:** Ground all devices in accordance with the requirements specified in Section 26 05 26 - Grounding.
- F. **Plug Installation:** Install plugs on the cables as shown on Contract Documents.

END OF SECTION

NO TEXT ON THIS PAGE



## SECTION 26 28 16

### DISCONNECT SWITCHES

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. Section Includes: Requirements for providing and installing enclosed safety switches and circuit breakers for use as feeder and branch circuit switching and disconnect devices for motors and equipment.
- B. Related work specified in other sections includes, but is not limited to, the following:
  - 1. Section 09 90 00 - Paints and Coatings
  - 2. Section 26 05 00 - Basic Electrical Material and Methods
  - 3. Section 26 05 26 - Grounding
  - 4. Section 26 05 53 - Electrical Identification

##### 1.02 REFERENCES

- A. Codes and standards referred to in this Section are:
  - 1. NFPA 70 - National Electrical Code (NEC)
  - 2. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum)
  - 3. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses
  - 4. UL 486A - Wire Connectors

##### 1.03 SUBMITTALS

- A. General: Provide all submittals, including the following, as specified in Section 26 05 00 - Basic Electrical Material and Methods.
- B. Product Data and Information: Provide manufacturers' data indicating switch and circuit breaker ratings, enclosure type and dimensions. Provide manufacturer's data on fuses including time-current curves.

##### 1.04 QUALITY ASSURANCE

- A. Codes: Provide switches and circuit breakers meeting the requirements of the NFPA, the National Electrical Code and local codes.
- B. Regulatory Requirements: Provide all switches and circuit breakers designed, manufactured and tested in accordance with latest ANSI, IEEE and NEMA Standards, and UL listed.

1.05 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 01 and Section 26 05 00 - Basic Electrical Material and Methods.

1.06 SPARE PARTS

- A. General: Provide the following spare parts:
  - 1. Six of each size and type fuse installed.
- B. Packaging: Pack spare parts in containers bearing labels clearly identifying the contents. Deliver spare parts in original factory packages. Identify all spare parts with information needed for reordering.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers: Acceptable manufacturers are as listed below. Other manufacturers of equivalent products may be submitted for review.
  - 1. Switches
    - a. Square D /Schneider Electric
    - b. Eaton/CutlerHammer
    - c. Hubbell/Killark
  - 2. Fuses
    - a. Eaton/Bussmann
    - b. Littelfuse
  - 3. Circuit Breakers
    - a. Square D/Schneider Electric
    - b. Eaton/Cutler-Hammer
    - c. ABB
    - d. Siemens

2.02 SWITCHES

- A. General: Provide switches of the NEMA KS-1, heavy-duty, load-interrupter, enclosed-knife switch type with externally operating handle interlocked to prevent opening of the front cover with the switch in the ON position. Provide an interlock that is defeatable and operable from the front of the switch. Provide handle lockable in the OFF position.
- B. Switch Ratings: Provide switches rated for 600-volts as applicable and horsepower rated when used in motor circuits. Current ratings are as indicated.

- C. Interrupting Rating: If the approved short circuit and coordination study indicates that the available fault current at any switch exceeds the interrupting rating of the switch, provide a fused switch with rejection feature. Size the fuses for the load served.
- D. Small Three Phase Motor Disconnect Switches: Provide a fusible switch for each small three phase motor where the branch feeder breaker directly upstream of the motor cannot provide overcurrent protection in accordance with NEC Table 430.52.
- E. Fusible Switches: Provide switches with rejection feature to allow only Class R fuses to be installed.
- F. Switch Housings: Provide switches housed in NEMA enclosures rated for the installed location as defined in 26 05 00 - Basic Electrical Material and Methods. Provide stainless steel NEMA 4X rated enclosures for corrosive areas.

#### 2.03 FUSES

- A. Characteristics: Provide UL 248-12 listed Class RK1 dual element, time-delay fuse with an interrupting rating of 200,000 rms symmetrical amperes.

#### 2.04 CIRCUIT BREAKERS

- A. General: Provide molded case, automatic, nonadjustable, high instantaneous trip only circuit breakers.
- B. Breaker Ratings: Provide disconnect circuit breakers with the voltage, number of poles and current ratings based on the connected load and a withstand capacity of not less than 65,000 amperes RMS symmetrical at 480 Volts AC.
- C. Breaker Housings: Provide circuit breakers housed in NEMA enclosures rated for the installed location as described in Section 26 05 00 - Basic Electrical Material and Methods. Provide each circuit breaker with provisions to padlock the operating handle in the OFF position.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Applicability: Installation requirements are applicable to disconnect switches provided as part of the factory installed assemblies included in the Procurement Contract.
- B. General: Install switches and circuit breaker as shown or required by the Contract Documents. Comply with requirements of NEC and local electrical codes.
- C. Provide fuses in fusible switches sized to protect the associated motor in accordance with the NEC and per the nameplate rating of the approved equipment. Provide an adhesive label attached to the inside of the switch cover indicating the replacement fuse type and size.

- D. Coordination: Coordinate with other work including cabling and wiring work.
- E. Torque Requirements: Tighten electrical connectors and terminals including screws and bolts in accordance with equipment manufacturers' published torque tightening recommendations. Where manufacturers' torquing requirements are not available, tighten connectors and terminals in accordance with UL Standard 486A.

3.02 CLEANING AND PAINTING

- A. Painting: Paint the disconnect switches as specified in Section 09 90 00 - Paints and Coatings.

END OF SECTION

SECTION 26 29 53

CONTROL COMPONENTS AND DEVICES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Requirements for providing manual starters, motor controllers and remote control stations. In addition, the requirements for control components and devices for use in equipment provided under various other sections.
- B. Related work specified in other sections includes:
  - 1. Section 09 90 00 - Paints and Coatings
  - 2. Section 26 05 00 - Basic Electrical Materials and Methods
  - 3. Section 26 05 19 - Wire and Cables - 600V and Below
  - 4. Section 26 05 26 - Grounding
  - 5. Section 26 05 53 - Electrical Identification
  - 6. Section 26 24 19 - Motor Control Centers

1.02 REFERENCES

- A. Codes and standards referred to in this Section are:
  - 1. NEMA ICS 2 - Industrial Control Devices, Controllers and Assemblies
  - 2. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)
  - 3. UL 486A - Wire Connectors and Soldering Lugs for Use With Copper Conductors

1.03 SYSTEM DESCRIPTION

- A. Design Requirements: Provide equipment capable of operating in an ambient temperature range of 0 to 40 degrees C and humidity of up to 90 percent non-condensing.
- B. Motor Controllers: Provide motor controllers suitable for 480-volt, three-phase, three-wire, 60-hertz operation.
- C. Control Devices: Provide control devices suitable for operation at 120-volts, 60-hertz, unless specifically noted otherwise.
- D. Insulation Class: Provide control equipment and devices that meet the requirements of the 600-volt insulation class.

#### 1.04 SUBMITTALS

- A. General: Furnish all submittals, including the following, as specified in Section 26 05 00 - Basic Electrical Materials and Methods.
- B. Product Data and Information: Furnish catalog data for all associated equipment and devices.
- C. Shop Drawings: Furnish shop drawings customized to the project for manual starters, motor controllers and remote control stations that include the following:
  - 1. Outline drawings showing dimensions, identification of components and a nameplate schedule for all units.
  - 2. Bill of materials including manufacturers' name and catalog number.
  - 3. Individual schematic and wiring diagrams for each motor controller
- D. Equipment Ratings: Obtain and enter full performance details on all motors and other equipment being served on the above drawings.

#### 1.05 QUALITY ASSURANCE

- A. Codes: Provide manual starters, motor controllers and remote control stations that are in accordance with NEMA ICS 2.
  - 1. Provide manual starters, motor controllers and remote control stations that are in accordance with the NEC and local codes.
- B. UL Listing: Provide UL-listed manual starters, motor controllers and remote control stations.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store, and handle all products and materials as specified in Section 01 66 00 - Product Storage and Handling Requirements.
- B. Storage and Protection: Store all equipment and materials in a dry, covered, heated and ventilated location. Provide any additional measures in accordance with manufacturer's instructions.

#### 1.07 SPARE PARTS

- A. General: Furnish the following spare parts:
  - 1. Three of each type of manual starter
  - 2. One of each type of motor controllers

- B. Packaging: Pack spare parts in containers bearing labels clearly designating contents and related pieces of equipment. Deliver spare parts in original factory packages. Identify all spare parts with information needed for reordering.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Acceptable Manufacturers: Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted for review.

- 1. Manual Starters, Motor Controllers and Remote Control Stations

- a. ABB
- b. Cutler-Hammer
- c. Square D Company
- d. Appleton Electric Company
- e. Crouse-Hinds Company

- 2. Control Relays

- a. Cutler-Hammer
- b. Square D Company
- c. IDEC

- 3. Timing Relays

- a. Agastat 7000 Series
- b. Eagle Signal
- c. IDEC

- 4. Reset and Repeat Cycle Timers

- a. Eagle Signal
- b. Automatic Timing and Controls

- 5. Alternators

- a. Time Mark Corp. Model 261
- b. ABB SSAC Inc. Series ABP

### 2.02 MANUAL MOTOR STARTERS

- A. Manual Motor Starters: Provide toggle-type, thermal-switch, manual, motor starters with push-to-test LED pilot lights for all 120-volt, single-phase motors rated less than ½ hp.

- 1. Provide starter enclosures as specified under the section Remote Control Stations.

## 2.03 MOTOR CONTROLLERS

- A. General: Provide 480-volt, 3-phase, 60-hertz, across-the-line, combination motor circuit protector magnetic starters with individual control power transformers. Where shown or required, provide starters complete with a HAND/OFF/AUTO selector switch.
- B. Magnetic Starters: Provide magnetic starters as follows:
  - 1. Full voltage nonreversing or full voltage reversing, as required.
  - 2. Starter contacts of the replaceable, spring-loaded, wedge type with silver-cadmium oxide plated contact surfaces.
  - 3. Provide replaceable coils of the epoxy sealed type.
  - 4. Thermal Overload Elements: Class 20 thermal overload element and all required accessories. Provide size five and larger starters with current transformer operated overload relays.
    - a. Bimetallic type with an adjustment knob which allow plus or minus 15-percent adjustment of the heater's nominal rating.
    - b. Size the overload relays after approval of the corresponding motor.
    - c. Provide and adjust overload relays that match the associated motor nameplate running-current rating.
    - d. Provide a set of isolated, normally-open and normally-closed contacts for each overload relay.
- C. Motor Circuit Protectors: Provide a motor circuit protector for each combination starter as follows:
  - 1. Molded-case, air-break type designed for 600-volt, 60-hertz service with an interrupting capacity of 65,000 rms symmetrical amperes at 480 volts.
  - 2. Three-pole motor circuit protectors with magnetic, adjustable-trip units actuating a common tripping bar to open all poles when an overload or short circuit occurs.
  - 3. No thermal elements.
  - 4. Magnetic trip units capable of being set from 700 to 1,300 percent of the motor full-load amperes.
- D. Control Components: Provide push buttons, switches, push-to-test LED indicating lights, transformers, relays and timers as specified under the section Control Components.



- E. Enclosures: Provide motor controllers installed in NEMA 250 rated enclosures as follows:

AREA	ENCLOSURE
Corrosive areas as defined in Section 26 05 00 - Basic Electrical Materials and Methods or as shown	NEMA 4X- Corrosion-resistant fiberglass reinforced thermal setting polyester formulation with stainless steel external hardware. Provide external operators of the same material as that of the enclosures
Above grade indoor	NEMA 12 – Industrial

#### 2.04 REMOTE CONTROL STATIONS

- A. General: Provide heavy-duty, oiltight remote control stations, consisting of push buttons, push-to-test LED indicating lights, and selector switches with double-break silver contacts meeting the requirements specified under the section Control Components.
- B. Enclosures: Provide motor controllers installed in NEMA 250 rated enclosures as follows:

AREA	ENCLOSURE
Corrosive areas as defined in Section 26 05 00 - Basic Electrical Materials and Methods or as shown	NEMA 4X- Corrosion-resistant fiberglass reinforced thermal setting polyester formulation with stainless steel external hardware. Provide external operators of the same material as that of the enclosures
Above grade indoor	NEMA 12 – Industrial

- C. Lockout Attachments: Where shown, provide lockout attachments as follows:
1. Push buttons with padlockable attachment that holds the button depressed.
  2. Selector switch with a padlockable attachment that covers the selector switch operators and allows the switch to be set in any position. Selector switch operators that use a removable key are not acceptable.

#### 2.05 CONTROL COMPONENTS

- A. Push Buttons, Selector Switches and Push-to-Test LED Indicating Lights
1. Provide heavy-duty, oiltight, 30.5 mm, push-button or selector-switch control stations arranged for flush-panel mounting.
  2. Provide the additional switches, relays, and other electrical accessories necessary to control and safeguard the operation of the associated equipment.

3. Provide 30.5 mm, low-voltage, push-to-test, LED type indicating lights suitable for operation at 120-volt, 60-hertz ac control circuit voltages.
  4. Color code indicating lights as follows:
    - a. Red - Motor running or valve open
    - b. Green - Motor off or valve closed
    - c. Amber - Alarm or trouble condition
- B. Terminal Blocks: Provide 30 amp minimum, ANSI switchgear standard grade and fixed mount type terminal blocks rated for 120 volts AC. DIN rail mounted terminal blocks are not acceptable.
- C. Control Power Transformer: Provide an individual, control power transformer for each starter to derive the 120 volts for the unit's control circuit. Provide transformers with sufficient capacity to meet the energy demands for all related control components including relays, solenoids and other indicated items. Provide dual fuses on the primary and one fuse on the secondary. Ground the unfused leg of the secondary to the enclosure.
- D. Elapsed Time Meters: Provide nonreset-type elapsed time meters to register up to 9999.9 hours, having square cases suitable for panel mounting and having coils for 120-volt, 60-hertz operation.
- E. Control and Latching Relays: Provide control and latching relays of 600-volt class, machine-tool quality with convertible contacts. Provide relay-operating contacts rated at a minimum of 10 amperes, 120 volts, 60 hertz. Relays shall have 25% voltage drop out and hold at 75% of nominal voltage minimum.
- F. Timing Relays: Provide four-pole, double-throw, timing relays with timing ranges and ON/DELAY or OFF/DELAY operation as required. Provide contacts rated a minimum of 10 amperes at 120 volts, 60 hertz. Relays shall have 25% voltage drop out and hold at 75% of nominal voltage minimum.
- G. Reset and Repeat Cycle Timers: Provide electromechanical or solid-state type reset and repeat cycle timers, with timing ranges and functions as indicated. Provide contacts rated at a minimum of 10 amperes, 120 volts, 60 hertz. Solid-state output contacts are not acceptable.
- H. Alternators: Provide alternators suitable for 120-volt, 60-hertz operation.
1. Provide alternator-operating double pole, double throw cross wired contacts rated at minimum of 7 amperes at 120 volts, 60 hertz.
  2. Provide alternators suitable for circuit design requiring alternating "lead-lag" operations.
  3. Provide alternators with integral three position switch "Load 1 - Alternate - Load 2" switch and LED status indicators.
  4. Provide 8-pin plug-in alternator with an 8-pin socket.

- I. Phase Failure and Undervoltage Relay: Provide a 3-phase, power monitor to detect phase failure, phase reversal, phase unbalance and undervoltage, suitable for operation at 480 volts. Provide an adjustable, drop-out voltage range of 380 to 500 volts and an adjustable time delay from 0.2 to 20 seconds. Provide a normally-open and normally-closed alarm contact rated 10 amperes at 120 volts with automatic reset.
  - J. Ground Fault Protection Relay: Provide a manually-reset, ground-sensing relay suitable for use with a window-type current transformer. Provide an adjustable time delay and pickup settings. Provide single-pole, double-throw, alarm contacts rated 10 amperes at 120 volts.
- 2.06 RUBBER WORK MATS
- A. Provide a three foot wide rubber work mat on the floor in front of each switchgear, ATS, panel, switchboard and motor control center. The mat will be long enough to cover the full length of the line-up. Provide mats that are 1/4 inch thick with beveled edges, canvas back and solid type with corrugations running the entire length. Mats will be guaranteed to be free from cracks, blow holes or other defects detrimental to their mechanical and electrical strengths. Mats will meet all OSHA requirements and those of ANSI/ASTM J6.7 - 1935 (R1971) / D178, Type 2, Class 2.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Applicability: Installation requirements are applicable to control components and devices provided as part of the factory installed assemblies included in the Procurement Contract.
- B. General: Install all equipment in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 01.
- C. Mounting: Mount manual starters, motor controllers and remote control stations 4 feet 6 inches from the finished floor up to their centerlines, unless otherwise shown. Mount all devices at least 1/2 inch away from concrete wall surfaces.
- D. Adjustments: Set all motor circuit protectors and circuit breakers based on the approved short circuit and coordination study.
- E. Overloads: Adjust the thermal overloads on each phase of each starter unit for the actual motor installed.
- F. Cable Connections: Terminate and label all field wiring per the approved diagrams.
- G. Torque Requirements: Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturers' published torque tightening recommendations. Where manufacturers' torquing requirements are not available, tighten connectors and terminals in accordance with UL Standard 486 A.

3.02 FIELD QUALITY CONTROL

- A. Inspections: Inspect, adjust and check the installation for physical alignment, cable terminations and ventilation.
- B. Operation and Maintenance: Furnish operation and maintenance instructions as specified in Section 01 78 23 - Operation and Maintenance Manuals.

END OF SECTION

SECTION 40 90 00

INSTRUMENTATION FOR PROCESS CONTROL - BASIC REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. The Seller shall provide all components, system installation supervision services, as well as all required and specified ancillary services in connection with the Instrumentation and Control System. The system includes all materials, labor, tools, fees, charges and documentation required to furnish a complete and operable control and information system also known as the Process Control System (PCS) as shown and/or specified. The Seller shall provide additional services as specified during installation of the PCS by the Install Contract. The PCS shall include all measuring elements, signal converters, transmitters, local control panels, digital hardware and software, operator work stations, data transmission systems, interconnecting wiring and such accessories as shown, specified, and/or required to provide the functions indicated. The PCS shall include but not be limited to the following:
1. Control Panels, complete with Operator Interface Terminals (OIT), programmable logic controllers (PLC) and all necessary software.
  2. Operator, Engineering and Programming Workstations.
  3. Fiber Optic Patch Panels
  4. IT cabinets complete with Cisco Network switches, Access Switches and Media Converters etc.
  5. Fiber Optic and Copper networks interconnecting all the system components. The Seller shall design the network as shown; the network shall be furnished and installed by the Install Contract.
- B. The PCS shall be designed to monitor, store, display and log process and equipment operating information and alarms and to perform various process control functions and generate operating, regulatory and other necessary reports. The unit processes which the PCS shall monitor and control are described in the Contract Documents.
- C. Section Includes:
1. Basic requirements for complete instrumentation system for process control.
- D. Related Specification Sections include but are not necessarily limited to:
1. Division 00 - Procurement and Contracting Requirements.
  2. Division 01 - General Requirements.
  3. Section 40 90 02 - Programmable Logic Controllers: Hardware and Software

4. Section 40 90 03 - Operator Interface Terminals, Operator Work Stations and Programming Work Stations
5. Section 40 90 04 - Primary Sensors and Field Instruments
6. Section 40 90 05 - Control Panels and Enclosures
7. Section 40 90 06 - Panel Instruments and Devices
8. Section 40 90 07 - Input/Output Lists
9. Section 40 90 08 - Control Strategies
10. Section 40 90 09 - Uninterruptible Power Supplies (UPS)
11. Section 40 90 10 - Process Control System Factory Testing
12. Section 40 90 11 - Process Control System Network Hardware and Software
13. Section 40 90 12 - Process Control System Start-Up and Commissioning
14. Section 40 90 13 - Training
15. Section 40 96 52 - Configuration Requirements: HMI and Reports
16. Section 40 99 00 - Surge Protection Devices for I&C Equipment

## 1.02 QUALITY ASSURANCE

### A. Referenced Standards:

1. Canadian Standards Association (CSA).
2. FM Global (FM).
3. The International Society of Automation (ISA):
  - a. 7.0.01, Quality Standard for Instrument Air.
  - b. S5.1, Instrumentation Symbols and Identification.
  - c. S5.2, Binary Logic Diagrams for Process Operations.
  - d. S5.3, Graphic Symbols for Distributed Control/Shared Display Instrumentation, Logic and Computer Systems.
  - e. S5.4, Standard Instrument Loop Diagrams.
  - f. S20, Standard Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves.

4. National Electrical Manufacturers Association (NEMA):
    - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
  5. National Fire Protection Association (NFPA):
    - a. 70, National Electrical Code (NEC).
  6. National Institute of Standards and Technology (NIST).
  7. Underwriters Laboratories, Inc. (UL):
    - a. 913, Standard for Safety, Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations.
- B. General: Provide quality control as specified in Division 01.
- C. Qualifications
1. The Seller shall use a UL 508A and UL 698A approved panel shop for panel fabrication.
- D. Responsibility
1. The Seller shall retain the ultimate responsibility for the complete and functional Process Control System (PCS):
    - a. Design, fabrication, implementation and software programming and configuration to furnish as complete and functional Process Control System (PCS) as described in the Contract Documents. PCS includes but not limited to Control Panels, local control stations, cabinets, field instruments, local alarm stations, HMI servers, workstations, network cabinets, PLC software and associated programming of all PLCs and Remote I/O (RIO) cabinets, PCS network configuration, Plant PLC communication with vendor panels, HMI software, graphics development and configuration and PLC and HMI database development and configuration.
    - b. Submit a detailed schedule prepared in the most recent version of Microsoft Project® within 30 calendar days of award of Contract. The schedule shall include schedule of deliverables, workshop(s), procurement, factory acceptance testing (FAT), shipping, commissioning, site acceptance testing (SAT) and training.
    - c. Preparation, assembly and correction of all submittals for equipment supplied under Division 40 in accordance with the Contract Documents.
    - d. Coordination and interface of the PCS hardware and software with various packaged control systems that are furnished by other equipment suppliers, VFDs, control valve actuators and field instruments.

- e. Developing and implementing the PCS's Control Strategies as specified under Section 40 90 08 Control Strategies.
- f. Field installation and supervision of the PLC Control Panels, Remote I/O (RIO) panels, local control stations (LCS) and field instruments, panels, consoles, cabinets, server racks, network equipment and workstations.
- g. Calibration and configuration of field instruments.
- h. Training of Owner's operations and maintenance personnel.
- i. Handling of all warranty obligations of the supplied control system.
- j. Maintain two (2) copies of the PLC program and HMI graphics configuration files for the duration of the warranty period. Document and update the program files when any changes are made to the program during the warranty period and turn over a copy of the files to the Owner after warranty expiration.

E. I&C Coordination and Progress Meeting:

- 1. A progress and coordination meeting will be scheduled. The meeting shall be in advance of the submittal of the HMI screen development submittal. Seller representative shall be required to attend
- 2. The purpose of the meeting shall be to review of programming effort and HMI screen development) . HMI screen development shall be demonstrated "live," so that color changes and animations are demonstrated.
- 3. Decisions and statements made at the meetings shall commit Seller to agreed procedures and schedules.

F. Miscellaneous

- 1. Comply with electrical classifications and NEMA enclosure types as shown, specified and required.

1.03 DEFINITIONS

- A. Architecturally finished area: Offices, laboratories, conference rooms, restrooms, corridors and other similar occupied spaces.
- B. Non-architecturally Finished Area: Pump, chemical, mechanical, electrical rooms and other similar process type rooms.
- C. Hazardous Areas: Class I, II or III areas as defined in NFPA 70.
- D. Highly Corrosive and Corrosive Areas: Rooms or areas identified on the Drawings where there is a varying degree of spillage or splashing of corrosive materials such as water, wastewater or chemical solutions; or chronic exposure to corrosive, caustic or acidic agents, chemicals, chemical fumes or chemical mixtures.



- E. Outdoor Area: Exterior locations where the equipment is normally exposed to the weather and including below grade structures, such as vaults, manholes, handholes and in-ground pump stations.
- F. Instrument Air Header: The segment of air supply piping and tubing which transports air from the compressed instrument air source through the branch isolation valve of any takeoff (branch) line.
- G. Branch Line: The segment of air supply piping and tubing which transports air from the outlet of the air header branch isolation valve through an air user's isolation valve.
- H. Intrinsically Safe Circuit: A circuit in which any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under test conditions as prescribed in UL 913.
- I. Calibrate: To standardize a device so that it provides a specified response to known inputs.
- J. PLC: Programmable Logic Controller or Programmable Automation Controller (PAC). A PLC or PAC is an industrial computer which has been ruggedized and adapted for the control of plant processes that require high reliability and high availability control systems and ease of programming and process fault or process upset diagnostics.
- K. PCS: PLC based Process Control System. PCS encompasses the range of process controls from field instruments, actuators, manual controllers, PLC and RIO control panels to the PLC's, OIT's, network switches, network cabinets, HMI software, servers and workstations and Historian.
- L. RIO: Remote I/O Control Panel. Remote I/O is an extension of the PLC control panel and may be installed due to physical plant layout or to reduce the volume of hardwired I/O points to the PLC control panel. Remote I/O usually does not have any processing capability (it does not run the application software), it only runs communications to transmit I/O data to the PLC for processing.
- M. Plant PLC: Main Plant Control Panels to which all RIO and vendor furnished control panels are connected via Ethernet data-links or hardwired connections.
- N. SCADA: Supervisory Control and Data Acquisition is a control system architecture that utilizes computer workstations, servers, networked data communications and graphical user interfaces for high-level process supervisory management, but uses other peripheral devices such as PLC's to interface with the process plant equipment.
- O. HMI: Human Machine Interface. An HMI is a software application that presents information to an operator or user about the state of a process, and to accept and implement the operators control instructions. Typically information is displayed in a graphic format (Graphical User Interface or GUI).
- P. OWS (Operator Workstation): PC-based operator system, including hardware, operating system software, and operator interface HMI system software. This is generally referred to as the HMI workstation.

## 1.04 SYSTEM DESCRIPTION

### A. Control System Requirements:

1. This Specification Section provides the general requirements for the instrument, control system, all materials and work necessary for complete and fully functional elements.
2. Provide instrumentation and control components as well as complete system integration. Provide all mounting hardware and supports. Work shall include panel mounting and the completion of all wiring terminations within control panels.
3. Coordinate work with all electrical, mechanical, and structural work furnished in this Contract.
4. Supervise the installation, testing, and start-up systems per manufacturer's instructions and recommendations.
5. The instrument and control system consists of all primary elements, transmitters, switches, controllers, computers, recorders, indicators, panels, signal converters, signal boosters, amplifiers, special power supplies, special or shielded cable, special grounding or isolation, auxiliaries, software, wiring, and other devices required to provide complete control of the plant as specified in the Contract Documents.

### B. All signals shall be directly linearly proportional to measured variable unless specifically noted otherwise.

1. Ensure coordination of instrumentation with other work to ensure that necessary wiring, conduits, contacts, relays, converters, and incidentals are provided in order to transmit, receive, and control necessary signals to other control elements, to control panels, and to receiving stations.
2. Prior to Shop Drawing preparation, the Seller shall inspect the Owner's existing equipment and as-constructed electrical documentation so as to be able to fully coordinate the interface of new and existing instrumentation and controls.
  - a. All costs associated with this Work shall be incorporated into the original bid.
  - b. Although such Work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, complete and compatible installation.

## 1.05 SUBMITTALS

### A. Shop Drawings

1. See Specification Section 01 33 00 - Submittals for requirements for mechanics and administration of the submittal process.
2. Submittals shall be original printed material or clear unblemished photocopies of original printed material.
  - a. Facsimile information is not acceptable.
3. Limit the scope of each submittal to one (1) Specification Section.
  - a. Each submittal must be submitted under the Specification Section containing requirements of submittal contents.
4. Product technical data including:
  - a. Acknowledgement that products submitted meet requirements of standards referenced.
  - b. Equipment catalog cut sheets.
  - c. Instrument data sheets:
    - 1) ISA S20 or approved equal.
    - 2) Separate data sheet for each instrument.
  - d. Materials of construction.
  - e. Instrument range and initial setpoint (if applicable).
  - f. Pressure loss curves.
  - g. Physical limits of components including temperature and pressure limits.
  - h. Size and weight.
  - i. Electrical power requirements and wiring diagrams.
  - j. NEMA rating of housings.
  - k. Submittals shall be marked with arrows to show exact features to be provided.

5. Loop diagrams in accordance with ISA S5.4.
  - a. Loop drawings shall show complete control loop, including instruments, PLC terminations, remote I/O terminations, controllers, transmitters, displays and final control elements.
  - b. Loop drawings shall identify all wiring details for the entire control loop and shall identify all terminations, including any intermediate termination points such as terminal strips, junction boxes or remote I/O panels. Loop drawings shall identify grounding requirements within the loop, including wiring shields.
  - c. Loop drawings shall identify all digital or serial communication protocols that are part of the loop, such as Ethernet TCP/IP, Modbus, etc. The loop drawing shall identify the signals that are communicated over digital or serial communication protocols and shall identify the beginning and end points of that communication.
6. Process connected instrument installation details containing the following minimum information:
  - a. Bill of materials providing as a minimum the following information:
    - 1) Tube material and size.
    - 2) Connection size.
    - 3) Fitting size, material, and rating.
    - 4) Valve type and material.
    - 5) Instrument description.
    - 6) Pipe stand size and material.
  - b. Tube slope requirements.
  - c. Required elevations and dimensions.
  - d. Installation drawings shall show all electrical, pneumatic, and mechanical connections required for proper installation of the instrument. Installation details shall provide a complete drawing showing the installation of the instrument from the process connection to the final mounting location of the instrument. Details shall identify process connection type/size, all connection welds, fittings, tubing, sensing lines, piping, valves, and any other required hardware for instrument installation.
  - e. Wiring drawings shall be provided showing all wiring requirements, terminations, conduits, fittings and any other electrical connections required to install instrument and connect wiring to power supplies and control system equipment. Electrical drawings shall identify all details required for a proper instrument installation, including wire type/size, terminations, junction boxes, and any other required electrical components.

- f. Instrument mounting details, including drawings showing mounting configuration, mounting hardware and any other mounting information.
- 7. Comprehensive set of wiring diagrams as specified in Section 40 90 05.
- 8. Panel fabrication drawings as specified in Section 40 90 05.
- 9. PLC equipment drawings.
- 10. Network Architecture Drawings: Include complete Control System Architecture drawings, showing all control panels, PLCs, Remote I/O panels, Local Control Stations, HMI servers, workstations, and any other nodes connected to the control system network. Include connections to Ethernet network, and any local bus (for example Modbus, Profibus, Foundation Fieldbus, etc.) Identify cable, termination type, termination location, and drop lengths for each segment.
  - a. Format: Network schematic for each different type of network.
  - b. Input and Output drawings, containing, but not limited to, the following information:
    - 1) Line numbers and instrument tag numbers
    - 2) Individual component locations
    - 3) Actual equipment wiring terminal designations, point to point wiring, and cable shield terminations.
    - 4) Wire type, size and identification number
    - 5) Signal types (e.g., 120 Volt ac, 4-20 mAdc, pulse frequency, etc.)
    - 6) Contact orientations (e.g., normally open, normally closed, etc.)
    - 7) Equipment grounding requirements
    - 8) Signal boosters, interposing relays, optical isolators, and shunt resistors.
    - 9) IP addresses, serial addresses and any other digital or serial communication addressing required to configure the network.
    - 10) Identify all digital and serial communication network terminations, included port numbers, patch panel terminations, etc.
  - c. Network Architecture Drawings shall identify connections to any external networks, including existing plant control systems.

11. HMI graphics.
  - a. Graphics for all HMI software, workstations, and any panel mounted OITs.
  - b. Formal submittal of HMI graphics shall be made after the I&C coordination and progress meeting specified in this Section.
12. Nameplate layout drawings.
13. Drawings, systems, and other elements are represented schematically in accordance with ISA S5.1 and ISA S5.3.
  - a. The nomenclature, tag numbers, equipment numbers, panel numbers, and related series identification contained in the Contract Documents shall be employed exclusively throughout submittals.
14. All Shop Drawings shall be modified with as-built information/corrections.
15. All panel and wiring drawings shall be provided in both hardcopy and softcopy.
  - a. Furnish electronic files on inerasable media such as DVD.
  - b. Drawings in AUTO CAD 2016 format.
16. Provide a parameter setting summary sheet for each field configurable device.
17. Certifications:
  - a. Documentation verifying that calibration equipment is certified with NIST traceability.
  - b. Approvals from independent testing laboratories or approval agencies, such as UL, FM or CSA.
    - 1) Certification documentation is required for all equipment for which the specifications require independent agency approval.
18. Testing reports: Source quality control reports.

B. Contract Closeout Information:

1. Operation and Maintenance Data
  - a. See Specification Section 01 78 23 - Operation and Maintenance Manuals for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
  - b. O&M manuals shall also include all items submitted as part of the shop drawings approval process.

- c. Include a list of spare parts as required by the Contract Documents.
2. The O&M manuals shall include the following:
- a. Name, address and telephone number of the local service representatives for all PCS component manufacturers.
  - b. Complete list of supplied system hardware parts with full model numbers, manufacturer, and quantity referred to system part designations, including spare parts and test equipment provided.
  - c. Copy of all approved submittal information and system shop drawings as specified herein with corrections made to reflect actual system as tested and delivered to the site for installation. All drawings shall be 11" x 17". If 11" x 17" drawings are not legible, half-size black line reproductions shall be provided for all shop drawings larger than 11" x 17" inches. Drawings size of 8.5" x 11" are not acceptable. Also provide electronic copies on CD-ROM or DVD format.
  - d. All up-to-date system software documentation.
  - e. Manufacturer's Original Copies of Hardware, Software and Installation. Assembly and Operations Manuals for the distributed control system central monitoring station and peripheral devices, and all other control system components. Manuals shall include the following information:
    - 1) General descriptive information covering the basic features of the equipment.
    - 2) Physical description covering layout and installation requirements and all environmental constraints.
    - 3) Functional and operational descriptions covering the procedures for programming, operation. Startup, shutdown and calibration of the distributed control system equipment and explaining how the various control functions are performed.
    - 4) Principles of operation explaining the logic of operation; provide information covering operation to a component level.
    - 5) Maintenance procedures covering checkout, troubleshooting, and servicing; checkout procedures shall provide the means to verify the satisfactory operation of equipment, troubleshooting procedures shall serve as a guide in determining faulty components and servicing procedure shall cover requirements and recommended time schedule for calibration, cleaning, lubrication and other housekeeping and preventive maintenance procedures.
    - 6) Wiring schematic and logic diagrams.

- 7) Safety considerations relating to operation and maintenance procedures.
  - 8) Recommended spare parts list.
  - 9) Manufacturer approved repair and service centers list.
  - 10) Replacement parts' sources.
  - 11) Recommended maintenance procedures and frequencies.
3. Warranties: Provide copies of warranties and list of factories authorized service agents.

C. Record Drawings and Documentation

1. Provide Record Documents in accordance with Section 01 78 18 – Contract Closeout.
2. Manufacturer shall revise all system shop drawings, submittals and software documentation to reflect as-built conditions in accordance with the requirements of the Contract Documents and the supplemental requirements below.
3. Copies of all revised shop drawings and documentation shall be submitted to the Engineer to replace outdated drawings and documentation contained in the O&M Manuals. Half-size black line sets shall be provided for all drawings larger than 11 x 17. Specific instructions for outdated drawing removal and replacement shall be provided with the record drawing submittal. Provide electronic copies on a CD-ROM or DVD media or on a USB flash drive.
4. Legible 11” x 17” or half-size black line prints of wiring diagrams applicable to each control panel shall be placed inside a clear plastic envelope and stored in a suitable print pocket or container inside each control panel.

D. Reports

1. Copies of the following reports shall be submitted to Engineer:
  - a. Factory Test Reports.
  - b. Installation Inspection, Field Calibration, and Field Testing.

1.06 DESIGN REQUIREMENTS

A. Power Supplies

1. All electrically powered equipment and devices shall be suitable for operation on 115 volt  $\pm$  10%, 60 Hz  $\pm$  2 Hz power. If a different voltage or closer regulation is required, a suitable regulator or transformer shall be provided.



2. Appropriate power supplies shall be provided for all two wire transmitters, loops for monitoring discrete inputs and all necessary outputs. Power supplies shall be mounted in enclosures and installed in the appropriate Control Room or field panel.
3. Design all power supplies for a minimum of 150% of the maximum simultaneous current draw.
4. A power on-off switch or an air circuit breaker shall be furnished for each item requiring electrical power.
5. Provide isolation transformers, line voltage regulators and surge suppressors for the distributed power portions of the plant monitoring and control system to eliminate electrical noise and/or transients entering on the primary power line.

B. Signal Requirements

1. The control system shall be designed to use 4 to 20 mA dc analog signals, unless otherwise specified.
2. Signal converters and repeaters shall be provided where required and in addition analog inputs to the distributed control system shall be through appropriate repeaters' to provide signal isolation where series looped with other devices and to allow the loop to maintain integrity even if the distributed control system is out of service. Power supplies shall be sized adequately for signal convertor and repeater loads.
3. Signals shall be isolated from ground.
4. Signals shall not have a transient dc voltage exceeding 300 volts over one millisecond nor a dc component over 300 volts.
5. The system and associated input/output wiring will be used in a plant environment where there can be high energy ac fields, dc control pulses, and varying ground potentials between the sensors/transducers or input contact locations and the system components. The system design shall be adequate to provide proper protection against interferences from all such possible situations.

C. Network Communication Requirements: Provide Ethernet-ready PLC systems.

D. Miscellaneous

1. All PCS components including field instruments shall be heavy duty types, designed for continuous service in a municipal treatment plant environment. The system is to contain products of a single manufacturer, when possible, and to consist of equipment models which are currently in production and fully supported. All equipment provided is to be of modular construction and to be capable of field expansion through the installation of plug-in circuit cards and

additional cabinets as necessary. Design all final control loops to fail safe or as are.

2. All field instruments shall be designed to return automatically to accurate measurement within 15 seconds upon restoration of power after a power failure or when transferred to standby power supply.
3. Surge protection shall be provided for all PCS components which could be damaged by electrical surges. Refer to Section 40 99 00 – Surge Protection Devices.
4. All field-mounted instruments and system components shall be designed for operation in humid and corrosive service conditions. All field mounted instrument enclosures; junction boxes and appurtenances shall be NEMA 4X rated 316 stainless steel unless otherwise specified.
5. All relays with interconnections to field devices shall be wired through terminal blocks. Terminals as part of the relay base are not an acceptable alternate.
6. All panel mounted instruments, switches, and other devices shall be selected and arranged to present a pleasing coordinated appearance. All front of panel mounted devices shall be of the same manufacturer and model line.
7. All components furnished, including field and rear of panel instruments, shall be tagged with the item number and nomenclature indicated on the Contract Documents and/or approved Shop Drawings.
8. Ranges and scales specified herein shall be coordinated to suit equipment actually furnished.
9. Field-mounted devices shall be treated with an anti-fungus spray.
10. Field-mounted devices shall be protected from exposure to freezing temperatures.

#### 1.07 RESPONSIBILITY

- A. Provide application software programming as specified in Section 40 90 08 Control Strategies.
- B. Prepare Interconnecting Wiring Diagram Drawings for the Process and Instrumentation Control System. Interconnecting wiring and terminations for the System shall be provided under Division 26, in accordance with the Interconnecting Wiring Diagram Drawings.
- C. Immediately correct incomplete or deficient Work discovered during application software programming, downloading, testing, troubleshooting, and System startup. Interim modifications or patches shall be used as required to maintain 24-hour, 7 day operation.

- D. Responsible for configuration, coordination, and addressing of Ethernet networks for the devices specified herein and as shown on the Drawings. Where additions to existing plant networks are required, request the range of available addresses from the Owner and coordinate requirements.
- E. Minimum Scope: Provide the following minimum scope of work:
1. For instrumentation and control panels, components, and ancillaries specified under this section:
    - a. Coordinating to ensure that: The proper size, type and number of instrumentation and control-related raceways and conductors are furnished and installed.
    - b. Completing panel fabrication drawings.
    - c. Providing the specified submittals.
    - d. Providing panels, components, and ancillaries.
    - e. Programming and configuration.
    - f. Providing instructions, details, and advice to and coordinating with the Seller to ensure proper installation.
    - g. Certifying correctness of installation.
    - h. Verifying final power and signal connections and labeling (lugging and connecting).
    - i. Adjusting and calibrating.
    - j. Starting up
    - k. Testing
    - l. Providing the required training.
  2. For systems, components, and ancillaries not provided under this Section but that are directly connect to components provided under this Section:
    - a. Obtaining manufacturers' information regarding installation, interface, function and adjustment.
    - b. For operation and control, verifying that installations, interfacing signal terminations and adjustments have been completed in accordance with manufacture's recommendations.
    - c. Testing to demonstrate proper interface and operation with instrumentation and control system.

1.08 APPLICATION SOFTWARE PROGRAMMING

- A. Provide application software programming for the PCS as required in this and related Sections.
- B. Training Services specified in Section 40 90 13 - Training and systems demonstrations specified in Division 01 shall not begin until PCS programming testing has been successfully completed.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Acceptance at Site: Inspect all materials and equipment against approved shop drawings at time of delivery. Immediately return for replacement or repair any equipment or materials damaged or not meeting requirements of approved shop drawings.
- B. Storage and Protection: Label all equipment and materials after they have been inspected. Store all equipment and materials in dry, covered, ventilated location. Do not remove shipping blocks, plugs, caps, and desiccant dryers installed to protect the instrumentation during shipment until the instruments are installed and permanent connections are made. Protect from harm in accordance with manufacturer's recommendations.

1.10 SITE CONDITIONS

- A. Unless designated otherwise on the Drawings, area designations are as follows:
  - 1. Outdoor area and/or indoor Process area:
    - a. Wet.
    - b. Corrosive and/or hazardous when specifically designated on the Drawings or in the Specifications.
    - c. Below grade vaults and manholes:
      - 1) Subject to temporary submergence when specifically designated on the Drawings or Specifications.
  - 2. Architecturally finished area:
    - a. Dry.
    - b. Noncorrosive unless designated otherwise on the Drawings or in the Specifications.
    - c. Nonhazardous unless designated otherwise on the Drawings or in the Specifications.
  - 3. Non-architecturally finished area: As designated elsewhere on the Drawings or in the Specifications.

- B. The complete monitoring and control system and associated input/output wiring will be used in a wastewater treatment facility environment where there will be high energy AC fields, DC control pulses, and varying ground potentials between the transducers or input contact locations and the system components. The presence of vapors from the wastewater treatment process is to be expected and equipment shall be protected against said vapors. The system design shall be adequate to provide proper protection against interferences from all such possible situations.
- C. Protect all equipment and instruments specified herein from moisture. Site is a wastewater treatment plant with potential for hazardous, corrosive, and chemical rich vapors. Process control equipment may be located outdoors and subject to temperatures from -20F to +120F, with rain and 100% humidity.

## PART 2 - PRODUCTS

### 2.01 SERVICE CONDITIONS

- A. The following defines temperature ranges in certain types of environments. Provide equipment for suitable continuous operation in these environments. See Drawings for area classifications.
  - 1. Inside
    - a. Temperature: 20 degrees F to 104 degrees F.
    - b. Relative Humidity: 10 percent to 100 percent.
  - 2. Outside:
    - a. Temperature: Minus 20 degrees F to 104 degrees F.
    - b. Relative Humidity: 10 percent to 100 percent, rain, snow, freezing rain.

### 2.02 SYSTEM ARCHITECTURE

- A. New control system architecture shall be as shown and specified.

### 2.03 MONITORING AND CONTROL - GENERAL

- A. Functional descriptions of the processes and equipment to be monitored and controlled by (or through) the PCS are specified in Section 40 90 08.
- B. Configure the PCC system to meet the functional requirements specified in Section 40 90 02 and Section 40 90 08.
- C. I/O points shall be as specified.

### 2.04 NEMA TYPE REQUIREMENTS

- A. Provide enclosures/housing for control system components in accordance with the following:
  - 1. Areas designated as wet: NEMA Type 4X 316 Stainless Steel.

2. Areas designated as wet and/or corrosive: NEMA Type 4X 316 Stainless Steel.
3. Areas designated as Class I hazardous, Groups A, B, C, or D as defined in NFPA 70:
  - a. NEMA Type 7 unless all electrical components within enclosure utilize intrinsically safe circuitry.
    - 1) Utilize intrinsically safe circuits to the maximum extent practical and as depicted in the Contract Documents and that meet all requirements of UL698A.
4. Areas designated as Class II hazardous, Groups E, F, or G as defined in NFPA 70:
  - a. NEMA Type 9 unless all electrical components within enclosure utilize intrinsically safe circuitry.
    - 1) Utilize intrinsically safe circuits to the maximum extent practical and as depicted in the Contract Documents and that meet all requirements of UL698A.
5. Either architecturally or non-architecturally finished areas designated as dry, noncorrosive, and nonhazardous: NEMA Type 12.
6. Areas designated to be subject to temporary submersion: NEMA 6P.

## 2.05 PERFORMANCE AND DESIGN REQUIREMENTS

### A. System Operating Criteria:

1. Repeatability: For any repeated magnitude of control signal, from either an increasing or decreasing direction, the final control element shall take a repeated position within 0.5 % of full travel regardless of force required to position final element.
2. Sensitivity: Controls shall respond to setpoint deviations and measured variable deviations within 1.0 % of full scale.
3. Performance: All instruments and control devices shall perform in accordance with manufacturer's specifications.

## 2.06 ACCESSORIES

- A. Provide identification devices for instrumentation system components in accordance with Specification Section 10 14 00.
- B. Provide corrosion resistant spacers to maintain 1/4 IN separation between equipment and mounting surface in wet areas, on below grade walls and on walls of liquid containment or processing areas.

## PART 3 - EXECUTION

### 3.01 GENERAL

- A. The Seller is responsible to provide the following field services:
  - 1. Manufacturers Field Services During Installation and Testing:
    - a. Installation instructions, oversight, supervision, and certification services
    - b. Field Testing support services
    - c. Startup and Commissioning support services
    - d. Performance and acceptance testing support services
    - e. Equipment and operational training of PVSC staff
  - 2. Manufacturers Field Services After Systems Acceptance By The Owner:
    - a. Operational Support services
    - b. System Optimization Services

### 3.02 INSTALLATION

- A. Wherever feasible, use bottom entry for all conduit entry to instruments and junction boxes.
- B. Install electrical components per the requirements of the Electrical design.
- C. Panel-Mounted Instruments:
  - 1. Mount and wire so removal or replacement may be accomplished without interruption of service to adjacent devices.
  - 2. Locate all devices mounted inside enclosures so terminals and adjustment devices are readily accessible without use of special tools and with terminal markings clearly visible.
- D. Equipment Tags and Nameplates
  - 1. Provide embossed stainless-steel tags for each device specified in Section 40 90 04 – Primary Sensors and Field Instruments.
  - 2. Provide engraved laminated nameplates for each panel as specified in Section 40 90 05 – Control Panels and Enclosures.
- E. See Specification Section 26 05 19 – Wires and Cables - 600 Volts and Below.

### 3.03 FIELD QUALITY CONTROL

- A. Tests and Inspection: Provide tests as required in Division 01 and Section 40 90 12– Startup and Commissioning.

- B. Inspection: Demonstrate that instruments, panels, programming equipment and network equipment:
1. Has not been damaged by transportation or installation.
  2. Has been properly installed.
  3. Has no mechanical defects.
  4. Is in proper alignment.
  5. Has been properly connected.
  6. Function recordings to system requirements
- C. Maintain accurate daily log of all startup activities, calibration functions, and final setpoint adjustments.
1. Documentation requirements including submitting the following:
    - a. Loop Check-out Sheet.
    - b. Instrument Certification Sheet.
    - c. Final Control Element Certification Sheet.
- D. In the event that instrument air is not available during calibration and testing, supply either filtered, dry, instrument quality air from a portable compressor or bottled, dry, instrument quality air.
1. Do not, under any circumstances, apply hydrostatic test to any part of the air supply system or pneumatic control system.
- E. Pneumatic Signal Tubing Testing:
1. Before the leak test is begun, blow clean with dry air.
  2. Test signal tubing per ISA 7.0.01, except for tubing runs of less than 10 FT where simple soap bubble testing will suffice.
  3. If a leak is detected, repair the leak and repeat the leak test.
  4. After completion of the leak test, check each signal line for obstructions.
    - a. If any are indicated, remove and retest.
- F. Instrumentation Calibration:
1. Verify that all instruments and control devices are calibrated to provide the performance required by the Contract Documents.
  2. Calibrate all field-mounted instruments, other than local pressure and temperature gages, after the device is mounted in place to assure proper installed operation.
  3. Calibrate in accordance with the manufacturer's specifications.



4. Bench calibrate pressure and temperature gages.
    - a. Field mount gage within seven 7 days of calibration.
  5. Check the calibration of each transmitter and gage across its specified range at 0, 25, 50, 75, and 100 %.
    - a. Check for both increasing and decreasing input signals to detect hysteresis.
  6. Replace any instrument which cannot be properly adjusted.
  7. Stroke control valves with clean dry air to verify control action, positioner settings, and solenoid functions.
  8. Mark range, date, setpoint and calibrator's initials on each instrument by means of blue or black ink on a waterproof tag affixed to the instrument.
  9. Calibration equipment shall be certified by an independent agency with traceability to NIST.
    - a. Certification shall be up-to-date.
    - b. Use of equipment with expired certifications shall not be permitted.
  10. Calibration equipment shall be at least three (3) times more accurate as the device being calibrated.
- G. Loop check-out requirements are as follows:
1. Check control signal generation, transmission, reception and response for all control loops under simulated operating conditions by imposing a signal on the loop at the instrument connections.
    - a. Use actual signals where available.
    - b. Closely observe controllers, indicators, transmitters, HMI displays, recorders, alarm and trip units, remote setpoints, ratio systems, and other control components.
      - 1) Verify that readings at all loop components are in agreement.
      - 2) Make corrections as required.
        - a) Following any corrections, retest the loop as before.
  2. Stroke all control valves, cylinders, drives and connecting linkages from the local control station and from the control room operator interface.
  3. Check all interlocks to the maximum extent possible.

4. In addition to any other as-recorded documents, record all setpoint and calibration changes on all affected Contract Documents and turn over to the Owner.
- H. Provide verification of system assembly, power, ground, and I/O tests.
- I. Verify existence and measure adequacy of all grounds required for instrumentation and controls.

END OF SECTION

SECTION 40 90 02

PROGRAMMABLE LOGIC CONTROLLERS - HARDWARE AND SOFTWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes

1. Programmable logic controller (PLC) control system(s), including software, programming, and training.

B. Section Includes

1. Design and fabrication of programmable logic controller (PLC) control system, including software, programming, and training.
2. Deliver, FOB destination.
3. Unloading.
4. Checkout and field testing.
5. Onsite services of factory-trained service representative.

C. Work by Others

1. Concrete pads for cabinets.
2. Unloading.
3. Onsite services of factory-trained service representative.

D. Related Sections include but are not necessarily limited to:

1. Division 00 - Procurement and Contracting Requirements.
2. Division 01 - General Requirements.
3. Section 40 90 00 - Instrumentation and Control System General Requirements
4. Section 40 90 05 - Control Panels and Enclosures
5. Section 40 90 07 - Input-Output List
6. Section 40 90 08 - Control Strategies
7. Section 40 90 10 - Factory Acceptance Testing
8. Section 40 90 13 - Training
9. Section 40 90 12 - Start-Up and Commissioning.

E. Programming and Software Configuration

1. All programming and software configuration for the PLC shall be included as part of this Contract work.

2. All programming and software configuration of any package control system PLCs shall be included as part of this Contract work.
3. PLC configuration and programming shall comply with the recommended practices published by the hardware manufacturer. Programming and configuration convention standards published by the Owner shall be followed.

F. Work includes all elements of the systems specified. Provide all control hardware complete with power supplies, enclosures, accessories, and other appurtenances. Provide installation of new equipment and testing necessary for the proper operation of the control system.

## 1.02 QUALITY ASSURANCE

### A. Referenced Standards

1. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
  - a. C37.90.2, Trial-Use Standard Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers.
  - b. C62.41, Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
2. National Electrical Manufacturers Association (NEMA):
  - a. ICS 1, General Standards for Industrial Control and Systems.

### B. Qualifications

1. Refer to Section 40 90 00 – Instrumentation for Process Control - Basic Requirements.

## 1.03 DEFINITIONS

### A. Installer or Applicator

1. Installer or applicator is the person actually installing or applying the product in the field at the Project site.
2. Installer and applicator are synonymous.

## 1.04 SUBMITTALS

### A. Shop Drawings

1. See Specification Section 01 33 00 - Submittals for requirements for the mechanics and administration of the submittal process.
2. See Specification Section 40 90 00 – Process Control System General Requirements.

3. Product technical data including:
  - a. Results of factory testing procedures.
  - b. Drawings containing the following information to be submitted as part of Specification Section 40 90 05 submittals:
    - 1) Arrangement drawings for PLC system components.
    - 2) Panel and enclosure plans, sections and details.
    - 3) Access opening locations and required clearances for each panel and enclosure.
    - 4) Enclosure internal wiring and terminal blocks.
    - 5) Submit rack, communication card, and I/O card layouts with calculations for power supplies indicating power draw and heat release for each rack and power supply.
  - c. Catalog cut sheets containing information on PLC components to be submitted as part of this Specification Section submittals.
4. Certifications:
  - a. Resumes of programmer(s)

B. Contract Closeout Information

1. Provide hard copy printout of all PLC logic.
2. Provide flash drive of each documented application program.
3. As-Built Drawings: Accurately record actual locations of controller cabinets and input and output devices connected to system. Include interconnection wiring and cabling information, and terminal block layouts in controller cabinets. Include copy of manufacturer's certified drawings.
4. Operation and Maintenance Data:
  - a. Provide O&M manuals in accordance with Section 01 78 23 – Operation and Maintenance Manuals.
  - b. Submit bound copies of operating and programming instructions.
  - c. Submit description of system operation, adjusting and testing required.
  - d. Submit card replacement, adjustments, and preventative maintenance procedures and materials.

- e. Identify system maintenance requirements, servicing cycles, lubrication types required and local spare part sources.
- 5. Submit maintenance procedures available to Owner.
  - a. Include the location and phone numbers of service centers (including 24 HR "hot lines").
  - b. Provide specific information including operation and maintenance requirements, programming assistance, troubleshooting guide, parts ordering, field service personnel requests, and service contracts.
- C. Informational Submittals:
  - 1. See Specification Section 01 33 00 - Submittals for requirements for the mechanics and administration of the submittal process.
  - 2. Index of all training offered by PLC system equipment manufacturers including operations and maintenance.
  - 3. List of all recommended spares for maintenance purposes with each item separately priced.
- D. Record Documents
  - 1. Provide Record Documents in accordance with Section 01 78 18 – Contract Closeout and Section 40 90 00 – Instrumentation and Control System General Requirements.

## PART 2 - PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable for all Plant PLCs and complex packaged control systems without exceptions:
  - 1. Rockwell Automation ControlLogix PLC platform
  - 2. Or Equal
- B. The following manufacturers are acceptable for small non-complex packaged control systems without exceptions:
  - 1. Rockwell Automation CompactLogix PLC platform
  - 2. Or Equal

## 2.02 PERFORMANCE AND DESIGN REQUIREMENTS

- A. See Specification Section 40 90 00 – Instrumentation for Process Control - Basic Requirements.
- B. The PLC system shall accomplish the control requirements of the loop descriptions, Drawings, and Specifications.
- C. PLC programming shall be documented and factory tested.
- D. The PLC system shall operate in ambient conditions of 32 to 140 Deg. F temperature and 5 to 95 percent relative humidity without the need for purging or air conditioning.
- E. Environmental Controls
  - 1. See Section 40 90 05.
  - 2. Furnish circulation fans in solid state control system enclosures.
  - 3. Over-temperature switches shall be utilized to provide special cooling if required to maintain operating temperatures within the manufacturer's specified range.
  - 4. Air conditioning applications shall include means of preventing moisture condensation.
- F. Where the PLC is utilized to control multiple trains of equipment and where the equipment in each train operates as a unit relatively independent of other equipment trains (e.g., facility with multiple boiler units or filter trains), the PLC components (I/O modules, power supplies, etc.) shall be assigned so that the failure of any one (1) component does not affect equipment on all trains.
  - 1. I/O modules shall be segregated on a train basis unless required otherwise for safety reasons.
  - 2. Where several equipment units operate in parallel, but are not considered assigned to a particular equipment train (e.g., multiple raw water pumps or chemical feed pumps all discharging into a common system), the PLC I/O modules associated with each equipment unit shall be assigned so that the failure of any one (1) I/O module does not affect all of the parallel operating equipment units.
- G. All PLC control system components shall be capable of meeting or exceeding electromagnetic interference tests per IEEE C37.90.2.
- H. Incorporate the following minimum safety measures:
  - 1. Master Safety Relay:
    - a. Cuts off power to specified I/O devices upon de-energization.

- b. Multiple Master Safety Relays shall be available as required to provide ability to control separate designated blocks of the control program.
- 2. Watchdog function to monitor:
  - a. Internal processor clock failure.
  - b. Processor memory failure.
  - c. Loss of communication between processor and I/O modules.
  - d. Processor ceases to execute logic program.
- 3. Safety function wiring: Emergency shutdown switches shall not be wired into the controller.
- 4. Safe wiring:
  - a. Equipment failure mode shall be selected so that the loss of power or control signal to the equipment will result in the equipment either shutting down or operating safely.
  - b. Unless otherwise specified, activation of alarms and stopping of equipment shall result from the de-energization of control circuits, rather than the energization of control circuits.
  - c. Low voltage control signal wires:
    - 1) Place in conduit segregated for that purpose only.
    - 2) Twisted shielded wire pair.
    - 3) Not located in the same conduit or bundle with power wiring.
- 5. Initial safety conditions:
  - a. Utilize program module to dictate output states in a known and safe manner prior to running of control program.
  - b. Utilize program each time PLC is re-initiated and the control program activated.
- 6. PLC fault relay:
  - a. Opening of PLC fault contact:
    - 1) Occurs upon unsafe or undesirable system operation, including:
      - a) Loss of memory.
      - b) Processor fault.
      - c) Power supply fault.
      - d) Communications failure.
      - e) Scan time overrun.
      - f) Module failure.



- 2) Results from de-energization of PLC fault relay or output.
  - 3) Causes Master Safety Relay to de-energize.
7. Monitoring of internal faults and display:
- a. Internal PLC system status and faults shall be monitored and displayed.
    - 1) Monitored items shall include:
      - a) Memory ok/loss of memory.
      - b) Processor ok/processor fault.
      - c) Scan time overrun.
8. Control of programs: Protect access to PLC program loading with password protection or with locked, key operated selector switches.
9. Design PLC system with high noise immunity to prevent occurrence of false logic signals resulting from switching transients, relay and circuit breaker noise or conducted and radiated radio frequency interference.
10. Operator intervention:
- a. Logic system failure shall not preclude proper operator intervention.
  - b. Safety shutdown of equipment or a system shall require manual operator intervention before the equipment or system operation may be reestablished.

## 2.03 COMPONENTS

- A. PLC System Central Processor Unit (CPU):
1. CPU shall provide communications with other control systems and man-machine interfaces as specified.
  2. Memory:
    - a. Battery-backed RAM.
    - b. EEPROM program back-up:
      - 1) Automatically download to RAM in the event RAM is corrupted.
  3. Memory battery backup shall be capable of 60 days memory retention with fresh battery.
    - a. Provide visual indication of battery status and alarm low battery voltage.
    - b. Memory battery backup shall be capable of 14 days memory retention after the "Battery Low" indicating LED is on.

4. Plug-in card design to allow quick field replacement of faulty devices.
  - a. Provide unit designed for field replacement and expansion of memory without requiring rewiring or use of special tools.
5. 25 percent minimum spare useable memory capacity after all required programming is in place and operating.
6. Capable of executing all control functions required by the Specifications and Drawings.
7. Built-in three-mode (proportional-integral-derivative) control capabilities.
  - a. As directly selectable algorithms requiring no user knowledge of programming languages.
8. On-line reconfigurable.
9. Lighted status indicators for "RUN" and "FAILURE".
10. Capable of manual or automatic control mode transfer from the operating console stations or from within the control strategy.
  - a. Transfer shall be bumpless and balanceless.
11. Acceptable CPUs for all Area PLCs and complex packaged control systems:
  - a. Rockwell Automation ControlLogix 1756-L72
  - b. Or Equal
12. Acceptable CPUs for small non-complex packaged systems:
  - a. Rockwell Automation CompactLogix 5069-L330ERM with built-in Ethernet communication capability
  - b. Or Equal

B. Input/output (I/O) Modules

1. Provide plug-in modular-type I/O racks with cables to connect to all other required PLC system components.
2. Provide I/O system with:
  - a. I/O solid state boards with status lights indicating I/O status.
  - b. Electric isolation between logic and field device.
  - c. Capability of withstanding low energy common mode transient to 1000 V without failure.
  - d. Incorporate noise suppression design.

- e. Capable of meeting or exceeding electrical noise tests, NEMA ICS 1-109.60-109.66.
  - f. Capable of being removed and inserted into the I/O rack under power, without affecting any other I/O modules in the rack.
  - g. Install at least 25 percent spare I/O of each type installed. Provide additional I/O cards as required to meet minimum spare requirement of 25% spare I/O capacity.
  - h. All I/O points including spares shall be wired to terminal blocks at the panel shop.
3. Input/output connection requirements:
- a. Make connections to I/O subsystem by terminating all field wiring on terminal blocks within the I/O enclosure.
  - b. Prewire I/O modules to terminal blocks.
  - c. Provide terminal blocks with continuous marking strip.
  - d. Size terminals to accommodate all active data base points and spares.
  - e. Provide terminals for individual termination of each signal shield.
  - f. Field wiring shall not be disturbed when removing or replacing an I/O module.
4. Discrete I/O modules:
- a. Interface to ON/OFF devices.
  - b. I/O status indicator on module front.
  - c. Voltage rating to match circuit voltage.
  - d. Output module current rating:
    - 1) Match maximum circuit current draw.
    - 2) Minimum 1.0 continuous A/point for 120 Vac applications.
  - e. Discrete input and output modules shall be 16 point modules with each channel optically isolated.
  - f. Discrete input and output modules shall be 120 VAC.
  - g. Discrete output modules shall have Form C relay contacts.



- k. Analog output modules shall be 8 point modules with isolated channels.
  - 9. At a minimum provide 25 % spare I/O capacity of each type of I/O provided for all Plant PLC.
  - 10. At a minimum provide 25 % spare I/O capacity of each type of I/O provided for all Remote I/O (RIO) panels.
  - 11. Above are minimum quantities and the Systems Integrator shall provide I/O modules as required per the I/O List in 40 90 07A I-O Schedule.
- C. Ethernet Communication Interface Modules:
- 1. Where required, provide Ethernet Communication modules in each PLC chassis including all Plant PLCs, RIO and vendor supplied PLC panels.
  - 2. Communication Interface Modules shall be capable of being added to the controller configuration while online and in the Run mode.
  - 3. The Ethernet Communication Interface Modules shall serve to communicate with the other Plant PLCs, vendor supplied PLCs for small non-complex systems and all EtherNet/IP and Modbus TCP/IP devices.
  - 4. Acceptable manufacturer shall be:
    - a. Rockwell Automation 1756-EN2T
    - b. Or Equal
- D. PLC Chassis
- 1. Where required, the chassis shall provide a high-speed communication path between the PLC processor and various modules and shall distribute power to each of the module within the chassis.
  - 2. Acceptable chassis models for all Area PLCs, RIO and complex packaged control systems:
    - a. Rockwell Automation ControlLogix 1756 -A10/B 10 or A17/B 17 slot chassis
    - b. Or Equal
  - 3. Control panel shall be sized to allow at least 4 inches space from either side of chassis to panel wall or per manufacturer's recommendation whichever is greater.
- E. Power Supply Units
- 1. Provide regulated power units:
    - a. Designed to operate with PLC system and shall provide power to:

- 1) All components of PLC system.
  - 2) All two-wire field instruments.
  - 3) Other devices as indicated on Drawings or Specifications.
- b. Capable of supplying PLC system when all of the specified spare capacity is utilized.
  - c. Each power supply shall be sized such that it will carry no more than 75 percent of capacity under normal loads.
2. Electrical service to PLC system is 105 to 125 V, 60 Hz, +1 percent, 1 PH power.
  3. Separate AC circuit breakers shall be provided for each power supply.
  4. If the PLC system is field expandable beyond the specified spare capacity, and if such expansion requires power supply modification, note such requirements in the submittals and allow room for power supply modification in the PLC system enclosure.
  5. Capable of meeting or exceeding electrical noise tests, NEMA ICS 1-109.60-109.66.
  6. Power distribution:
    - a. Immune to transients and surges resultant from noisy environment.
    - b. Shall provide constant voltage level DC distribution to all devices.
  7. Acceptable power supply modules shall be:
    - a. Rockwell Automation ControlLogix 1756-PA75/PB75
    - b. Or Equal
  8. Failed redundant power supplies must be removable without disconnecting power from any part of the system or affecting control and operation.
  9. Provide uninterruptible power supply (UPS) to sustain full power to UPS powered loads for a minimum of 30 minutes. Provide UPS per Section 40 90 09.

F. PLC System Enclosure

1. In accordance with Specification Section 40 90 05.
2. Component placement:
  - a. Mount all controller components vertically within the enclosure to allow maximum convection cooling.

- b. Either install power supplies above all other equipment with at least 10 IN of clearance between the power supply and the enclosure top, or adjacent to other components, but with sufficient spacing for circulation of cooling air.
  - c. Do not place I/O racks directly above the CPU or power supply.
  - d. Locate incoming line devices (isolation or constant voltage transformers, local power disconnects, surge suppressors, etc.) so as to keep power wire runs within an enclosure as short as possible.
  - e. If items such as magnetic starters, contactors, relays, and other electromagnetic devices must be located within the same enclosure as the PLC system components, place a barrier with at least 6 IN of separation between the magnetic area and the control area.
  - f. Place circulating fans close to major heat generating devices.
  - g. Segregate input/output modules into groups of identical type.
3. Wiring and grounding to be in accordance with Specification Section 40 90 05.
4. Termination requirements:
- a. In accordance with Specification Section 40 90 05.
  - b. Make connections to I/O subsystem by terminating all field wiring on terminal blocks within the enclosure.
  - c. Prewire I/O modules to terminal blocks.
  - d. Size terminals to accommodate all active database points and spares.
  - e. Provide terminals for individual termination of each signal shield.
  - f. Field wiring shall not be disturbed when removing or replacing an I/O module.

G. PLC System Software and Programming

1. Provide all hardware and programming required to provide communication between the PLC and the man-machine interface.
2. Provide programming to accomplish all control and monitoring requirements of the Drawings and Specifications.
3. Provide two (2) copies of control logic program on USB drive.
4. Microsoft Windows 10 latest service pack compatible software.
5. Full documentation capability.
  - a. Provide description for each rung.
6. On/off line programming.
7. Offline simulation prior to download.
8. Program over network capability.
9. Two-step commands requiring operator verification prior to deletion of any programming.
10. All PLCs including vendor supplied PLCs shall be programmed using the Rockwell Automation Studio 5000 Logix Designer programming software, or equal. The Systems Integrator shall be responsible for procuring or having in their possession a licensed copy of the software. The Owner shall not pay towards the licensing of the software. Respective vendors shall be responsible for procuring or having in their possession a licensed copy of the software for programming of vendor furnished PLCs. The Owner shall not pay towards the licensing of the software.

#### 2.04 ACCESSORIES

- A. Provide all accessories required to furnish a complete PLC control system to accomplish the requirements of the Drawings and Specifications.

#### 2.05 FACTORY ACCEPTANCE TEST (FAT)

- A. Refer to the requirements of Section 40 90 10 for Factory Acceptance Testing (FAT) and Section 40 90 12 for Start-Up and Commissioning.
- B. PCS shall not ship to site prior to successful completion of the FAT and subsequent approval from the Owner and Engineer.

#### 2.06 MAINTENANCE MATERIALS

- A. Furnish Owner with the following spares:



1. One spare processor, with PLC program already configured and installed that can be used as a plug-and-play replacement in the event of a PLC processor failure.
2. One (1) spare I/O card of each card type for every 10 cards or fraction thereof installed.
3. One power supply assembly of each size utilized.
4. One communication module of each type utilized.
5. One dozen fuses of each size furnished.
6. One dozen relays of each type utilized.
7. A list of all the recommended spares for maintenance purposes with each item separately priced.
  - a. The list shall include all the special tools and test equipment necessary for the maintenance of the complete system.

## 2.07 FACTORY TRAINING

- A. Training shall be in accordance with Section 40 90 13 - Training.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install PLC control system in accordance with manufacturer's written instructions.
- B. Inputs and Outputs Isolation
  1. Unless otherwise required, design PLC discrete inputs to monitor dry contact closures, sourced from the PLC enclosure.
  2. Design PLC discrete outputs to energize terminal block style interposing relays as specified in Section 40 95 13 - Process Control System Panel Enclosures and Equipment.
- C. Provide all communication cables necessary for complete working systems. Provide surge protection on all communication ports as necessary.
- D. Interface with Other Products: Provide all special interface modules necessary for complete working systems. These shall include all necessary cables and connectors as required.
- E. Testing: Test all control functions as described in Division 01, Section 40 90 12 - Startup and Commissioning, Section 40 90 08 – Control Strategies, and Section 40 90 10 - Factory Acceptance Testing.

### 3.02 FIELD QUALITY CONTROL

- A. Employ and pay for services of equipment manufacturer's field service representative(s) to:
  - 1. Inspect equipment covered by these Specifications.
  - 2. Supervise adjustments and installation checks.
  - 3. Maintain and submit an accurate daily or weekly log of all commissioning functions.
    - a. All commissioning functions may be witnessed by the Engineer.
    - b. All reports shall be cosigned by the Seller, and the Engineer if witnessed.
  - 4. Conduct startup of equipment and perform operational checks.
  - 5. Provide Owner with a written statement that manufacturer's equipment has been installed properly, started up, and is ready for operation by Owner's personnel.

### 3.03 DEMONSTRATION

- A. On-Site Training
  - 1. Refer to Specification Sections 40 90 13 - Training for requirements and duration of on-site operator training. Training shall only commence after the system has successfully undergone all field testing and acceptance procedures.

END OF SECTION

SECTION 40 90 03

OPERATOR INTERFACE TERMINALS, OPERATOR WORKSTATIONS AND  
PROGRAMMING WORKSTATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Operator interface terminals and workstation requirements, which include, but are not necessarily limited to:
  - a. LED-backlit LCD Flat Panel Type Monitors.
  - b. Operator Workstations.
  - c. Engineering Workstations.
  - d. Panel Mounted OITs (Operator Interface Terminals) for Plant PLCs and Large Packaged Control Systems.
  - e. Panel Mounted OITs (Operator Interface Terminals) for Small Non-Complex Packaged Systems.
  - f. Panel Mounted Industrial Computers
  - g. Software.
  - h. Accessories and Maintenance Materials.

B. Related Specification Sections include, but are not necessarily limited to:

1. Division 00 - Procurement and Contracting Requirements.
2. Division 01 - General Requirements.
3. Section 40 90 00 - Instrumentation and Control: General Requirements
4. Section 40 90 02 - Programmable Logic Controllers: Hardware and Software
5. Section 40 90 05 - Control Panels and Enclosures
6. Section 40 90 07 - Input/Output Lists

7. Section 40 90 08 - Control Strategies
8. Section 40 90 11 - Process Control System Network Hardware and Software

## 1.02 QUALITY ASSURANCE

### A. Referenced Standards

1. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
  - a. 802.3, Information Technology - Local and Metropolitan Area Networks - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications.
    - 1) 802.3u: IEEE Standards for Local and Metropolitan Area Networks: Supplement to Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications Media Access Control (MAC) Parameters, Physical Layer, Medium Attachment Units, and Repeater for 100 Mb/s Operation, Type 100BASE-T.
    - 2) 802.3x: IEEE Standards for Local and Metropolitan Area Networks: Specification for 802.3 Full Duplex Operation.

- B. Comply with the requirements of Section 40 90 00 – Instrumentation for Process Control - Basic Requirements

## 1.03 DEFINITIONS

- A. HMI: Human Machine Interface.
- B. LED-backlit LCD: Light Emitting Diode backlit Liquid Crystal Display.
- C. OIT: Operator Interface Terminal.
- D. OPC: “OLE for Process Control”, a software standard utilizing a client/server model that makes interoperability possible between automation/control applications and field systems/devices.
- E. PC: Personal Computer.
- F. RAID: Redundant Array of Independent Disks, a method of storing the same data in different places on multiple hard disks.
- G. RAM: Random Access Memory.
- H. SDRAM: Synchronous Dynamic RAM.

I. SNMP: Simple Network Management Protocol, a set of protocols for managing complex networks.

1.04 SUBMITTALS

A. Shop Drawings

1. The Seller shall comply with the requirements specified in Specification Section 01 33 00 - Submittals for requirements for the mechanics and administration of the submittal process.
2. The Seller shall comply with the requirements specified in Specification Section 40 90 00 – Instrumentation and Control system General Requirements.
3. Product technical data including:
  - a. Acknowledgement that products submitted meet requirements of standards referenced.
  - b. Manufacturer's installation instructions.
4. Fabrication and/or layout drawings with dimensions, layout and bill of materials.
5. Certifications.
6. Test reports.

B. Contract Closeout Information

1. Operation and Maintenance Data:
  - a. See Specification Section 01 78 23 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
2. Record Documents
  - a. Provide Record Documents in accordance with Section 01 78 18 – Contract Closeout and Section 40 90 00 – Instrumentation and Control System General Requirements.

PART 2 - PRODUCTS

2.01 LED-BACKLIT LCD FLAT PANEL TYPE MONITORS

A. Provide LED-backlit LCD Flat Panel Type Monitors as shown on the Drawings and the Schedule herein.

B. Design Requirements:

1. Type of display: Color TFT active matrix LCD.
2. Size
  - a. 30 IN
3. Native Resolution:
  - a. 3840 x 2160
4. Aspect ratio: 16:9 (widescreen)
5. Image brightness: Minimum 300 cd/m2.
6. Backlight technology: LED
7. Display image contrast ratio: 800:1 or higher.
8. Maximum sync rate (vertical scan rate x horizontal scan rate): At least 75 Hz x 80 KHz.
9. Viewing angle: 180 degrees both vertical and horizontal.
10. Adjustable tilt, pivot, height and swivel features.
11. Anti-glare flat screen.
12. Output ports: 1 X Audio line-out and 1 X audio headphone port
13. Connectivity: DVI video connection,3 HDMI connector(s) and 2 DP 1.2 connector
14. Power input: 120 Vac.
15. Speakers: integral display mounted soundbar.

C. Schedule

EQUIPMENT NO	DESCRIPTION	SIZE (IN)	REMARKS
OX-OWS Monitor	Remote Monitoring Station	30	Located in Main Control Room – Oxygen Production Facility
VPSA-OWS Monitor	Control Room in Electrical Building	30	One OWS monitor for each VPSA unit

## 2.02 OPERATOR WORKSTATIONS

- A. Provide Operator Workstations as shown on the Schedule herein.
- B. Design Requirements:
  - 1. Processor: Latest Intel® CPU
  - 2. RAM: At least 16 GB.
  - 3. Operating System: Latest version of Microsoft Windows supported by HMI Software and owner at time of procurement.
  - 4. Communication ports as listed below:
    - a. All communication ports as required by functional requirements of Contract Documents.
    - b. Minimum eight (8) USB 3.0, two (2) USB 2.0, one (1) RJ45 (NIC), 1 audio line-in, 1 audio line-out.
    - c. Ethernet 10/100/1000 MB/s.
  - 5. Power input: 120 Vac.
  - 6. Case style: Tower.
  - 7. Case color: Black.
  - 8. Keyboards:
    - a. Incorporate Standard QWERTY design with numeric keypad and assigned function keys.
    - b. Sculptured keys.
    - c. Tactile feedback.
  - 9. Mouse: High performance mouse with laser sensor and tilt wheel.

C. Schedule

EQUIPMENT NO	DESCRIPTION	REMARKS
OX-OWS	Remote Monitoring Station	Located in Main Control Room – Oxygen Production Facility
VPSA-OWS	Control Room in Electrical Building	One OWS for each VPSA unit

2.03 PANEL MOUNTED INDUSTRIAL COMPUTERS

A. Acceptable Manufacturers

1. Allen-Bradley 6180: PanelView Plus.
2. Or Equal

B. Provide Panel Mounted Industrial Computers as shown on the Drawings and the Schedule herein.

C. Design and Fabrication:

1. Integrated display computer with solid-state drive.
2. Minimum processing speed: 2.0 GHz.
3. Storage drive: Minimum 80 GB.
4. Operating System: Microsoft Windows 10 Pro.
5. Display: Color graphics.
6. Touch screen.
7. Power Input: 120 VAC.
8. Provide password protection to prevent unauthorized entries for a minimum of two (2) levels:
  - a. Authorization to operate.
  - b. Authorization to adjust setpoints.
9. Operating temperature: 32 DEGF to 131 DEGF.
10. Humidity: 10 to 90 PCT RH non-condensing.



D. Schedule:

EQUIPMENT NO.	LOCATION	SIZE (IN)	SUPPLIED BY
LOX-OIT	LOX Control Panel	15	11 55 20

2.04 SOFTWARE

- A. Provide all software and associated programming/configuration required to meet performance requirements of the Contract Documents.
1. At substantial completion of the Project:
    - a. Turn current licenses for all software over to the Owner in the Owner's name and install the latest version, upgrade or service pack for all software.
    - b. Provide the respective software supplier's Comprehensive Support Contract for all software covering a full one (1) year warranty period following substantial completion which shall provide no cost software upgrades, service packs and tech support from the software supplier.
- B. Provide each operator workstation and server with the latest edition of the following software:
1. Operating system: Microsoft Windows 10 Pro 64-bit operating system with latest service pack installed.
  2. Microsoft Office Professional 2021.
  3. GE Automation's Proficy iFix Control System software.
    - a. HMI based on ISA 18.2 Alarm Management Standard
    - b. Include advanced graphing functions.
  4. GE Proficy Historian for SCADA.
    - a. All data collected can be exported.
- C. All software must be latest edition and licensed to the Owner.

2.05 ACCESSORIES AND MAINTENANCE MATERIALS

- A. Provide all accessories required to furnish a complete computer-based network for the control system to accomplish the requirements of the Drawings and Specifications.

- B. Furnish Owner with the following extra materials:

Contract B355	40 90 03 - 7	Operator Interface Terminals,
PVSC Oxygen Production Facility		Operator Workstations and
Equipment Procurement		Programming Workstations
		09/08/2023

1. None.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION AND FIELD QUALITY CONTROL

- A. Provide installation and checkout in accordance with Specification Section 40 90 00 – Instrumentation for Process Control - Basic Requirements.

END OF SECTION

SECTION 40 90 04

PRIMARY SENSORS AND FIELD INSTRUMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. This section describes the requirements for furnishing, installing, and placing into operation field-mounted instrumentation:
  - 1. Flow Instruments
  - 2. Level Instruments
  - 3. Pressure Instruments
  - 4. Temperature Instruments
  - 5. Analytical Instruments
  - 6. Miscellaneous Instruments
  - 7. Pipe, tubing and fittings
  - 8. Instrument valves
  
- B. It is the Seller's responsibility to provide a complete functional system. Provide all instrument devices that are necessary for a complete system. This includes, but is not necessarily limited to, terminal blocks, fuses, signal conditioners, power supplies, transient and surge protection, special wires/cables and connectors, and any other electronics that may be necessary to properly interface with the instrumentation provided.
  
- C. It is the Seller's responsibility to verify the type, state, and condition of all existing signals required to interface to the Process Control System (PCS). Information concerning these signals given in these Contract Documents is provided for the Seller's reference and is deemed reliable but is not guaranteed to be accurate or true. Acceptance by the Seller without field verification of the information contained herein regarding existing instrumentation and associated signals is done at the Seller's risk.
  
- D. Related Specification Sections include but are not necessarily limited to:
  - 1. Division 00 - Procurement and Contracting Requirements.
  - 2. Division 01 - General Requirements.
  - 3. Section 11 55 10 - Vacuum Swing Adsorption Oxygen Generation System
  - 4. Section 11 55 20 - Liquid Oxygen Storage and Vaporization System
  - 5. Section 40 90 00 - Instrumentation and Control General Requirements
  - 6. Section 40 90 08 - Control Strategies.
  - 7. Section 40 90 13 - Training

## 1.02 QUALITY ASSURANCE

### A. Referenced Standards

1. American Gas Association (AGA):
  - a. Gas Measurement Committee Report #3.
2. American Iron and Steel Institute (AISI).
3. American National Standards Institute (ANSI).
4. American Society of Mechanical Engineers (ASME):
  - a. B16.5, Pipe Flanges and Flanged Fittings.
  - b. B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
  - c. B31.1, Power Piping.
  - d. PTC 19.3, Instruments and Apparatus, Part 3 Temperature Measurement.
  - e. PTC 19.5, Application of Fluid Meters, Part 2.
  - f. Section II, Part A SA-182, Forged or Rolled Alloy Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
  - g. Section II, Part A SA-479, Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels.
5. ASTM International (ASTM):
  - a. A106, Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service.
  - b. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
  - c. A182, Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
  - d. A234, Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
  - e. A240, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

- f. A269, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
  - g. A276, Standard Specification for Stainless Steel Bars and Shapes.
  - h. A479, Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels.
  - i. B32, Standard Specification for Solder Metal.
  - j. B75, Standard Specification for Seamless Copper Tube.
  - k. B88, Standard Specification for Seamless Copper Water Tube.
  - l. B626, Standard Specification for Welded Nickel and Nickel-Cobalt Alloy Tube.
- 6. Canadian Standards Association (CSA).
  - 7. Federal Communications Commission (FCC)
    - a. 47 CFR 15, Radio Frequency Devices.
  - 8. FM Global (FM).
  - 9. The International Society of Automation (ISA):
    - a. MC96.1, Temperature Measurement Thermocouples.
  - 10. National Electrical Manufacturers Association (NEMA):
    - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
  - 11. US Department of Interior Bureau of Reclamation (USDIBR):
    - a. Water Measurement Manual.
  - 12. Compressed Gas Association (CGA)
    - a. CGA publication G-4.1 Cleaning of Equipment for Oxygen Service

### 1.03 SYSTEM DESCRIPTION

- A. The instruments specified in this Specification Section are the primary element components for the control requirements specified in Specification Section 11 55 10 - Vacuum Swing Adsorption Oxygen Generation System, 11 55 20 - Liquid Oxygen Storage and Vaporization System, 40 90 08 - Control Strategies and related Sections.

1. These instruments are integrated with other control system components specified under Specification Section 40 90 00 – Instrumentation for Process Control - Basic Requirements series to produce the functional control defined in the Contract Documents.

#### 1.04 SUBMITTALS

##### A. Shop Drawings

1. See Specification Section 01 33 00 - Submittals for requirements for the mechanics and administration of the submittal process.
2. See Specification Section 40 90 00 - Instrumentation for Process Control - Basic Requirements.

##### B. Include the following for each model instrument provided under Division 40:

1. Manufacturer's design and performance specification data and descriptive literature.
2. Equipment dimensioning and installation requirements and recommendations.
3. Required and optional accessories lists.
4. Electrical/pneumatic signal and power connection diagrams.
5. Operations and maintenance manuals for each type of instrument after product approval.
6. Calibration certifications from the manufacturer for each calibrated instrument.

##### C. For each instrument specified in the sections which follow, include the following information in the submittal for that section:

1. Tag number and description.
2. Complete model number.
3. Data sheets and catalog literature edited to indicate specific items provided.
4. Mounting details for all typical installation requirements and special details for non-typical applications.
5. Methods and materials required for installation. Include power and signal connection details.
6. List of recommended spare parts and spare parts provided.
7. List of optional accessories.

- D. Instrument Data Sheets: For each instrument, provide an instrument data sheet in accordance with ISA20, Instrument Specifications Forms.
- E. Contract Closeout Information:
  - 1. Operation and Maintenance Data:
    - a. See Specification Section 01 78 23 - Operation and Maintenance Manuals for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
  - 2. Record Documents
    - a. Provide Record Documents in accordance with Section 01 78 18 - Contract Closeout and Section 40 90 00 - Instrumentation for Process Control – Basic Requirements.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Each manufacturer or supplier to provide and securely attach the tag number and instructions for proper field handling and installation to each instrument prior to packaging.
- B. Each manufacturer or supplier shall package instrumentation to provide protection against shipping damage, dust, moisture, and atmospheric contaminants. Include a shipping label which contains the following information:
  - 1. Tag number and description.
  - 2. Instructions for unloading, transporting, storing, and handling at the site.
- C. Seller to provide for unloading, transporting, storing, and handling instrumentation at the site. Inspect instrumentation for damage during shipment and return damaged instrumentation to the manufacturer.
- D. Do not store instrumentation out-of-doors. Provide dry, permanent storage facilities.

#### 1.06 WARRANTY

- A. Warranty the instrumentation, materials, workmanship and installation to be free from defects for a period of one year from the date of Final Acceptance of the Work. Extend standard manufacturer's warranties as necessary to ensure coverage. Document warranty coverage immediately prior to Final Acceptance.
- B. Furnish and install replacement parts during the warranty period for any defective component at no additional cost. Replace spare parts consumed during the warranty period with new equipment at no additional cost, immediately after use, to restore the spare parts inventory. A complete contingent of unused spare parts shall exist one year after Final Acceptance.

## 1.07 MAINTENANCE

- A. Provide spare parts as specified.
- B. Provide special tools necessary for normal operation, maintenance and calibration.
- C. Package spare parts in a manner suitable for long term storage and adequately protected against corrosion, humidity and temperature.

## 1.08 SPARE PARTS

- A. Provide the following spare parts:
  - 1. One (1) spare instrument of each type and range.

## PART 2 - PRODUCTS

### 2.01 GENERAL

- A. Provide instruments which operate on 115 VAC +/-10 percent, 60 Hz power and which return automatically and immediately to accurate measurement upon restoration of power after a power failure, except where specifically noted.
- B. Provide open and short circuit protection except for two-wire transmitters.
- C. Provide and install two-wire transmitter power supplies in local panels or enclosures with receiver/indicator/transmitter as required.
- D. Provide instrument transmitters which produce isolated 4-20 mA<sub>dc</sub> analog signals. Follow ISAS50.1. Process transmitters shall be smart electronic type devices capable of driving a load of at least 1000 ohms with non-interacting zero and span adjustments and remote recalibration features.
- E. Each transmitter shall be supplied with an integral junction box with terminal strip, integral test jacks, and conduit connection, and shall be complete with all mounting accessories.
- F. Provide signal isolators as necessary to resolve interface problems between field instruments, final control elements, panel instruments, and PCS components. Signal isolation may require the inclusion of one or more isolated signal converters for analog circuits and one or more interposing relays for discrete circuits.
- G. For each field mounted instrument (transmitter, analyzer, gauge, etc.) requiring 120 VAC, provide an individual non-fused disconnect switch with auxiliary contact (switch position indication) to allow for remote monitoring and indication functionality. Provide Pass & Seymour PS30SSAX, Square D Class 2510-TypeKW1, or equal. Provide disconnect switch cover, Crouse Hinds Model DS185 or equal.



- H. For instruments that produce a pulse signal, use dc pulse frequency signals whose repetition rate is directly proportional to the process variable over a 10:1 range. Use 24 VDC power source.
- I. Provide instruments with printed circuit boards suitably coated to prevent damage by dust, moisture, fungus, and airborne contaminants. All spare boards are to be conformal coated.
- J. Provide instruments complete with mounting hardware, floor stands, wall brackets, or instrument racks. Provide all stainless steel mounting hardware for surface, panel or handrail mounting as required by location.
- K. Use linear, direct reading indicators unless otherwise specified. Local gauges shall have minimum 4-1/2 inch dials with white scales containing black division marks, and where practical, the divisions shall be based on multiples of 10.
- L. Provide instrument enclosures NEMA rated for the environment. In hazardous areas, meet the NEC Class, Group, and Division as shown or specified. In areas subject to flooding, provide submergence rated enclosures.
- M. Provide sun shields for all outdoor enclosures, indicators and transmitters with displays.
- N. For instruments in Oxygen service: Provide instruments that are both suitable and cleaned for Oxygen service.
  - 1. All instruments, as well as accessories and appurtenances such as valves, seals, and gaskets to be used with oxygen, shall be constructed of materials resistant to damage, corrosion or degrading by contact with oxygen.
  - 2. All instruments, as well as accessories and appurtenances such as valves, seals, and gaskets to be used with oxygen, shall be cleaned, sealed and protected in accordance with CGA publication G-4.1 and certified of oxygen service before shipment to the field.

## 2.02 FLOW INSTRUMENTS

- A. Differential Pressure Type Flow Element - Flow Orifice Plate System
  - 1. General:
    - a. Provide a flow conditioning orifice meter system from a single Supplier consisting of:
      - 1) Flow conditioning orifice plate installed in the process piping in between raised-face orifice flanges.
      - 2) Orifice Flanges
      - 3) Pressure differential transmitter that measures the pressure drop across the orifice plate.

- b. Orifice plates, flanges and pressure differential transmitters shall be proven in VPSA Oxygen Plant operation.
- c. Provide all applicable accessory fittings, valves, gaskets, sensing lines or any other accessory devices required for the proper operation of the flow conditioning orifice meter system.
- d. All components of the flow conditioning orifice meter system shall be supplied by a single manufacturer.
- e. The flow elements shall be designed such that they can be installed in process piping with a limited upstream and downstream straight run of piping.
- f. The flow elements shall be designed, constructed, fabricated, and tested in accordance with the requirements of the industry standards specified, as well as any additional requirements that may be specified herein.
- g. The flow elements shall have a minimum design life of 40 years at the specified conditions.
- h. Seller shall identify all components and parts that fail to meet the specified design life.
- i. The materials of the flow elements and their working parts shall not be deteriorated by the process fluid.

2. Orifice Plate System Submittals:

- a. Bill of Material (BOM) - The BOM shall contain at minimum, the following information: Manufacturer, Part Number, Material, Dimensions (diameter, length, width), and Quantity. Materials shall be fully identified by referencing the appropriate ASTM or ASME material, specification number, and grade (or class) in each case.
- b. Certified orifice plate and orifice flange drawings shall be supplied consisting of a composite outline layout of all equipment including accessories. These drawings shall show all basic dimensions, weld end dimensions, tolerances, required clearances for access, equipment removal and maintenance, including location and size of all connections, and material specifications. Total weight shall also be provided for the entire orifice plate and flange assembly.
- c. Installation drawings and instructions completely detailing the installation requirements of the flow element and flanges including, but not limited to: fittings, bolts, gaskets, and welds.
- d. Instrument Data Sheets
- e. Certified Material Test Reports (CMTR)

- f. Welding Procedures
- g. Hydrostatic Testing Procedures
- h. Flow Element Accuracy
- i. Flow Calculations: Instrument manufacturer shall submit flow calculations for each flow conditioning orifice meter system. These calculations shall include as a minimum:

Flow Calculations: Required Calculated Values		
Flow Element	Type Material Beta Ratio @ 68°F	Bore @ 68°F Accuracy Minimum Measurable Flow Rate
Pipe	Size Schedule	Inside Diameter @ 68°F
Base	Pressure at Standard Conditions	Temperature @ Standard Conditions
Local	Atmospheric Pressure	
Pressure	Flowing @ Upstream Tap Differential Maximum	Differential Normal Permanent Loss @ Maximum Flow
Temperature	Flowing	
Flow	Maximum Base Conditions Normal Base Conditions	Reynolds Number @ Normal Flow Reynolds Number @ Maximum Flow
Fluid Properties	Density @ Base Conditions Density @ Flow Conditions Viscosity @ Flowing Conditions	Compressibility @ Base Conditions Compressibility @ Flowing Conditions
Factor	Flow Coefficient Sizing Coefficient	Gas Expansion Factor Combined Thermal Expansion Factor

- 3. Materials:
  - a. Orifice plate: ASTM A240, Type 316, stainless steel.
  - b. Flange material, type and rating per piping specifications.

4. Design and fabrication:

a. Orifice Plate

- 1) Bore: Four-hole design that enables flow measurement in turbulent profiles.
- 2) Piping straight-run requirements: Flow conditioning orifice plates shall require only 2D upstream and 2D downstream straight run of piping to measure flow in accordance with rated accuracy (where D=internal pipe diameter).
- 3) Orifice plates shall be installed in a piping configuration such that there shall be two (2) pipe diameters (2D) of straight run upstream of the orifice and 2D of straight run downstream of the orifice. The orifice plate shall have an accuracy of 2% or better and a turndown ratio of 4:1 or better when installed in this piping configuration.
- 4) Maximum flow rate at maximum differential pressure shall be used to calculate the orifice bore.
- 5) The orifice plate shall be suitable for installation between raised face orifice flanges, also supplied by the manufacturer.
- 6) Minimum nominal plate thickness:

THICKNESS (IN)	PIPE SIZE (IN)
0.125	1 to 8
0.250	10 to 14
0.375	16 to 20

- 7) Plate thickness shall be adequate to prevent warping under specified process pressure and temperature conditions.
- 8) Upstream side of tab handle marked "inlet" and with bore size and flange type/rating.
- 9) Conformity: Finish 45 micro inch or better.
- 10) Bore tolerance in accordance with ASME PTC 19.5 and AGA Gas Measurement Committee Report #3.

b. Orifice Flanges

- 1) Orifice flanges shall be provided with the flow conditioning orifice flow element. Orifice flanges shall be designed and constructed in accordance with ASME B16.36, "Orifice Flanges".
- 2) A minimum flange rating of ANSI/ASME 300# is required.

- 3) Orifice flanges shall be of the raised face, weld neck type. End connections shall be of the butt weld type.
- 4) Orifice flange size shall be as indicated on the instrument data sheets.
- 5) Orifice flanges shall be constructed of Type 316 stainless steel.
- 6) For flow conditioning orifice meters with remote mounted transmitters, orifice flanges shall be supplied with dual sets of pressure taps. Pressure taps shall be oriented horizontally, 180° apart. Flange taps shall be ½ ” socket weld 3000# type.
- 7) Flanges shall be supplied complete with gaskets, nuts, bolts, and jacking screws.
- 8) Gasket material shall withstand the fluid and environmental conditions in the installed location. No gasket material containing Teflon shall be used.
- 9) Gaskets shall be ring type and constructed of inorganic (non-asbestos) compressed fiber.
- 10) Gaskets shall be 1/16” thick. Other gasket dimensions shall be in accordance with ASME B16.21.

5. Flow Transmitter (Pressure Differential Transmitter)

- a. Provide a flow transmitter with the flow condition orifice meter system. The flow transmitter shall calculate the flow rate through the conditioning orifice plate by measuring the pressure drop across the orifice plate.
- b. The pressure differential transmitter shall have the ability to output a 4-20 mA signal that can be configured to represent the pressure drop measured across the conditioning orifice plate (in inches of H<sub>2</sub>O) or the flow rate of the process fluid. The pressure differential transmitter shall calculate the flow rate by converting the pressure drop measured across the orifice plate to a flow rate. The output of the transmitter shall provide a 4-20ma signal to a PLC that represents the flow of process media through the orifice plate.
- c. Pressure Differential Transmitters shall meet the requirements of the PRESSURE AND DIFFERENTIAL PRESSURE TRANSMITTERS section as specified in this Specification.
- d. Pressure differential transmitter shall be supplied by the same manufacturer as the flow conditioning orifice plate.

## 2.03 FLOW INDICATORS

### A. Rotameters - General Performance:

#### 1. Materials:

- a. Tube/Body: Acrylic plastic.
- b. Float: Type 316 stainless steel.
- c. End fittings: Type 316 stainless steel.

#### 2. Design and fabrication:

- a. Direct reading scale.
- b. Clean-out plugs.
- c. Accuracy:  $\pm 4$  PCT.
- d. Range: To be specified by Supplier, range shall be selected such that normal operating flow rate is at 1/3 to 2/3 of maximum expected flow range.

## 2.04 LEVEL INSTRUMENTS

### A. Differential Pressure (Level) Transmitter

#### 1. Specifications:

##### a. General:

- 1) Measurement Principle: Differential-pressure (hydrostatic) based on the height of the liquid head.
  - a) Open (to atmosphere) or Closed Tanks.
  - b) Uses a process isolating diaphragm.
- 2) Minimum/Maximum Span:  $\pm 0.15$  to 300 PSIG.
- 3) Accuracy:  $\pm 0.075$  PCT of span.

##### b. Process Connection:

- 1) Isolation Diaphragm: 2 IN.
- 2) Flange Rating: Class 150.

##### c. Display and Configuration:

- 1) Integral Display for live measurement and configuration.
- 2) Adjustable zero and span.
- 3) Damping: Adjustable from 0 to 32 seconds.
- 4) Output variables: Level; optional: Volume, Mass.
- 5) Output Units: psi, feet, inches, meters, or millimeters (mm).

- d. Electrical:
  - 1) Signal Power: Loop-powered, 2-wire, 24 VDC.
  - 2) Current Output: Analog 4-20 Ma into a 400 ohm loop.
  - 3) Optional Communication: HART.
  - 4) Configuration: With remote hand-held configurator.
  - 5) Cable entry: 1/2 IN NPT connection.
- e. Materials of Construction:
  - 1) Process flanges and adapters: 316SS].
  - 2) Vent/Drain valves: 316SS.
  - 3) Isolation Diaphragm: 316SS.
    - a) Fill Fluid: By Seller.
  - 4) Housing: Polyurethane-covered aluminum or cast aluminum.
- f. Environment:
  - 1) Ambient Temperature: -40 to 158 DEGF (-40 to 70 DEGC).
  - 2) Humidity: up to 99 PCT.
  - 3) Process Temperature: -4 to 185 DEGF (-20 to 85 DEGC); depends on fill fluid.
  - 4) Process Pressure: 0 to 35 PSIG.
  - 5) Protection: Refer to Area Classification Drawings.

## 2.05 LEVEL SWITCHES

### A. Float-Tilt Type Level Switch

- 1. Materials:
  - a. Float material: Polypropylene or Teflon coated type 316 stainless steel.
  - b. Cable jacket: PVC, neoprene.
  - c. Cable clamp: Polypropylene or 316 stainless steel.
- 2. Design and fabrication:
  - a. Mercury-free switch.
  - b. Provide switch complete with flexible electrical cables.
  - c. DPST contact rated at 1 amp at 120 VAC.

- d. Direct acting float switch:
  - 1) Switch actuates on rising level.
  - 2) Switch deactuates when liquid falls 1 IN below actuation level.
- e. Terminate cables in junction box.
- f. Process temperature: max. 120 DEGF.
- g. Install floats per drawing details.

B. Level Switch – Side Mount Insertion Type

- 1. Provide side-mount insertion type float switches suitable for use in liquid level applications.
- 2. The insertion float shall be side-wall mounted to the process piping or tank in the horizontal orientation, such that the float extends into the process. The insertion float switch shall actuate an output contact when the process liquid rises and displaces the float, pushing it upwards.
- 3. The output switch contact shall be actuated when the process liquid displaces the float that is inserted into the process. There shall be no mechanical linkage between the float level and output switch contacts. The float level and output switch contacts shall be linked via magnetic operation.
- 4. Insertion float level switches shall be sensitive to level changes of less than 1/2".
- 5. Wetted Materials: All wetted materials shall be compatible with the process fluid.
- 6. Float
  - a. Float shall be constructed of solid polypropylene or stainless steel, whichever is compatible with the process media and provides the longest service life with the process media.
  - b. Float specific gravity shall be selected such that float is displaced when liquid level rises to the level of the float.
- 7. Mounting Orientation: Horizontal
- 8. Markings: Switch body shall have an index error pointing down to indicate mounting orientation. Arrow shall be clearly etched on switch body on the portion of the instrument that is external and visible when the instrument is installed in the process piping or tank.
- 9. Enclosure Rating
  - a. Weatherproof and explosion-proof
  - b. Suitable for Class I Division 1 hazardous areas.



10. Upper Body Construction: Type 303 Stainless steel
11. Lower Body Construction: Provide leak-proof lower body machined from bar stock, constructed of Type 303 Stainless steel
12. Switch Type: Double pole, double throw (DPDT) snap switch.
13. Temperature Limits: -4 to 200 degF
14. Pressure Limits: 2,000 psig
15. Contact Ratings: 5A @ 125/250 VAC
16. Process Connection: 1" male NPT
17. Electrical Connection: 3/4" NPT conduit connection, with minimum 18 AWG wire leads

## 2.06 LEVEL INDICATORS

### A. Level Gauge (Differential Pressure)

1. Specifications:
  - a. Gauge shall be of the bellows type, measuring level in an enclosed tank by measuring both gas phase and liquid phase pressures.
  - b. Gauge internals shall be Type 316 SS.
  - c. Gauge shall be ranged in depth units and calibrated for liquid oxygen.
  - d. Gauge seals shall be suitable for liquid oxygen.
  - e. Gauge shall be complete with 5-valve manifold.

## 2.07 PRESSURE INSTRUMENTS

### A. Pressure Transmitters (Gauge and Absolute)

1. Materials:
  - a. Process flanges and adapters: 316 stainless steel.
  - b. Vent/drain valve: 316 stainless steel.
  - c. Isolating diaphragm: 316 stainless steel.
  - d. Housing: Aluminum.

- e. Fill fluid:
    - 1) Utilize halocarbon fill for process applications involving strong oxidizing agents.
      - a) Agents include but are not limited to: Cl<sub>2</sub>, KMnO<sub>4</sub>, FeCl, NaOH, and NaOCl.
    - 2) Utilize manufacturer's standard fill for other applications.
      - a) Ensure fill is suitable for application temperatures.
2. Design and fabrication:
- a. Smart transmitters utilizing microprocessor based electronics.
  - b. Signal Output: 4-20 mA DC proportional to pressure.
  - c. Optional Communication: HART, Modbus RTU.
  - d. Nonvolatile EEPROM memory.
  - e. Power supply: 24 VDC Loop Power.
  - f. Adjustable zero and span.
  - g. Temperature limits:
    - 1) -20 to 180 DEGF (without digital display).
    - 2) -4 to 175 DEGF (with digital display).
  - h. Overpressure limits: Withstand 150 PCT of stated maximum service pressure without damage.
  - i. Humidity limits: 0 to 100 PCT relative humidity.
  - j. Damping: Adjustable between 0 and 60 seconds.
  - k. Accuracy (includes effects of linearity, repeatability and hysteresis): ±0.10 PCT of calibrated span for 15:1 rangeability.
  - l. Stability: ±0.2 PCT of upper range limit for 12 months.
  - m. Temperature effect:
    - 1) Total effect including span and zero errors: + 0.2 PCT of upper range limit per 100 DEGF for minimum 15:1 rangeability.
  - n. Minimum 1/2 IN pressure connection.
  - o. Equip with test jacks or accessible terminals for testing output.
  - p. Equip with Type 316 stainless steel two-valve manifold with Type 316 stainless steel valves for isolation and for vent/bleed.
  - q. Integral 4-digit display

## B. Differential Pressure Transmitters

### 1. Materials:

- a. Process flanges and adapters: 316 stainless steel.
- b. Vent/drain valve: 316 stainless steel.
- c. Isolating diaphragm: 316 stainless steel.
- d. Housing: Aluminum.
  
- e. Fill fluid:
  - 1) Utilize halocarbon fill for process applications involving strong oxidizing agents.
    - a) Agents include but are not limited to:  $\text{Cl}_2$ ,  $\text{KMnO}_4$ ,  $\text{FeCl}_3$ ,  $\text{NaOH}$ , and  $\text{NaOCl}$ .
  - 2) Utilize manufacturer's standard fill for other applications.
    - a) Ensure fill is suitable for application temperatures.

### 2. Design and fabrication:

- a. Smart transmitter utilizing microprocessor based electronics.
- b. Signal Output: 4-20 mA DC proportional to differential pressure.
- c. Optional Communication: HART, Modbus RTU.
- d. Nonvolatile EEPROM memory.
- e. Power supply: 24 VDC Loop Power.
- f. Adjustable zero and span.
- g. Temperature limits:
  - 1) -20 to 180 DEGF (without digital display).
  - 2) -4 to 175 DEGF (with digital display).
- h. Overpressure limits:
  - 1) Withstand body rated pressure on either side without damage or loss of calibration.
  - 2) Withstand 150 PCT of stated maximum service pressure without damage.
- i. Humidity limits: 0 to 100 PCT relative humidity.

- j. Damping: Adjustable between 0 and 60 seconds.
- k. Accuracy (includes effects of linearity, repeatability and hysteresis):  $\pm 0.10$  PCT of calibrated span for 15:1 rangeability.
- l. Stability:  $\pm 0.2$  PCT of upper range limit for 12 months.
- m. Temperature effect:
  - 1) Total effect including span and zero errors:  $\pm 0.2$  PCT of upper range limit per 100 DEGF for minimum 15:1 rangeability.
- n. Minimum 1/2 IN pressure connection.
- o. Equip with test jacks or accessible terminals for testing output.
  - 1) Equip with a Type 316 stainless steel five-valve manifold with Type 316 stainless steel valves: High Pressure connection
  - 2) Low pressure connection
  - 3) High pressure side vent/bleed
  - 4) Low pressure side vent/bleed
  - 5) Pressure equalization valve
- p. Provide with test connections with isolation valves and/or plugs.

## 2.08 PRESSURE SWITCHES

### A. Electro-Mechanical

- 1. Materials:
  - a. Wetted switch elements: 316 stainless steel.
  - b. Diaphragm seal housing: 316 stainless steel.
  - c. Pressure snubber:
    - 1) Filter disc: 316 stainless steel.
    - 2) Housing: 316 stainless steel.
- 2. Accessories:
  - a. Provide ball valve to isolate pressure switch from source.
  - b. Utilize pressure snubber with porous metal discs to provide pulsation dampening on pressure switch.

- c. On applications where a pressure switch and a pressure gauge are used at the same location, it is permissible to utilize one (1) pulsation dampener and diaphragm seal to isolate both elements from the process fluid.
3. Design and fabrication:
- a. Utilize “Snap Action” type contact switches.
  - b. No external power needed.
  - c. One (1) SPDT contact rated:
    - 1) 0.5 amps inductive at 125 VDC.
    - 2) 5 amps inductive at 120 VAC.
  - d. Switch set points:
    - 1) Above 1,000 PSI:
      - a) Between 30 and 35 PCT of switch rated working range.
      - b) Operating pressure range not to exceed 35 PCT of switch rated working pressure.
    - 2) Below 1,000 PSI:
      - a) Set points between 30 and 70 PCT of switch rated working range.
      - b) Operating pressure not to exceed 75 PCT of switch rated workingrange.
  - e. Accuracy:  $\pm 1$  PCT of full scale.
  - f. Process connection: Minimum of 1/4 IN.
  - g. Conduit connection: Minimum of 1/2 IN.

## 2.09 PRESSURE GAUGES

### A. Pressure Gauge – Mechanical

- 1. Materials:
  - a. Bourdon tube, socket, connecting tube: 316 stainless steel.
  - b. Case: Phenolic.
  - c. Pressure snubber:
    - 1) Filter disc: 316 stainless steel.
    - 2) Housing: 316 stainless steel.
- 2. Accessories:
  - a. Provide valve at point of connection to equipment and at panel if panel mounted.

- b. Utilize pressure snubber with porous metal discs to provide pulsation dampening on gauge applications.
  - c. Provide 1/2 IN stainless steel anti-siphon pigtail inlet connection for hot water and steam applications.
3. Design and fabrication:
- a. All components suitable for service at:
    - 1) 250 DEGF.
    - 2) The maximum process temperature to which the gauge is to be exposed.
  - b. Provide viewer protection from element rupture.
  - c. Calibrate gauges at jobsite for pressure and temperature in accordance with manufacturer's instructions.
  - d. Unless otherwise required by codes, provide stem mounted or flush mounted, as required, with dial diameter as follows:

PIPE SIZE	DIAL SIZE	GAUGE CONNECTION
1-1/2 IN or less	2-1/2 IN	1/4 IN
Larger than 1-1/2 IN	4-1/2 IN	1/2 IN

- e. Equip with white faces, black numerals and black pointers.
- f. Gauge tapping position to be clear of equipment functions and movements and protected from maintenance and operation of equipment.
  - 1) Gauge to be readable from an accessible standing position.
- g. Gauge accuracy: 1 PCT of full range.
- h. Select gauge range so that:
  - 1) The normal operating value is in the middle third of the dial.
  - 2) Maximum operating pressure does not exceed 75 PCT of the full scale range.

## 2.10 ISOLATION DEVICES

### A. Diaphragm Seal:

#### 1. Materials:

- a. Lower housing: 316 stainless steel.
- b. Diaphragm material: 316 stainless steel.

#### 2. Design and fabrication:

- a. Isolates instrument from process fluids which are corrosive or contain solids.
- b. Upper housing with bleed screw.
- c. Lower housing with flushing connection.
- d. Fill fluid:

- 1) Utilize halocarbon fill for process applications involving strong oxidizing agents.

- a) Agents include but are not limited to: Cl<sub>2</sub>, KMNO<sub>4</sub>, FeCl, NaOH, and NaOCl.

- 2) Utilize manufacturer's standard fill for other applications.

- a) Ensure fill is suitable for application temperatures.

#### e. Process connections:

- 1) Instrument: 1/2 IN NPT.
- 2) Process: 0.5 IN female NPT.
- 3) PVC pipe applications: Use a socket weld connection.

#### 3. Installed where specified or shown on Drawings.

## 2.11 TEMPERATURE INSTRUMENTS

### A. RTDs

#### 1. Materials:

- a. Sensor: Platinum.
- b. Sheath:

- 1) 900 DEGF maximum: Type 316 stainless steel.
- 2) 1200 DEGF maximum: Inconel.

#### c. Insulation: Ceramic or metallic oxide.

2. Design and fabrication:
  - a. 100 ohms at 0 DEGC.
  - b. Spring loaded.
  - c. Dual element.
  - d. Lead wire compensation: Three- or four-wire.
  - e. Accuracy: +0.5 DEGF or +0.5 PCT of measured temperature, whichever is greater.
  - f. Sheath: Type 316 Stainless Steel
  - g. Sheath diameter: 1/4 IN.
  - h. Insertion Length: Provide RTDs with sufficient insertion length (“U” dimension) to eliminate conduction error and optimize temperature element response time. RTDs insertion length shall be selected such that the immersion length of the RTD is 1/3 to 2/3 of the internal pipe diameter. The RTD length shall be coordinated with the length of the associated thermowell.

B. Thermowells

1. Materials:
  - a. Well: ASTM A182, F316 stainless steel.
  - b. Head: Cast iron.
2. Design and fabrication:
  - a. Constructed in accordance with ASME PTC 19.3, Part 3, Chapter 1, Paragraphs 8-19.
  - b. Lagging extension sufficient to provide wrench clearance above lagging.
  - c. Seal welded on applications where process pressure exceeds 450 PSI.
  - d. Test thermowells shall be supplied with watertight cap and chain.

C. Temperature Transmitters

1. Materials:
  - a. Housing: Aluminum.



2. Design and fabrication:
  - a. Smart transmitter utilizing microprocessor based electronics.
  - b. Input: RTD.
  - c. Transmitter inaccuracy shall be in accordance with the following:
    - 1) 100 ohm platinum RTD input: +/-0.25 DEGF +0.02 PCT of span or +/-0.2 DEGF +0.025 PCT of span or +/-0.09 DEGF +0.05 PCT of span, whichever is greater.
  - d. Stability:
    - 1) Any of the following drift limits are acceptable:
      - a) Greater of: 0.1 PCT of reading or 0.1 DEGC per 12 months.
      - b) 0.05 PCT of input reading plus 0.043 PCT of span per 12 months.
      - c) 0.05 PCT of maximum span per 12 months.
  - e. Ambient temperature effects (including digital, D/A conversion, and cold junction effects):
    - 1) Any of the following effects per 50 DEGF change are acceptable:
      - a) One-half reference inaccuracy plus 0.18 DEGF.
      - b) Effects in accordance with the following inputs:
        - (1) 100 platinum RTD input: +/-0.08 DEGC +0.025 PCT of (reading +200) +0.025 PCT of span +0.02 PCT of (reading - lower range value).
  - f. Ambient temperature limits:
    - 1) -40 to 185 DEGF.
    - 2) Integral LCD meter: -4 to 158 DEGF.
  - g. Output: 4-20 mA DC signal linearly proportional to temperature.
  - h. Power supply: 24 VDC loop powered.
  - i. Adjustable span.
  - j. Adjustable zero.

D. Temperature Switches

1. Design and fabrication:

- a. Contact rating:
  - 1) 1 amp inductive at 125 VDC.
  - 2) 5 amp inductive at 120 VAC.
- b. Switch accuracy: 1 PCT or better.
- c. Switch: Single or dual SPDT as required.
- d. Wetted Parts: Type 304 SS
- e. Enclosure: NEMA 4

## 2.12 ANALYTICAL INSTRUMENTS

### A. Oxygen Purity Analyzers

#### 1. General

- a. Provide oxygen purity analyzer, capable of reading oxygen purity in the supply pipeline / output gas of vacuum pressure swing adsorption (VPSA) oxygen production plants.
- b. Analyzer shall be of the paramagnetic type designed for hazardous area use.
- c. Provide a purge connection to allow inert gas to be supplied to the analyzer to prevent the build-up of any gases within the sample compartment.

#### 2. Performance

- a. Measurement Range: 0-100% O<sub>2</sub>
- b. Minimum recommended range: 0-0.5% O<sub>2</sub>
- c. Linearity Error: < 0.01% O<sub>2</sub>
- d. Repeatability Error: ±0.02% O<sub>2</sub>
- e. Accuracy: ±0.05% O<sub>2</sub>
- f. Response Time (T<sub>90</sub>): < 4 seconds at 250 ml/min and 1 l/min

#### 3. Display: LCD display with LED backlight

#### 4. Output

- a. Analog Output: 4-20 mA isolated
- b. Analog Output Range: User-configurable over the complete measurement range with a minimum range of 0-1%
- c. Alarms: Three (3) programmable range alarms, each with a corresponding SPDT dry contact

#### 5. Digital Communications

- a. Modbus RTU (RS-485)
- b. Ethernet (Modbus TCP)

6. Operating Environment:
  - a. Operating Temperature: +14 deg F to +122 deg F in sheltered location
  - b. Storage Temperature: -4 deg F to +158 deg F
  - c. Relative Humidity: 0-95%, non-condensing
  - d. Warm up time: < 2 hours (at 68 degF ambient temperature)
  - e. Maximum Altitude: 9,842 feet)
7. Enclosure: IP66 and NEMA 4X
8. Size: No larger than 18" wide, 12" high and 9" deep
9. Mounting: Wall mount
10. Flow Sensor
  - a. Provide an internal solid-state flow sensor fitted directly to the outlet of the O2 measurement transducer such that the flow rate through the O2 transducer is measured at all times.
  - b. Provide a minimum of one (1) high flow alarm setpoint and two (2) low flow alarm setpoints which can be configured to be active or inactive; and can be configured to indicate a fault or maintenance required status alarm via the instrument relay outputs or digital communications
11. Sample Conditioning
  - a. Sample conditioning shall be provided as required to deliver the gas sample to the analyzer such that analyzer measurements meet stated accuracy and performance specifications.
  - b. Sampling conditioning equipment shall be provided as a wall-mounted manifold, complete with all required tubing, valves, fittings, pressure reducers, heaters, instruments and any other required equipment to deliver the sample to the analyzer at the acceptable sampling conditions.
  - c. Coordinate with sampling system provided.
  - d. Supplier shall submit calculations, drawings and technical documentation demonstrating the sample will reach Oxygen Analyzer at acceptable conditions such that analyzer can meet stated accuracies and performance specifications.
12. Acceptable Sample Conditions
  - a. Particulate Size: < 3 $\mu$ m
  - b. Maximum Dew Point: +5°C (+9°F) below minimum ambient temperature of +14 deg F (with sample heater)
  - c. Flow Rates: 250 ml/min or 1 l/min

- d. Maximum Inlet Pressure: 0.3kPa (0.43psi) relative to sample vent pressure
- 13. Breather: Provide a, IP66 rated breather fitting that allows the pressure within the enclosure to be the same as the surrounding atmosphere.
- 14. Gas Connections
  - a. Sample Connection: 1/8" NPT male, 1/4" O.D. tubing or 6mm O.D. tubing
  - b. Purge Connections: 1/8" NPT female inlet and outlet
- 15. Power: 120 Vac
- 16. Electrical Connections: 3 x 1/2" NPT female and 2 x 3/4" NPT
- 17. Certifications and Approvals: Oxygen Purity Analyzer shall be suitable for use in Class I Division 1 Hazardous Areas.
- 18. Accessories
  - a. Provide one year's supply of zero and span calibration gases, and all hardware for calibration, including valves, tubing and pressure regulator.
  - b. Provide all mounting hardware required.
- 19. Spares Required
  - a. One (1) spare transmitter and control unit

## 2.13 MISCELLANEOUS INSTRUMENTS

### A. Vibration Transmitters

- 1. Manufacturer
  - a. Bently Nevada
  - b. Or Equal
- 2. Provide two-wire, loop powered vibration transmitters
- 3. Measuring range: 0 to 1 inch/sec
- 4. Signal output: 4-20mA
- 5. Number of measurement axes: 1
- 6. Measuring error: less than  $\pm 3\%$

7. Repeatability: less than 0.5%
8. Frequency Range: 10 to 1,000 Hz
9. Operating Voltage: 24 Vdc
10. Operating Temperature: -22 to 257 degF
11. Protection: IP68
12. Material of Construction: Type 316 stainless steel
13. Connection Type: As required by the application. Supplier shall specify and select connection type such that vibration transmitters can measure the vibration of the associated equipment and provide the intended protective functions to prevent damage and adverse impacts to the associate equipment from excessive vibration.

## 2.14 PIPE, TUBING, AND FITTINGS

### A. Instrument Tubing and Fittings

1. Material:
  - a. Tubing: ASTM A269, Grade TP 316 stainless steel.
  - b. Straight fittings: 316 stainless steel per ASME SA-479 or ASTM A276.
  - c. Shaped bodies: ASME SA-182 F316 stainless steel.
2. Design and fabrication:
  - a. Tubing:
    - 1) Seamless.
    - 2) Fully annealed.
    - 3) Maximum hardness: 80 Rb.
    - 4) Free from surface scratches and imperfections.
    - 5) Diameter: 1/2 IN OD unless specified otherwise.
    - 6) Wall thickness:
      - a) Meet requirements of ASME B31.1, Paragraph 122.3.
      - b) Minimum 0.049 IN for 1/2 IN OD tubing.
  - b. Fittings:
    - 1) Flareless.
    - 2) Compression type.

### B. Instrument Piping

1. For applications where the instrument is supported solely by the sensing line, (e.g., pressure gauge directly mounted to process line) utilize piping as specified below.
  - a. Diameter: 1/2 IN unless specified otherwise.
  - b. Schedule 80.
  - c. 316 stainless steel.

C. Pneumatic Signal Tubing

1. Material: Type 316 stainless steel.
2. Design and fabrication:
  - a. Free from surface scratches and imperfections.
  - b. Wall thickness:
    - 1) 0.030 IN for 1/4 IN OD.
    - 2) 0.035 IN for 3/8 IN OD.

D. Pneumatic Tube Fittings

1. Material: Type 316 stainless steel
2. Design and fabrication:
  - a. Flareless.
  - b. Compression type.

2.15 INSTRUMENT VALVES

A. Process instrument multi-valve manifolds, isolation, vent and blow-down valves:

1. Materials:
  - a. Packing:
    - 1) 450 DEGF and above: Graphite.
    - 2) Below 450 DEGF: Graphite or Teflon.
  - b. Body: 316 stainless steel per ASTM A479.
  - c. Stem: 316 stainless steel per ASTM A276.
  - d. Ball: 316 stainless steel per ASTM A276.
  - e. Support rings: 316 stainless steel per ASTM A276.
  - f. Seats:
    - 1) Metal:
      - a) 316 stainless steel per ASTM A276.
    - 2) Soft:

- a) Teflon, Delrin.
- b) Only utilized on applications where manufacturer's temperature and pressure ratings exceed process design conditions.

2. Design and fabrication:

- a. Either of the following:
  - 1) Ball valve with 1/4 turn activation.
  - 2) Free-swiveling ball stem.
- b. Provide body wall thickness sufficient for process design conditions per ASME B31.1.
- c. Temperature: Manufacturer's temperature rating for all components shall exceed process design conditions.

2.16 ACCESSORIES

A. Furnish all mounting brackets, hardware and appurtenances required for mounting primary elements and transmitters.

- 1. Materials, unless otherwise specified, shall be as follows:
  - a. Bolts, nuts, washers, expansion anchors: 316 stainless steel.
  - b. Mounting brackets:
    - 1) Standard: 316 stainless steel.
    - 2) Highly corrosive areas: Aluminum.
  - c. Mounting plates, angles:
    - 1) Standard: Carbon steel.
    - 2) Corrosive areas: 316 stainless steel.
  - d. Instrument pipe stands:
    - 1) Standard: Hot-dip galvanized 2 IN schedule 40, ASTM A106, Grade B carbon steel.
    - 2) Corrosive areas: 316 stainless steel.

B. Tubing Support Angles and Brackets

- 1. Any of the following materials are acceptable:
  - a. Aluminum support with dielectric material between support and tubing.
  - b. Type 316 stainless steel.
  - c. Fiberglass.

- C. Tubing Tray or Channel
  - 1. Aluminum.
  - 2. Provide dielectric material between tray or channel and tubing.
- D. Provide handheld communicator compatible with all intelligent transmitters furnished.
  - 1. Hand held communicator shall provide capability to check calibration, change transmitter range, and provide diagnostics.
  - 2. If these features are provided with the intelligent transmitter, the hand held communicator is not required.
- E. Cable lengths between sensors and transmitters shall be continuous (without splices) and as required to accommodate locations as shown on Drawings.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install instrument mounting pipe stands level and plumb.
- C. Instrument Valves
  - 1. Orient stems for proper operation.
  - 2. Install arrays orderly and neat in appearance with true horizontal and vertical lines.
  - 3. Provide a minimum of 2 IN clearance between valve handle turning radii where there are multiple valve handles appearing in a straight line.
  - 4. Valves shall have bonnets and any soft seals removed during welding or soldering into the line.
    - a. When cool, reassemble the valves.
  - 5. Support each valve individually.
    - a. The tubing system does not qualify as support for the valve.
- D. Locate instrument piping and tubing so as to be free of vibration and interference with other piping, conduit, or equipment.
- E. Keep foreign matter out of the system.



F. Remove all oil on piping and tubing with solvent before piping and tubing installation.

G. Plug all open ends and connections to keep out contaminants.

H. Tubing Installation

1. General:

- a. Install such that tube shows no sign of crumpling, bends of too short a radius, or flattening, etc.
- b. Make tube runs straight and parallel or perpendicular to the floor, equipment and piping runs.
- c. For liquid and steam applications, slope continuously from the process to the instrument with a minimum slope of 0.50 IN per foot.
- d. For gas and air applications, slope continuously from the instrument to the process with a minimum slope of 0.50 IN per foot.
- e. If the sensing line cannot be continuously sloped, install high point vents and low point drains.
- f. Keep instrument tubing clean during all phases of work.
- g. Blow out with clean, dry, oil-free air immediately before final assembly.
- h. Cut by sawing only and debur.

2. Bending:

- a. Make each bend with tube bender of the correct size for the tube.
- b. Make all bends smooth and continuous.
- c. Rebending is not permitted.
- d. Make bends true to angle and radius.
- e. Maintain a true circular cross section of tubing without buckling or undue stretch of tube wall.
- f. Allowable tolerance for flattening out of tubing bends: Maximum of 8 PCT of the OD for stainless steel tubing.
- g. Minimum bending radius for stainless steel tubing:

TUBE OD, INCHES	MINIMUM BENDING RADIUS, INCHES
-----------------	--------------------------------------

1/4	9/16
3/8	15/16
1/2	1-1/2

h. Minimum bending radius for type L, hard (drawn) copper:

TUBE OD, INCHES	MINIMUM BENDING RADIUS, INCHES
3/8	1-3/4
1/2	2-1/2

3. Tubing Support:

- a. Intermittently support by clamping to support angle.
- b. Install supports to be self-draining, supported by hangers, or cantilevered from walls or structural beams.
- c. Support at 5 FT-0 IN maximum spans for horizontal or vertical runs.
- d. Use tubing trays in areas where spans between supports are greater than 5 FT and for all signal tubing support.
- e. Support each tubing tray at 10 FT maximum spans.
- f. Align tubing in orderly rows and retain in the tray by bolted clips.
  - 1) The use of spring or speed clips is not acceptable.
- g. Maintain order of the tubing throughout the length of the tray.
- h. Locate angle, channel and tray installation to protect tubing from spills and mechanical damage.
- i. Locate support members to clear all piping, conduit, equipment, hatchways, monorails, and personnel access ways and allow access for equipment operation and maintenance.
- j. Support trays to prevent torsion, sway or sag.
- k. Permanently attach supports to building steel or other permanent structural members.
  - 1) Arrange supports and trays so that they do not become a trough or trap.

4. Routing and Orientation:

- a. Route to from the maintain a minimum headroom clearance of 8 FT.

b. Locate and orient valves and specialties so that they are accessible for operation and maintenance operating floor.

1) Do not route through or over equipment removal areas, below monorails or cranes nor above or below hatches.

5. Expansion and Vibration Provisions:

a. Provide horizontal expansion loops at the process connections.

b. Route tubing parallel to relative motion through sleeved supports that allow linear tube movement.

c. Cold springing of tubing to compensate for thermal expansion is prohibited.

d. Utilize flexible hoses to connect pneumatic tubing to air users which may move or vibrate.

I. Air Supply

1. Connect all instruments requiring air to air supply piping and tubing.

2. Provide connections as follows:

a. Terminate branch supply line not more than 36 IN from the device with a 1/2 IN isolation valve.

b. For remaining line, use 1/4 or 3/8 IN tubing of a length to allow for normal equipment movement and vibration.

c. Use flexible hoses to connect pneumatic tubing to air users which may experience significant movement or vibration.

d. Make branch connections to individual instruments from the top of the supply header.

e. Purge instrument air piping of extraneous material by blowing clean, dry, oil-free air through the system prior to final connection.

J. Threaded Connection Seals

1. Use Tite-Seal or acceptable alternate.

2. Use of lead base pipe dope or Teflon tape is not acceptable.

3. Do not apply Tite-Seal to tubing threads of compression fittings.

K. Capillary Tubing

1. Route capillary tubing in tubing tray.

2. Install capillary tubing with a 2 IN minimum bend radius which does not kink or pinch the capillaries.
3. Do not cut or disconnect at any point.
4. Coil excess capillary tubing and secure at the instrument.

L. Temperature Elements

1. Assemble in the following sequence:
  - a. Remove temperature sensor sheaths and terminal blocks from the head and nipple assembly.
  - b. Connect nipple and head to thermowell installed in the pipe.
  - c. Insert sheath and terminal block until it seats in the thermowell.
  - d. Connect to the head.

M. Instrument Mounting

1. Mount all instruments where they will be accessible from fixed ladders, platforms, or grade.
2. Mount all local indicating instruments with face forward toward the normal operating area, within reading distance, and in the line of sight.
3. Mount instruments level, plumb, and support rigidly.
4. Mount to provide:
  - a. Protection from heat, shock, and vibrations.
  - b. Accessibility for maintenance.
  - c. Freedom from interference with piping, conduit and equipment.
5. Attach a durable stainless steel tag using stainless steel wire or stainless steel drive screws to each primary element, transmitter, and field mounted readout device. Permanently engrave the tag with the instrument tag number and description. Include manufacturer's name and model number if not discernible on the instrument. Provide tags which are a minimum of 1"x 3" size, 1/16" thick, with characters 1/4" high (minimum).

3.02 FIELD QUALITY CONTROL

- A. Provide field quality control in accordance with Specification Section 40 90 00 - Instrumentation for Process Control - Basic Requirements.

3.03 TRAINING

- A. Provide on-site training in accordance with Specification Section 40 90 13 - Training.

3.04 SCHEDULES

- A. Seller shall develop the Instrument Schedule and submit for approval. The Instrument Schedule shall include all instruments shown, specified, and required for the complete PCS. Information and format of the Instrument List shall be as indicated on the attached form.
- B. Refer to Section 11 55 10 - Vacuum Swing Adsorption Oxygen Generation System and Section 11 55 20 - Liquid Oxygen Storage and Vaporization System for minimum required instrumentation.

END OF SECTION

NO TEXT ON THIS PAGE

## SECTION 40 90 05

### CONTROL PANELS AND ENCLOSURES

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. Section includes technical requirements for fabrication engineering, wiring and installation of Process Control panels and Enclosures. Special control panels such as outdoor kiosks or purged panels may have additional requirements which are not covered here.
- B. Related work specified in other sections includes but not limited to the following:
  - 1. Division 00 - Procurement and Contracting Requirements.
  - 2. Division 01 - General Requirements.
  - 3. Section 40 90 00 - Instrumentation and Control: General Requirements
  - 4. Section 40 90 02 - Programmable Logic Controllers: Hardware and Software
  - 5. Section 40 90 03 - Operator Interface Terminals, Operator Work Stations and Programming Work Stations
  - 6. Section 40 90 06 - Panel Instruments and Devices
  - 7. Section 40 90 07 - Input/Output Lists
  - 8. Section 40 90 08 - Control Strategies
  - 9. Section 40 90 09 - Uninterruptible Power Supplies (UPS)
  - 10. Section 40 90 11 - Process Control System Network Hardware and Software
  - 11. Section 40 96 52 - Configuration Requirements: HMI and Reports
  - 12. Section 40 99 00 - Surge Protection Devices for I&C Equipment

##### 1.02 SUBMITTALS

- A. Shop Drawings
  - 1. See Section 01 33 00 - Submittals for requirements for the mechanics and administration of the submittal process.
  - 2. See Section 40 90 00 - Instrumentation for Process Control - Basic Requirements.

3. Prepared with computer aided design (CAD) software AutoCAD 2023.
4. Printed on 11 by 17 IN sheets.
5. Drawings shall include a title block containing the following:
  - a. Plant or facility name where panel(s) are to be installed.
  - b. Drawing title.
  - c. Drawing number.
  - d. Revision list with revision number and date
  - e. Drawing date.
  - f. Drawing scale.
  - g. Manufacturer name, address, and telephone number.
6. Cover sheet for each drawing set shall indicate the following:
  - a. Plant or facility name.
  - b. Project name.
  - c. Submittal description.
  - d. Revision number.
  - e. Issue date.
7. Table of contents sheet(s) shall indicate the following for each drawing in the set:
  - a. Drawing number.
  - b. Drawing title.
  - c. Sheet number.
8. Legend and abbreviation sheet shall indicate the following:
  - a. Description of symbols and abbreviations used.
  - b. Panel construction notes including enclosure NEMA rating, finish type and color, wire type, wire color strategy, conductor sizes, and wire labeling strategy.
  - c. Confirmation that the panel(s) are to be affixed with a UL 508A or UL 698A label prior to shipment from the factory.
  - d. Confirmation that the panel(s) are to be affixed with panel markings in compliance with NEC Article 409.110.
9. Bill of Material for each panel shall include the following component information:
  - a. Instrument tag number.
  - b. Quantity.
  - c. Functional name or description.
  - d. Manufacturer.



- e. Complete model number.
  - f. Size or rating.
10. Panel exterior layout drawings to scale and shall indicate the following:
- a. Panel materials of construction, dimensions, and total assembled weight.
  - b. Panel access openings.
  - c. Door cut out dimensions.
  - d. Conduit entry zone dimensions.
  - e. Conduit access locations.
  - f. Front panel device layout.
  - g. Nameplate schedule:
    - 1) Nameplate location.
    - 2) Legend which indicates text, letter height and color, and background color.
    - 3) Short Circuit Current Rating (SCCR) marking per NFPA 70 or statement of exception. Include any required calculations.
  - h. Alarm annunciator window engraving schedule.
  - i. Layouts of graphic panels or mosaic displays.
11. Panel interior layout drawings shall be drawn to scale and shall indicate the following:
- a. Sub-panel or mounting pan dimensions.
  - b. Interior device layouts.
  - c. PLC/RTU general arrangement layouts.
  - d. Wire-way locations, purpose, and dimensions. Provide centerline dimensions for wireways and terminals.
  - e. Show dimensions for spacing between wireways and terminals and components.
  - f. Terminal strip designations.
  - g. Location of external wiring and/or piping connections.
  - h. Location of lighting fixtures, switches and receptacles.
12. Wiring diagrams shall consist of the following:
- a. Panel power distribution diagrams.
  - b. Control and instrumentation wiring diagrams.

- c. PLC/RTU I/O information:
    - 1) Model number of I/O module.
    - 2) Description of I/O module type and function.
    - 3) Rack and slot number.
    - 4) Terminal number on module.
    - 5) Point or channel number.
    - 6) Programmed point addresses.
    - 7) Signal function and type.
  - d. Wiring diagrams shall identify each wire as it is to be labeled.
  - e. Network connections diagram
13. Shop Drawing electronic files:
- a. Electronic files (pdf) for each Shop Drawing.
  - b. Electronic files shall be in dwg and pdf format.
  - c. Compatible with the latest version AutoCAD software.
  - d. Furnished on electronic media.
- B. Manufacturer catalog cut sheets for enclosure, finish, panel devices, control auxiliaries, and accessories.
- C. Wireway (Panduit) fill calculations.
- D. Electrical load calculations for each panel:
- 1. Total connected load.
  - 2. Peak electrical demand for each panel.
  - 3. UPS sizing calculations for each panel, showing duration of time for backup power.
- E. Climate control calculations for each panel.
- 1. Verify that sufficient dissipation and/or generation of heat is provided to maintain interior panel temperatures within the rated operating temperatures of panel components.
  - 2. Submit control panel heat load calculations showing total heat dissipation from all panel mounted components.
- F. Contract Closeout Information:
- 1. Operation and Maintenance Data:
    - a. See Section 01 78 23 - Operation and Maintenance Manuals for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.

2. See Section 40 90 00 - Instrumentation for Process Control - Basic Requirements.
3. List of spare parts.
4. All drawings shall bear an “as-built” label in the title block or as a block on the drawing.
5. The O&M manuals shall include all items submitted as part of the shop drawing submittals.

G. Informational Submittals

1. Record Documents:
  - a. Provide Record Documents in accordance with Section 01 78 18 – Contract Closeout and Section 40 90 00 – Instrumentation and Control System General Requirements.
  - b. Updated panel drawings delivered with the panel(s) from the 's factory.
    - 1) Drawings shall be enclosed in transparent plastic and firmly secured within each panel.

1.03 QUALITY ASSURANCE

A. Comply with the applicable provision of the following codes and standards:

1. American National Standards Institute (ANSI).
2. ASTM International (ASTM):
  - a. B75, Standard Specification for Seamless Copper Tube.
3. National Electrical Manufacturers Association (NEMA):
  - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
  - b. ICS 4, Industrial Control and Systems: Terminal Blocks.
4. National Fire Protection Association (NFPA):
  - a. 70, National Electrical Code (NEC):
    - 1) Article 409, Industrial Control Panels.
    - 2) Article 504, Intrinsically Safe Systems.
5. Underwriters Laboratories, Inc. (UL):
  - a. 508A, Standard for Safety Industrial Control Panels.

- b. 698A, Standard for Industrial Control Panels Relating to Hazardous (Classified) Locations.
    - c. 913, Standard for Safety Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations.
  - B. All electrical materials and equipment shall be new and bear the label of the Underwriters' Laboratory (UL), Inc., Factory Mutual (FM) or equivalent where standards have been established and label service regularly applies.
  - C. All Process Control System Panels furnished as part of Division 40, including PLC control panels, shall comply with the requirements of UL-508A or UL-698A and NEC 409, Industrial Control Panels unless otherwise noted. Panels furnished under Section 26 05 60, Electrical Requirements for Shop-Assembled Equipment shall meet the requirements of that section.
    - 1. Entire assembly shall be affixed with a UL 508A or UL 698A label "Listed Enclosed Industrial Control Panel" prior to shipment to the jobsite.
    - 2. Control panel(s) without an affixed UL 508A or UL 698A label shall be rejected and sent back to the Proposer's factory.
  - D. Provide integrated instrumentation and control systems. Proposer shall have complete responsibility for furnishing, coordination, assembly, and installation supervision of all equipment. Provide complete, satisfactory, and trouble-free operating installation.
  - E. Furnish like instruments from the same manufacturer. Minimize number of different manufacturers.
  - F. Furnish safety and regulatory labels required by NEC, NFPA, and UL.

#### 1.04 DEFINITIONS

- A. Panel: Control panels or enclosures listed in the schedule included in this Specification Section.
- B. Foreign Voltages: Voltages that may be present in circuits when the panel main power is disconnected.
- C. Intrinsically Safe:
  - 1. A device, instrument or component that will not produce sparks or thermal effects under normal or abnormal conditions that will ignite a specified gas mixture.
  - 2. Designed such that electrical and thermal energy limits inherently are at levels incapable of causing ignition.

- D. Intrinsicly Safe Circuit: A circuit in which any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under test conditions as prescribed in UL 913.
- E. Cable: Multi-conductor, insulated, with outer sheath containing either building wire or instrumentation wire.
- F. Instrumentation Cable
  - 1. Multiple conductor, insulated, twisted or untwisted, with outer sheath.
  - 2. Instrumentation cable is typically either TSP (twisted-shielded pair) or TST (twisted-shielded triad), and is used for the transmission of low current or low voltage signals.
- G. Ground Fault Circuit Interrupter (GFCI): A type of device (e.g., circuit breaker or receptacle) which detects an abnormal current flow to ground and opens the circuit preventing a hazardous situation.
- H. Programmable Logic Controller (PLC): A specialized industrial computer using programmed, custom instructions to provide automated monitoring and control functions by interfacing software control strategies to input/output devices.
- I. Remote Terminal Unit (RTU): An industrial data collection device designed for location at a remote site, that communicates data to a host system by using telemetry such as radio, dial-up telephone, cellular or leased lines.
- J. Input/Output (I/O): Hardware for the moving of control signals into and/or out of a PLC or RTU.
- K. Supervisory Control and Data Acquisition (SCADA): Used in process control applications, where programmable logic controllers (PLCs) perform control functions but are monitored and supervised by computer workstations.
- L. Highway Addressable Remote Transducer (HART): An open, master-slave protocol for bus addressable field instruments.
- M. Digital Signal Cable: Used for the transmission of digital communication signals between computers, PLCs, RTUs, etc.
- N. Uninterruptible Power Supply (UPS): A backup power unit that provides continuous power when the normal power supply is interrupted.
- O. Loop Calibrator: Portable testing and measurement tool capable of accurately generating and measuring 4-20ma DC analog signals.

## PART 2 - PRODUCTS

### 2.01 ACCESSORIES

#### A. Panel Nameplates and Schedules:

1. Provide panel nameplates as shown on the Contract Drawings and Control Panel Schedule in 40 90 05 A.
2. Attach nameplates on panels in a prominent place using 316SS screws or 2-part epoxy adhesive. Attachment shall maintain the required NEMA rating of the enclosure. Ensure that panel surface is clean and free of oil.
3. Lettering shall be 3/16" gothic extra condensed. Center justify all text to nameplate.

### 2.02 ENCLOSURES

#### A. General

1. Proposer to fabricate panels with component arrangements and dimensions identified in the Contract Documents.
2. Provide panel(s) with the required enclosure rating per NEMA 250 to meet classifications identified in the Contract Documents and Control Panel Schedule 40 90 05 A.
  - a. Control panels located outdoors or indoor in process areas, buildings and non-air conditioned spaces shall be 316 stainless steel NEMA 4X rated with 316 stainless steel backplanes unless stated otherwise.
  - b. Control panels located inside air-conditioned control room or electrical room areas shall be NEMA 12 rated painted steel with painted steel backplanes unless other rating is approved by the Owner and/or Engineer.
  - c. Control panels located in hazardous environments shall be suitable for use in NEC Class I Division 1 NEMA 7 rated and shall comply with UL standards.
3. Devices installed in panel openings shall have a NEMA enclosure rating at least equal to the panel enclosure rating.
  - a. Devices that cannot be obtained with an adequate NEMA rating shall be installed behind a transparent viewing window.
  - b. The window shall maintain the required NEMA rating of the enclosure.

4. Panel(s) shall be completely assembled at the Proposer's factory.
  - a. No fabrication other than correction of minor defects or minor transit damage shall be performed on panels at the jobsite.
5. Painting:
  - a. Panels fabricated from steel shall have their internal and external surfaces prepared, cleaned, primed, and painted.
    - 1) Mechanically abrade all surfaces to remove rust, scale, and surface imperfections.
    - 2) Provide final surface treatment with 120 grit abrasives or finer, followed by spot putty to fill all voids.
    - 3) Utilize solvent or chemical methods to clean panel surfaces.
    - 4) Apply surface conversion of zinc phosphate prior to painting to improve paint adhesion and to increase corrosion resistance.
    - 5) Electrostatically apply polyester urethane powder coating to all inside and outside surfaces.
    - 6) Bake powder coating at high temperatures to bond coating to enclosure surface.
      - a) Panel interior shall be white with semi-gloss finish.
      - b) Panel exterior shall be ANSI #61 gray with flat finish.
    - 7) Application of alkyd liquid enamel coating shall be allowed in lieu of polyester urethane powder for wall mounted NEMA 1 or NEMA 12 rated panels.
  - b. Panels fabricated from stainless steel, aluminum, or fiberglass shall not be painted.
6. Finish opening edges of panel cutouts to smooth and true surface conditions.
  - a. Panels fabricated from steel shall have the opening edges finished with the panel exterior paint.
7. Panels shall meet all requirements of UL 508A or UL 698A.
  - a. Panel components in accordance with UL 508A, Section 4.
  - b. Corrosion protected per UL 508A, Section 8.
  - c. Spacings per UL 508A, Section 10.
  - d. Grounding per UL 508A, Sections 14 through 17.

- e. Enclosure and openings per UL 508A, Sections 18 and 19.
- f. Accessibility of live parts per UL 508A, Section 20.
- g. Ventilation openings, if utilized, per UL 508A, Sections 21 and 22.
- h. Observation windows, if utilized, per UL 508A, Section 23.
- i. Enclosures made of insulation materials shall have bonding means to provide continuity of grounding between all conduit openings per UL 508A, Section 24.
- j. Wire bending space per UL 508A, Section 25.
- k. Enclosure environmental control devices per UL 508A, Section 26.
- l. Enclosure maintenance lighting per UL 508A, Section 27.
- m. Termination of field wiring per UL 508A, Sections 28 and 37.
- n. Internal wiring per UL 508A, Sections 29 and 38.
- o. Disconnect switches and circuit breakers per UL 508A, Sections 30 and 39.
- p. Branch circuit protection per UL 508A, Section 31.
- q. Overcurrent protection of feeder per UL 508A, Section 32.
- r. Control circuit overcurrent protection per UL 508A, Sections 40 through 42.
- s. Low-voltage limited energy circuits per UL 508A, Section 43.
- t. Class 2 circuits per UL 508A, Section 44.
- u. Switch devices per UL 508A, Section 45.
- v. Control circuit loads per UL 508A, Section 46.
- w. Miscellaneous control circuit devices per UL 508A, Section 47.
- x. Pneumatic switching devices, if utilized, per UL 508A, Section 48.
- y. Ratings of power supply, individual loads, and control circuit outputs per UL 508A, Sections 49 through 51.
- z. Markings per UL 508A, Sections 52 through 61.



- aa. If more than one (1) disconnect switch is required to disconnect all power within a panel or enclosure, provide a cautionary marking with the word "CAUTION" and the following or equivalent, "Risk of Electric Shock-More than one (1) disconnect switch required to de-energize the equipment before servicing."
  - bb. Enclosure construction pertaining to metal thickness, covers and doors, and corrosion protection, per UL 508A, Section 63.
8. Provide control panel in accordance with NFPA 70, Article 409.
- a. In the event of any conflict between NFPA 70, Article 409 and UL 508A or UL 698A, the more stringent requirement shall apply.
9. Provide equipment or control panels with Short Circuit Current Rating (SCCR) labeling as required by NFPA 70 and other applicable codes.
- a. Determine the SCCR rating by one of the following methods:
    - 1) Method 1: SCCR rating meets or exceeds the available fault current of the source equipment when indicated on the Drawings.
    - 2) Method 2: SCCR rating meets or exceeds the source equipment's Amp Interrupting Current (AIC) rating as indicated on the Drawings.
    - 3) Method 3: SCCR rating meets or exceeds the calculated available short circuit current at the control panel.
  - b. The source equipment is the switchboard, panelboard, motor control center or similar equipment where the control panel circuit originates.
  - c. For Method 3, provide calculations justifying the SCCR rating. Utilize source equipment available fault current or AIC rating as indicated on the Drawings.

B. Free-Standing Panels

- 1. Welded construction.
- 2. Completely enclosed, self-supporting, and gasketed, dust-tight.
- 3. Rolled lip around all sides of enclosure door opening.
- 4. Seams and corners welded and ground smooth to touch and smooth in visual appearance.
- 5. Arrange control panel faces continuous and flush with face of adjacent electrical motor control centers.

6. Provide filler panels where necessary to close gaps between panels or back of panel and wall.
7. Full height, fully gasketed flush pan doors.
8. Full length piano hinges rated for 1.5 times door plus instrument weight.
9. Doors with keyed alike locking handles and three-point catch.
10. Appropriate conduit, wiring, and instrument openings shall be provided.
11. Lifting eyebolts to allow simple, safe rigging and lifting of panel during installation.

C. Wall Mounted Panels

1. Seams continuously welded and ground smooth.
2. Rolled lip around all sides of enclosure door opening.
3. Gasketed dust tight.
4. Door clamps and hasp/staple for padlocking.
5. Key doors alike.
6. Continuous heavy GA hinge pin on doors.
  - a. Hinges rated for 1.5 times door plus instrument weight.
7. Front full opening door.
8. Brackets for wall mounting.

D. Environmental Controls

1. Indoor panels located in a designated electrical room or control room:
  - a. Thermostat controlled cooling fans with exhaust louvers if required to maintain temperature inside panel(s) below the maximum operating temperature rating of the internal components.
  - b. Internal corrosion inhibitors.
2. Indoor panels not located within a designated electrical room or control room:
  - a. Thermostat controlled heaters to maintain temperature approximately 10 DEGF above ambient for condensation prevention inside the panels.

- b. Automatically controlled, closed-loop heat exchangers or closed-loop air conditioners where required to maintain temperature inside each enclosure below the maximum operating temperature rating of the components inside the panel(s).
  - c. Internal corrosion inhibitors.
3. Outdoor panels:
- a. Outdoor temperature range of 0 DEGF through 120 DEGF.
  - b. Thermostat controlled heaters to maintain temperature approximately 10 DEGF above ambient dew point for condensation prevention inside the panels.
  - c. Outdoor temperature range of 0 DEGF through 120 DEGF.
  - d. Thermostat controlled closed-loop heat exchangers or closed-loop air conditioners if required to maintain temperature inside each enclosure below the maximum operating temperature rating of the components inside the panel.
  - e. Internal corrosion inhibitors.
4. Thermostat high and or low temperature points shall be hardwired to the associated PLC input for alarms at the PCS.
5. Environmental control components:
- a. Panel heaters:
    - 1) Thermostat controlled.
    - 2) Fan driven.
    - 3) Components mounted in an anodized aluminum housing.
    - 4) Designed for sub-panel mounting.
    - 5) Powered from 120 VAC and protected with a dedicated circuit breaker.
  - b. Cooling fans and exhaust packages:
    - 1) Cooling fan with louver or grill and replaceable filter.
    - 2) Designed to be mounted within a panel cutout to provide positive airflow through the panel.
    - 3) Cooling fan and exhaust louvers shall be designed and listed to maintain a NEMA 12 enclosure rating.
    - 4) Fitted with replaceable, high-density foam or synthetic fiber.

- 5) Cooling fan controlled with a separately mounted thermostat with bi-metal sensor and adjustable dial for temperature setting.
  - 6) Powered from 120 VAC and protected with a dedicated circuit breaker.
- c. Heat exchangers and air conditioners:
- 1) Dual-loop design to isolate panel interior air from exterior air.
  - 2) Thermostat controlled.
  - 3) Operate from 120 VAC and protected with a dedicated circuit breaker.
- d. Internal corrosion inhibitors:
- 1) Contains chemical which vaporizes and condenses on surfaces in the enclosure.
  - 2) Inhibitor shall be applied in accordance with manufacturer instructions for the enclosure volume.
  - 3) Inhibitor shall be applied in the panel(s) prior to shipment from the Proposer's factory.
- e. Environmental pressurization systems:
- 1) System shall operate on a supply of compressed instrument air or inert gas to regulate the pressure within the sealed panel or enclosure.
  - 2) System shall prevent the accumulation of damaging and caustic gases and dust.
  - 3) System shall maintain higher pressure inside the panel or enclosure which shall prevent entry of corrosive environments in the panel.
  - 4) System shall maintain a constant pressure of at least 0.5 inches of H<sub>2</sub>O or 1.25 mbar inside the panel or enclosure.
  - 5) Provide a complete environmental pressurization system including pressure regulator and/or vent.

## 2.03 WIRING

### A. Internal Panel Wiring

1. Panel wire duct shall be installed between each row of components, and adjacent to each terminal strip.
  - a. Route wiring within the panel in wire-duct neatly tied and bundled with tie wraps.
  - b. Wire-duct shall not be filled greater than 50% of the manufacturer's recommended fill limits.
  - c. Wire-duct shall have removable snap-on covers and perforated walls for easy wire entrance.
  - d. Wire-duct shall be constructed of nonmetallic materials with rating in excess of the maximum voltage carried therein.
2. Wiring shall be installed such that if wires are removed from one (1) device, source of power will not be disrupted to other devices.
3. Splicing and tapping of wires permitted only at terminal blocks.
4. Wire bunches to doors shall be secured at each end so that bending or twisting will be around longitudinal axis of wire.
  - a. Protect bend area with sleeve.
5. Arrange wiring neatly, cut to proper length, with surplus wire removed.
  - a. Arrange wiring with sufficient clearance.
  - b. Provide abrasion protection for wire bundles that pass through openings or across edges of sheet metal.
6. AC circuits shall be routed separate from analog signal cables and digital signal cables.
  - a. Separate by at least 6 IN, except at unavoidable crossover points and at device terminations.
7. Separation of intrinsically safe circuit conductors and non-intrinsically safe circuit conductors:
  - a. Secure conductors so that any intrinsically safe circuit conductor that might come loose from a terminal is unlikely to come into contact with another terminal.

- b. Separate non-intrinsically safe circuit conductors from intrinsically safe circuit conductors by one of the following methods:
  - 1) Separation of non-intrinsically safe circuit conductors from intrinsically safe circuit conductors by at least 6 inches or as required per UL 698A whichever is greater.
  - 2) Separation of non-intrinsically safe circuit conductors from intrinsically safe circuit conductors by use of a grounded metal partition 0.0359 IN (0.91 mm) or thicker.
  - 3) Separation of non-intrinsically safe circuit conductors from intrinsically safe circuit conductors by use of an approved insulating partition that extends to within 0.0625 IN (1.5 mm) of the enclosure walls.
  - 4) Where either (1) all of the intrinsically safe circuit conductors or (2) all of the non-intrinsically safe circuit conductors are in grounded metal-sheathed or metal-clad cables where the sheathing or cladding is capable of carrying fault current to ground.
- 8. Separate different intrinsically safe circuit conductors from each other by one of the following means:
  - a. The conductors of each circuit are within a grounded metal shield.
  - b. The conductors of each circuit have insulation with a minimum thickness of 0.01 IN (0.25 mm).
- 9. Provide minimum clearance of 0.125 IN (3 mm) between uninsulated parts of intrinsically safe field wiring conductors connected to terminals and grounded metal or other conducting parts.
- 10. Wiring to pilot devices or rotary switches shall be individually bundled and installed with a "flexible loop" of sufficient length to permit the component to be removed from panel for maintenance without removing terminations.
- 11. Conductors for AC and DC circuits shall be type MTW stranded copper listed for operation with 600 V at 90 DEGC.
  - a. Conductor size shall be as required for load and 16 AWG minimum.
  - b. Internal panel wiring color code:
    - 1) AC circuits:
      - a) Power wiring: Black.
      - b) Control interconnections: Red.
      - c) Neutral: White.
      - d) Ground: Green.

- 2) Low voltage DC circuits:
    - a) Power wiring: (+ 24 Vdc) Dark Blue, (0 V) White with Blue Stripe.
    - b) Control interconnections: Dark Blue.
  - 3) Foreign voltage circuits: Yellow.
  - 4) Annunciator circuits: Red.
  - 5) Intrinsically safe circuits: Light Blue.
12. Analog signal cables shall be of 600 V insulation, stranded copper, twisted-shielded pairs.
- a. Conductor size: 18 AWG minimum.
  - b. Terminate shield drain conductors to ground only at one (1) end of the cable.
13. High precision 250 ohm resistors with 0.25 PCT accuracy shall be used where 4 - 20 mA DC analog signals are converted to 1 - 5 VDC signals.
- a. Resistors located at terminal strips.
  - b. Resistors terminated using individual terminal blocks and with no other conductors.
  - c. Resistor leads shall be un-insulated and of sufficient length to allow test or calibration equipment (e.g., HART communicator, loop calibrator) to be properly attached to the circuit with clamped test leads.
14. Analog signals for devices in separate enclosures shall not be wired in series.
- a. Loop isolators shall be used where analog signals are transmitted between control enclosures.
15. Wire and cable identification:
- a. Wire and cables numbered and tagged at each termination.
  - b. Wire tags:
    - 1) Slip-on, PVC wire sleeves with legible, machine-printed markings.
    - 2) Adhesive, snap-on, or adhesive type labels are not acceptable.
  - c. Markings as identified in the Shop Drawings.

16. It shall be the responsibility of the panel fabricator to provide appropriate protection against transients and surges for all field wiring, interfacing with the control panels. This protection equipment shall reside in the appropriate control panel. Lightning and surge devices shall protect the system from induced surges in analog, discrete and control circuitry and power supply lines. The protective devices shall not interfere with the normal operation of the panel hardware and shall be designed not to have a maximum clamping voltage in excess of what the protected device is capable of withstanding. Protection devices for all internally mounted power supplies shall be installed on individual 120 VAC supply wiring. Each surge/lighting protector shall be independently grounded to the panel ground bus. Protector mounting rail shall not be used to ground the protector.
  - a. See Section 40 99 00 - Surge Protection Devices.

B. Grounding Requirements

1. Equipment grounding conductors shall be separated from incoming power conductors at the point of entry.
2. Minimize grounding conductor length within the enclosure by locating the ground reference point as close as practical to the incoming power point of entry.
3. Bond electrical racks, chassis and machine elements to a central ground bus.
  - a. Nonconductive materials, such as paint, shall be removed from the area where the equipment contacts the enclosure.
4. Bond the enclosure to the ground bus. It is imperative that good electrical connections are made between the ground bus and enclosure.
5. Panel-mounted devices shall be bonded to the panel enclosure or the panel grounding system by means of locknuts or pressure mounting methods.
6. Sub-panels and doors shall be bonded to ground.
7. Associated apparatus (connected to intrinsically safe circuits) and associated cable shields:
  - a. Ground in accordance with the associated control drawing (drawing provided for the intrinsically safe circuit and which contains manufacturer's entity parameters).

C. Termination Requirements:

1. Wiring to circuits external to the panel connected to interposing terminal blocks.
2. Terminal blocks rigidly mounted on DIN rail mounting channels.



3. Terminal strips located to provide adequate space for entrance and termination of the field conductors.
4. Minimum dimension for spacing between wire duct and terminals shall be at least 2 inches.
5. One (1) side of each strip of terminal blocks reserved exclusively for the termination of field conductors.
6. Terminal block markings:
  - a. Marking shall be the same as associated wire marking.
  - b. Legible, machine-printed markings.
  - c. Markings as identified in the shop drawings.
7. Terminal block mechanical characteristics, and electrical characteristics shall be in accordance with NEMA ICS 4.
8. Terminal blocks with continuous marking strips.
  - a. Each terminal block shall be identified with machine printed labels.
9. Terminals shall facilitate wire sizes as follows:
  - a. 120 VAC applications: Conductor size 12 AWG minimum.
  - b. Other: Conductor size 14 AWG minimum.
  - c. Analog signal cable shield drain conductors shall be individually terminated.
10. All field wiring includes spare wires shall be terminated on terminal blocks.
11. Install minimum of 20% spare terminals.
12. Bladed, knife switch, isolating type terminal blocks where control voltages enter or leave the panel.
13. Fused terminal blocks shall be used in the following circuits:
  - a. Control voltage is used to energize a solenoid valve.
  - b. DC power is connected to 2-wire, loop-powered instruments.
14. Fused terminal blocks shall be provided with blown fuse indicators.
15. When control circuits require more than one (1) field conductor connected to a single wiring point, a sufficient number of terminal points shall be connected internally to allow termination of only one (1) field conductor per terminal block.
16. DIN rail mounting channels shall be installed along full length of the terminal strip areas to facilitate future expansion.

17. Connections to devices with screw type terminals shall be made using spade-tongue, insulated, compression terminators.
18. Intrinsically safe circuit termination:
  - a. Provide at least 0.25 IN (6 mm) clearance between two terminals for connection of field wiring of different intrinsically safe circuits, unless this clearance is permitted to be reduced by the control drawing this is provided for the intrinsically safe circuit and which contains manufacturer's entity parameters.
  - b. Identify intrinsically safe circuits at terminal and junction locations in a manner that is intended to prevent unintentional interference with the circuits during testing and servicing as required by NEC, Article 504.

D. Component Mounting and Placement:

1. Components shall be installed per manufacturer instructions.
2. Control relays and other control auxiliaries shall be mounted on DIN rail mounting channels where practical.
3. Front panel devices shall be mounted within a range of 40 to 70 IN above the finished floor, unless otherwise shown in the Contract Documents.
4. PLC/RTU and I/O rack installation:
  - a. Located such that the LED indicators and switches are readily visible with the panel door open.
  - b. Located such that repair and/or replacement of component can be accomplished without the need to remove wire terminations or other installed components.
5. Locate power supplies with no less than the manufacturer's recommended spacing for circulation of air.
6. Where components such as magnetic starters, contactors, relays, and other electromagnetic devices are installed within the same enclosure as the PLC/RTU system components, provide a barrier of at least 6 IN of separation between the "power area containing the electromagnetic devices" and the "control area".
7. Components mounted in the panel interior shall be fastened to an interior sub-panel using machine screws.
  - a. Fastening devices shall not project through the outer surface of the panel enclosure.

8. Excess mounting space of at least 20% for component types listed below to facilitate future expansion:
  - a. Fuse holders.
  - b. Circuit breakers.
  - c. Control relays.
  - d. Time delay relays.
  - e. Intrinsically safe barriers and relays.
  
9. Components installed on sub-panels shall be provides with a minimum spacing between component and wire duct of 1 IN.
  - a. Minimum of 2 IN separation between terminal strips and wire ducts.
  
10. Pneumatic tubes and appurtenances:
  - a. Connect panel air piping and tubing penetrations with bulkhead fittings.
  - b. Pneumatic control tubing shall be 1/4 IN OD.
    - 1) Tubing material: Either soft annealed ASTM B75 copper or flame-resistant polyethylene.
  - c. Main headers within panels shall be minimum 1 IN.
  - d. Compression-type pressure fittings.
  - e. Equip panel instrument leads with ball type isolation valve.
  - f. Route tubing neatly and mount securely.
  - g. Do not route tubing in front of or in wire ducting.
  - h. Code terminal plates.
  - i. Pneumatic devices shall be served by a dual function filter regulator.

E. Power Distribution

1. Main incoming power circuits shall be protected with a thermal magnetic circuit breaker.
2. Limit load to maximum of 80% of circuit breaker rating.
3. Component types listed below shall be individually fused so that they may be individually de-energized for maintenance:
  - a. PLC/RTU power supply modules.
  - b. Single-loop controllers.
  - c. Recorders.
  - d. Alarm annunciators.
  - e. OIT
  - f. I/O Modules
4. Each control panel with PLC/RTU components shall be furnished with power protection in the form of a double conversion UPS. Refer to UPS Specification Section 40 90 09 for UPS requirements.

5. Each control panel with PLC/RTU components shall be furnished with power protection in the form of a surge suppressor followed by an isolation transformer.
  - a. See Section 40 99 00 - Surge Protection Devices.
6. Equip each panel with necessary power supplies with ratings required for installed equipment and with minimum 25 PCT spare capacity.
7. Constant voltage transformers, balancing potentiometers, and rectifiers as necessary for specific instrument requirements.

F. Internal Panel Lighting and Service Receptacles:

1. Panels less than or equal to 4 FT wide:
  - a. One (1) electrical GFCI duplex receptacle.
  - b. One (1) compact fluorescent light fixture with manual switch.
2. Panels or panel faces greater than 4 FT wide:
  - a. One (1) duplex electrical GFCI receptacle per 6 FT of length.
  - b. Continuous fluorescent lighting strip with manual switches.

2.04 PANELS AND ENCLOSURES-SCHEDULE

- A. See attached Control Panel Schedule 40 90 05 A

2.05 MAINTENANCE MATERIAL

A. Spare Parts List

1. Minimum 12 replacement filters of each type installed.
2. One (1) quart of exterior finish touch-up paint.
3. One (1) complete set of replacement corrosion inhibitors in sealed packages for each panel.
4. Quantity of 25% replacement lamps for each type installed (minimum of 12 of each type).
5. Minimum 20-50 fuses of each type installed.
6. Minimum 25 relays of each type installed.
7. Minimum 10 circuit breakers of each type installed.
8. One (1) panel heater of each type supplied.
9. One (1) UPS of each type supplied.

## PART 3 - EXECUTION

### 3.01 TESTING AND CALIBRATION

- A. Thoroughly shop test the completed panel as detailed in Specification 40 90 10 for factory testing. Remove, box, and label all parts that may come loose or detached in shipment, so that after installation they may be easily replaced.
- B. Perform preliminary calibrations in the fabricator's shop, and final calibrations at start-up at site by qualified personnel.

### 3.02 PANEL SHIPMENT AND STORAGE

- A. Wrap the completed panel in polyethylene plastic and crate in a wooden shipping crate with sufficient packing to avoid damage in shipment.
- B. Support the base of the shipping crate with the cross members of sufficient strength and clearance to allow movement of the entire crated panel by fork-lift truck
- C. The panels shall be stored in a weatherproof building until installed, and the sealed shipping enclosure shall be maintained at all times.
- D. All exterior surfaces that are damaged, scratched, etc. shall be repaired and painted with matching paint as supplied by the manufacturer. The touch-up paint must match the original panel paint so as not to be obvious.
- E. All instruments, meters, devices, etc. shall be mounted and braced to ensure compliance with manufacturer's specifications and to prevent any damage during shipping and installation.
- F. The panels shall be shipped complete with all required instruments, meters, relays, controls, indicating lights, etc. and fully tested to meet the operational specifications of the Contract Documents. The manufacturer shall submit a certified document stating the panel has been tested and meets the operational requirements before shipping.
- G. Tubing shall be installed in straight planer runs, parallel and normal with panel surfaces. All tubing shall be supported by brackets and holders to prevent any damage by vibration during shipment and installation of panels. Tubing shall be labeled with plastic markers in accordance with ISA Standards.
- H. One copy of the wiring and tubing diagrams, schematics, panel layout drawings, and all instrument and device installation instruction manuals shall be shipped with each panel. This material shall be bound in black pressboard binders with the panel name label. This binder shall always be stored inside the panel to provide an as-built reference. This requirement is in addition to the as-built documentation requirement.

### 3.03 INSTALLATION

#### A. Preparation

1. Sequence enclosure installation as follows:
  - a. Install enclosures and conduits and pull field wiring into enclosures.
  - b. Seal all wire entries with non-setting silicon compound to prevent moisture from entering enclosure.
  - c. Top conduit entries shall not be permitted unless approved by the Owner and/or Engineer.
  - d. Cover enclosure installation thoroughly with heavy-duty plastic sheet to protect against moisture, paint splatter and dirt. Cover until 120-volt power is available, and enclosure is ready to receive internal panel.
  - e. Terminate field wiring on terminal blocks.
  - f. Energize panel heater and keep enclosure door closed when no work is being performed in enclosure. (Do not energize any other equipment prior to field wiring termination check.)
  - g. Check field wiring terminations and test all wiring for continuity.
  - h. Energize panel mounted equipment only after all wiring has been thoroughly checked and tested.
  - i. Energize panel heater to prevent condensation inside the panel.

#### B. Installation

1. Do not install control panels or enclosures directly against concrete walls. Provide stainless steel channels between wall and enclosure. Mount enclosure to stainless steel channels.
2. Do not install panels directly on the floors. Use steel channels or unistruts.
3. Install enclosures and panels level and plumb. Touch up all nicks, scratches, etc.
4. Vacuum and clean all panel interior surfaces prior to system testing and commissioning.
5. All floor-mounted panels shall be anchored to the concrete pad or foundation. Floor-mounted two-door panels shall have at least 8 mounting holes in the enclosure feet. All holes shall be anchored to the concrete pad or foundation using 3/8" drop-in type anchors or other NEC approved method.

3.04 FIELD QUALITY CONTROL

- A. Demonstrate that each enclosure and each panel mounted equipment has been properly installed, wired and connected per drawings. Demonstrate that there is enough space in the front and rear for maintenance and trouble shooting.

3.05 DEMONSTRATION

- A. Test all control function as described in Division 1 and Section 40 90 00 - Instrumentation for Process Control - Basic Requirements and Section 40 90 10 - Process Control System Factory Testing. In addition, perform the following:
  - 1. Calibrate all process variable indications.
  - 2. Adjust all alarm setpoints.
  - 3. Tune all control function to achieve optimum and stable control.

NO FURTHER TEXT ON THIS PAGE

**40 90 05 A**  
**Control Panel Schedule**

<b>Panel Tag</b>	<b>Description</b>	<b>Process Area</b>	<b>Drawing</b>	<b>Location</b>	<b>NEMA Rating</b>	<b>Supplied By</b>	<b>Revision</b>
VPSA1CP	VPSA Unit 1 Control Panel	VPSA 1	N01	VPSA 1	NEMA 4X	11 55 10	
VPSA2CP	VPSA Unit 2 Control Panel	VPSA 2	N01	VPSA 2	NEMA 4X	11 55 10	
VPSA3CP	VPSA Unit 3 Control Panel	VPSA 3	N01	VPSA 3	NEMA 4X	11 55 10	
VPSA4CP	VPSA Unit 4 Control Panel (if required)	VPSA 4	N01	VPSA 4	NEMA 4X	11 55 10	
LOXCP	LOX System Control Panel	LOX	N01	LOX	NEMA 4X	11 55 20	
	Remote I/O Panels (as required) Seller to submit a panel schedule.						

END OF SECTION



SECTION 40 90 06

PANEL INSTRUMENTS AND DEVICES

PART 1 - GENERAL

1.01 SUMMARY

A. Scope

1. Seller shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, calibrate, test, adjust and place into satisfactory operation panel instruments and devices.
2. Contract Drawings and Specifications illustrate and specify functional and general construction requirements of the panel components and do not necessarily show or specify all components, wiring, piping and accessories required to make a completely integrated system. Seller shall provide all piping, wiring, accessories and labor required for a complete, workable and integrated system.
3. Coordination: Seller shall coordinate the installation of all items specified herein and required to ensure the complete and proper interfacing of all the components and systems.
4. Related Specifications:
  - a. Section 40 90 00 - Instrumentation and Control System - General Requirements
  - b. Section 40 90 05 - Control Panels and Enclosures
  - c. Section 40 90 10 - Factory Acceptance Testing
  - d. Section 40 90 13 - Process Control System Training

1.02 SUBMITTALS

A. Shop Drawings

1. Submittals shall be in accordance with the requirements of Section 01 33 00 – Submittals.
2. Before the instruments and devices are mounted on the panel, the Seller shall submit the catalog cuts with selected model numbers for engineer's approval.
3. After the approval and before factory tests of the panels the manufacturer shall submit test and calibration information.
4. After the successful panel factory test the Seller shall submit operation and maintenance manuals and as built drawings for all the instruments and devices.

5. Control drawings for intrinsically safe systems:
  - a. Print on 8 ½ x 11 IN sheets.
  - b. In accordance with recommendations of ANSI/ISA-12.02.02-2014.
  - c. One control drawing per sheet.
  - d. Identify model numbers of both the associated apparatus and the intrinsically safe apparatus.
  - e. Include wiring diagram showing interconnections of the intrinsically safe apparatus and the associated apparatus.
  - f. Provide entity parameters for both the associated apparatus and the intrinsically safe apparatus.
  - g. Identify line of demarcation between classified (hazardous) and unclassified (nonhazardous) locations and identify equipment that is installed in each location.
  - h. Identify hazardous areas by class, groups, and divisions.
  - i. Show maximum nonhazardous location voltage that may be used with the associated apparatus.
  - j. Include any specific conditions that are necessary to maintain the intrinsic safety protection.

**B. Contract Closeout Information**

1. Operation and Maintenance Manuals
  - a. Provide O&M manuals in accordance with Section 01 78 23 - Operation and Maintenance Manual and Section 40 90 00 - Instrumentation for Process Control - Basic Requirements.

**C. Record Documents**

1. Provide Record Documents in accordance with Section 01 78 18 - Contract Closeout and Section 40 90 00 - Instrumentation for Process Control - Basic Requirements.

**1.03 QUALITY ASSURANCE**

- A. Seller shall comply with the requirements of Section 40 90 00 - Instrumentation for Process Control - Basic Requirements and Division 01.

- B. Acceptable Manufacturers
  - 1. Seller shall obtain all instruments and devices of a given type from the same manufacturer.
- C. Instruments and devices shall not be assembled in the panels until all product information and system shop drawings for respective components have been approved.
- D. The instruments and devices shall meet electrical area classification requirements and NEMA enclosure type shown on Drawings.
- E. Reference Standards:
  - 1. International Society of Automation (ISA)
    - a. S18.1 Annunciator Sequences and Specifications.
  - 2. National Electrical Manufacturers Association (NEMA):
    - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
    - b. ICS 2, Industrial Control and Systems: Controllers, Contactors, and Overload
    - c. 504, Intrinsically Safe Systems.
    - d. Relays Rated 600 Volts.
    - e. Underwriters Laboratories, Inc. (UL).

#### 1.04 IDENTIFICATION TAGS

- A. All panel instruments and devices shall have an identification tag meeting the following requirements:
  - 1. Identifying tag number shall be permanently etched or embossed onto a stainless steel tag which shall be fastened to the device housing with stainless steel rivets or self-tapping screws of appropriate size.
  - 2. Where neither of the above fastenings can be accomplished, tags shall be permanently attached to the device by a circllet of 1/16-inch diameter stainless steel wire rope.
  - 3. Front of panel mounted components shall have nameplates which comply with the requirements specified in Section 40 90 00 - Instrumentation for Process Control - Basic Requirements..

#### 1.05 INTRINSIC SAFETY DEFINITIONS

- A. Associated Apparatus: apparatus in which the circuits are not necessarily intrinsically safe themselves but that affects the energy in the intrinsically safe circuits and is relied on to maintain intrinsic safety.
- B. Intrinsically Safe Apparatus: apparatus in which all the circuits are intrinsically safe.

- C. Intrinsicly Safe Circuit: A circuit in which any spark or thermal effect is incapable of causing ignition of a mixture of flammable or combustible material in air under prescribed test conditions.
- D. Intrinsicly Safe System: An assembly of interconnected intrinsicly safe apparatus, associated apparatus, and interconnecting cables, in that those parts of the system that may be used in hazardous (classified) locations are intrinsicly safe circuits.

## PART 2 - PRODUCTS

### 2.01 ANNUNCIATORS

- A. Design and fabrication
  - 1. Type: Solid State.
  - 2. Cabinet Style: Flush mounting for Control Panel.
  - 3. Manual reset sequence per ISA S18.1.
  - 4. Utilize both audio and visual indication in accordance with ISA S18.1 diagrams and descriptions.
  - 5. Microprocessor based logic
  - 6. Pushbuttons providing following functions:
    - a. Lamp test
    - b. Alarm acknowledge
    - c. Alarm reset
    - d. Alarm silence
  - 7. Mount: Flush
  - 8. Clearly identified nameplate for each annunciation window.
  - 9. Cabinet Rating: As a minimum, NEMA 12 for indoor use; NEMA 4x for outdoor mounting use.
  - 10. Minimum Window Size: 3" x 3"
  - 11. System Power Supply: 120 VAC +/-10%, 60m Hz.
  - 12. Temperature Range (operating): -40 to +140 Deg. F.
  - 13. Humidity: 10 to 95 percent non-condensing.

## 2.02 SIGNAL CONDITIONERS

### A. Signal Current to Current Isolators/Converter

#### 1. Materials:

- a. Housing: DIN Aluminum for DIN 50035-G32 (Grail mounting) with removable screw-clamp terminals capable of accepting 22-14AWG wire to allow unplugging of input wiring without use of tools while maintaining polarity.

#### 2. Design and fabrication

- a. Type: 2-wire
- b. Input: Current 4-20ma DC, Voltages: 0-1VDC, 0-5VDC, 1-5VDC.
- c. Output: 4-20ma DC.
- d. Power: Loop powered (24VDC).
- e. Solid state electronics.
- f. Transmit analog output signal directly proportional to measured input signal.
- g. Accuracy: Better than +/- 0.1% of span
- h. Isolation: Up to 500 V RMS (input, output and case).

### B. Analog Alarm Trips

#### 1. Materials:

- a. Housing: DIN style rail mounting with removable terminal blocks.

#### 2. Design and fabrication:

- a. Type: Programmable Direct Current Alarm.
- b. Input: 4-20ma DC, 1-5VDC.
- c. Output: Dual alarms SPDT relays rated at 5A, 117VAC non inductive.
- d. Indicator: 3-1/2 digit LCD Digital indication of trip points in engineering unit with LEDs on front panel indicating alarm status.
- e. Diagnostics: Error message display for sensor break, loss of communication; output shall default to programmable state.

- f. Signal Retransmission: Isolated 4-20ma DC retransmission of input signal.
- g. Power supply: Loop Powered
- h. Adjustments: Front panel pushbutton control settings for Zero, span, alarm trip points.
- i. Power: 24VDC +/-10%.

C. Potentiometer Transmitters

- 1. Design and fabrication:
  - a. Solid state electronics.
  - b. Transmit analog signal directly proportional to measured impedance input.
  - c. Power source: 24 VDC.
  - d. Input: 0-1000 ohms.
  - e. Output signal: 4-20 mA DC.
  - f. Accuracy (maximum error):  $\pm 0.25$  PCT.
  - g. Ambient temperature range: 0-140 DEGF.

2.03 DIGITAL INDICATORS

A. Materials

- 1. Housing: 1/8 DIN size front panel aluminum case.

B. Design and Fabrication

- 1. Type: Microprocessor based.
- 2. Input: 4-20ma DC.
- 3. Power: 120VAC, 60 Hz.
- 4. Display: 6 digits red LED.
- 5. Accuracy: 0.005% of reading.
- 6. Configuration: Via front pushbuttons.

2.04 POWER SUPPLIES

A. DC Power Supplies

- 1. Design and fabrication:
  - a. Converts 120 Vac input to DC power at required voltage.
  - b. DIN rail mount with enclosure (i.e., not open frame).

- c. Provide redundant 24VDC modules with diode redundancy module for automatic switchover to standby module on failure of primary module. Hardwire the 24 Vdc module fault contact to the associated PLC input point for alarm.
- d. Switching type.
- e. AC input: 120 Vac +/-15 percent, nominal 60 Hz.
- f. Efficiency: Minimum 86 percent.
- g. Rated mean time between failure (MTBF): 500,000 HRS.
- h. Voltage regulation:
  - 1) Static: Less than 1.0 percent  $V_{out}$ .
  - 2) Dynamic: +/-2 percent  $V_{out}$  overall.
- i. Output ripple/noise: Less than 100 mV peak to peak (20 MHz).
- j. Overload, short circuit and open circuit protection.
- k. Temperature rating: 0 to 60 DegC full rated, derated linearly to 50 percent at 70 DegC.
- l. Humidity rating: Up to 90 percent, non-condensing.
- m. LED status indication for DC power.

## 2.05 RELAYS

### A. Control Relays

- 1. Design and fabrication:
  - a. Plug-in general purpose relay.
  - b. Blade connector type.
  - c. Switching capacity: 10 A.
  - d. Contact material: Silver cadmium oxide.
  - e. Provide relays with a minimum of 3 SPDT contacts.
  - f. Coil voltage: 120 Vac.
  - g. Hermetically sealed contacts
  - h. Relay sockets are DIN rail mounted.
  - i. Internal neon or LED indicator is lit when coil is energized.
  - j. Check button
  - k. Temperature rise:
    - 1) Coil: 85 Deg F max.
    - 2) Contact: 65 Deg F max.

- l. Insulation resistance: 100 Meg min.
- m. Frequency response: 1800 operations/hour.
- n. Operating temperature: -20 to +150 Deg F.
- o. Life expectancy:
  - 1) Electrical: 500,000 operations or more.
  - 2) Mechanical: 50,000,000 operations or more.
- p. UL listed or recognized.

**B. Time Delay Relays**

- 1. Design and fabrication:
  - a. Heavy-duty.
  - b. Solid-state construction.
  - c. External adjusting dial.
  - d. Auxiliary relays as required to perform functions specified or shown on Drawings.
  - e. Operates on 117 Vac ( $\pm 10$  percent) power source.
  - f. Contact rating: A150 per NEMA ICS 2-125.
  - g. Furnish with "on" and "timing out" indicators.

**2.06 HORNS**

**A. Materials**

- 1. Housing Rating: NEMA 12 for indoor non-hazardous areas, NEMA4X for outdoor areas; NEMA 7 for Class 1, Group C and D areas (UL Listed).
- 2. Housing Finish: Die-case corrosion resistant grey powder epoxy.

**B. Design and fabrication**

- 1. Type: Vibrating type with grille housing and stainless steel diaphragm.
- 2. Power: 120 VAC, 60 Hz single phase.
- 3. Output: 100 dB at 10 ft. adjustable volume (78 to 100 dB).

**2.07 STROBES**

**A. Design and Fabrication**

- 1. Tube Type: Heavy Duty Xenon flash tube.



2. Dome: Shatter-resistant polycarbonate lens. Lens color shall be Amber. Gray color base.
3. Beacon shall be suitable for indoor and outdoor installations and shall be panel or conduit mountable.
4. Beacon housing shall be capable of withstanding vibration.
5. Dual-mode design which shall be field adjustable between steady-on or flashing mode by changing a dipswitch inside the beacon housing.
6. For outdoor locations provide manufacturer supplied gasket kit for weatherproofing.
7. Flash rate: Single Flash 65 fpm.
8. For wall mount installations provide manufacturer supplied wall mount bracket.
9. For panel mount installations provide manufacturer supplied mounting accessories.
10. Power: 120 VAC, 60 Hz.
11. Rating: NEMA 4X or NEMA 7 rated based on location of install.
12. Mounting Hardware: Manufacturer furnished stainless steel mounting hardware for wall/panel mounting required.

## 2.08 SELECTOR SWITCH

### A. Design and Fabrication

1. Heavy-duty type.
2. Oiltight, NEMA 4X.
3. Rotary cam units conforming to NEMA ICS 2-216.22.
4. Mounting hole: 30.5 MM.
5. Supply switches having number of positions required with contact blocks to fulfill functions shown and specified.
6. UL listed.
7. Maintained contact type.
8. Knob type operators.
9. Black colored operators.

10. Designed with cam and contact block with approximate area of 2 IN SQ.
11. Legend plate marked per Contract Documents.
12. Contact block requirements:
  - a. Dry and indoor locations: Standard contact blocks rated for 10 A continuous current.
  - b. Wet or outside locations: Hermetically sealed contact blocks.

## 2.09 INDICATING LIGHTS

### A. Design and Fabrication

1. Heavy duty.
2. NEMA 4X.
3. Type allowing replacement of bulb without removal from control panel.
4. LED.
5. UL listed.
6. 24 Vdc or 120 VAC lamp.
7. Nominal 2 IN SQ face.
8. Mounting hole: 30.5 MM.
9. Push-to-test indicating lights.
10. Plastic lens.
11. Color code lights as follows:
  - a. Green: Equipment/Motor/Pump Running.
  - b. Red: Alarm/Overload/Lockout/Tagout.
  - c. Blue: Valve Open
  - d. Yellow: Valve Closed
  - e. Gray: Valve in Transition
  - f. White: Equipment Off but Available
  - g. White: Power
12. Manufacturer supplied legend plates engraved for each light.

## 2.10 RESET TIMERS

### A. Design and fabrication

1. Heavy duty.
2. Consisting of adjustable time delay with automatic reset feature when period is timed out.
3. Auxiliary relays as required to perform functions specified or shown on Drawings.
4. Operate on 117 VAC (+10 PCT) power source.
5. Nominal dimensions: 4 x 4 IN.
6. Switch rating: 10 amps.
7. Dial range: 60 minutes.

## 2.11 ELAPSED TIME METERS (ETM)

### A. Design and Fabrication

1. Non-reset type
2. Shall register hours and tenths of an hour
3. NEMA 4X flush panel-mounted case not less than 3 inches squares.
4. Suitable for operation at 120V.
5. 60 Hz, AC.

## 2.12 PUSHBUTTONS

### A. Materials

1. Backing diaphragm: Buna-N.

### B. Design and Fabrication

1. Heavy-duty type.
2. NEMA 4X.
3. Conforming to NEMA ICS 2-216.22.
4. Mounting hole: 30.5 MM.
5. Diaphragm backed.
6. UL listed.
7. Emergency stop pushbuttons to have mushroom head operator and maintained contact.

8. Non-illuminated type:
  - a. Momentary contact with necessary contact blocks.
  - b. Molded, solid color melamine buttons.
  - c. Standard flush operators with full shroud.
  - d. Red colored buttons for START or ON and green color for STOP or OFF.
  - e. Appropriate contact blocks to fulfill functions shown or specified.
9. Contact block requirements:
  - a. Dry and indoor locations: Standard contact blocks rated for 10 A continuous current.
  - b. Wet or outside locations: Hermetically sealed contact blocks.
  - c. Legend plate marked per Contract Documents.
10. Illuminating type:
  - a. Momentary contact with necessary contact blocks.
  - b. Serves as both pushbutton control and indicating light.
  - c. Red colored lenses for start or on and green for STOP or OFF.
  - d. LED type unit with lens and panel gasket.
  - e. Appropriate contact blocks to fulfill functions shown or specified.
11. Manufacturer supplied legend plates engraved for each pushbutton.

## 2.13 LIMIT SWITCHES

### A. Design and fabrication

1. Limit switches shall be mounted on panel doors for intrusion detection or light activation, shall be proximity-type and shall be self-contained, side or end sensitive as required.
2. Output shall be a closed contact with no intrusion.

## 2.14 POTENTIOMETERS

### A. Design and fabrication

1. Furnished and installed whenever required to adjust the speed (frequency) of rotating equipment.
2. Heavy-duty NEMA type

3. Potentiometers shall be NEMA 4X (for outdoors) and NEMA 13 (for indoors).
4. UL listed.
5. Linear adjustment through 0-1000 ohms with 1 percent resolution
6. 3-wire interface
7. Dial plate with 0-100 percent scale.
8. Rated for the resistance value required to operate the connected input device.
9. Mounting hole 30.5 mm. 3-wire interface
10. Panel mounted.
11. One-turn adjustable knob.

## 2.15 INTRINSICALLY-SAFE RELAYS

### A. Design and Fabrication

1. Utilize in all circuits required to be intrinsically safe.
2. All instruments installed in hazardous locations per Section 40 90 07 shall be provided with intrinsic safety isolators.
3. DIN rail mountable.
4. Provide galvanic isolation; use of passive zener diode type barriers is not permitted.
5. Limit voltage and current so that no spark or thermal effect can cause a potentially explosive atmosphere to ignite.
6. Provide redundant 24Vdc power supplies in accordance with Paragraph 2.5 A of this Specification. Power supplies shall be installed in the same enclosure as the intrinsic safety isolators. Power supplies shall be sized based on the active load of the associated loop powered field instruments.
7. Furnish and install in accordance with requirements of NEC Article 504, Intrinsically Safe Systems.
8. Certified to be in accordance with latest edition of UL 913 for application.
9. Operating temperature: 0 to 122 DegF.

## 2.16 BATCH COUNTER

### A. Design and Fabrication

1. Furnished complete with preset switches up to a maximum of 9999.9 counts.
2. Each unit shall be capable of automatic or manual reset and restart with multiple contact outputs to signal external equipment at the end of each batch cycle.
3. The unit shall count up and provide a control relay output at a preset count.
4. Each unit shall be furnished with black trim

## 2.17 INSTRUMENT ISOLATION TRANSFORMERS

### A. Isolation Transformers

1. Design and fabrication:
  - a. Protects sensitive electronic equipment from electrical noise.
  - b. Common-mode noise attenuation: 146 dB at 0.0005 pF coupling capacitance.
  - c. Normal-mode attenuation: 60 dB.
  - d. Input voltage range:  $\pm 10$  PCT of rated.
  - e. Regulation: 3.5 PCT or less from full-load to no-load.
  - f. Dielectric strength: 2,500 VAC minimum.
  - g. Harmonic distortion: 1 PCT maximum.
  - h. Electromagnetic interference: 0-1 gauss maximum at 18 IN.
  - i. UL listed.

## 2.18 STRIP HEATERS

### A. Electric strip heaters shall be provided as indicated on the Contract Documents and as required for the application.

1. Design and fabrication:
  - a. Shall be sized to prevent condensation with the enclosure and to ensure that equipment is maintained above its minimum operating temperature.
  - b. Shall be located so as not to overheat electronic hardware or produce large temperature fluctuations on the hardware.

- c. Controlled by adjustable thermostats with adjustment ranges of 30°F to 90°F.
- d. A strip heater circuit disconnect switch shall be provided within the enclosure.

## 2.19 TERMINAL BLOCKS

### A. Terminal Blocks

1. Design and fabrication:
  - a. Modular type with screw compression clamp.
  - b. Screws: Stainless steel.
  - c. Current bar: Nickel-plated copper allow.
  - d. Thermoplastic insulation rated for -40 to +90 DEGC.
  - e. Wire insertion area: Funnel-shaped to guide all conductor strands into terminal.
  - f. Install end sections and end stops at each end of terminal strip.
  - g. Install machine-printed terminal markers on both sides of block.
  - h. Spacing: 6 MM.
  - i. Wire size: 22-12 AWG.
  - j. Rated voltage: 600 V.
  - k. Din rail mounting.
  - l. UL listed.
2. Standard-type block:
  - a. Rated current: 30 A.
  - b. Color: Gray body.
3. Bladed-type block:
  - a. Terminal block with knife blade disconnect which connects or isolated the two (2) sides of the block.
  - b. Rated current: 10 A.

- c. Color:
    - 1) Panel control voltage leaves enclosure - normal: Gray body, orange switch.
    - 2) Foreign voltage entering enclosure: Orange body, orange switch.
  - 4. Grounded-type block:
    - a. Electrically grounded to mounting rail.
    - b. Use to terminal ground wires and analog cable shields.
    - c. Color: Green and yellow body.
- B. Fuse Holders
- 1. Design and fabrication:
    - a. Modular-type with screw compression clamp.
    - b. Screws: Stainless steel.
    - c. Current bar: Nickel-plated copper alloy.
    - d. Thermoplastic insulation rated for -40 to +105 DEGC.
    - e. Wire insertion area: Funnel-shaped to guide all conductor strands into terminal.
    - f. Blocks can be ganged for multi-pole operation.
    - g. Install end sections and end stops at each end of terminal strip.
    - h. Install machine-printed terminal markers on both sides of block.
    - i. Spacing: 9.1 MM.
    - j. Wire size: 30-12 AWG.
    - k. Rated voltage: 300 V.
    - l. Rated current: 12 A.
    - m. Fuse size: 1/4 x 1-1/4.
    - n. Blown fuse indication.
    - o. DIN rail mounting.
    - p. UL listed.



PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install each item in accordance with manufacturer's recommendations and in accordance with the Contract Documents.
- B. All items shall be mounted and anchored in compliance with Section 40 90 05.
- C. Intrinsically safe apparatus and associated apparatus shall be installed in accordance with the manufacturer's control drawings and in accordance with NEC Article 504.

3.02 INSTALLATION AND FIELD QUALITY CONTROL

- A. Provide installation and checkout in accordance with Specification Section 40 90 00 - Instrumentation for Process Control - Basic Requirements and Section 40 90 05 - Control Panels and Enclosures.

END OF SECTION

NO TEXT ON THIS PAGE

SECTION 40 90 07

INPUT/OUTPUT LIST

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. This Section describes the Process Control System (PCS) PLC Input/Output (I/O) list.
2. There is no completed I/O List included for this project. Minimum I/O is defined in Section 11 55 10 - Vacuum Swing Adsorption Oxygen Generation System and Section 11 55 20 - Liquid Oxygen Storage and Vaporization System. The Systems Integrator shall develop the I/O List based on the Seller's design and the minimum I/O specified in Section 11 55 10 and 11 55 20. The Systems Integrator's complete I/O List shall be submitted for approval and shall include content and be formatted as specified in this Section and the attached form.
3. I/O list shall include the following types of points:
  - a. Points that are hardwired between the PCS and field instrumentation and control devices.
  - b. Points that are interfaced to the PCS via a communications link.

B. Related Specification Sections include but not necessarily limited to:

1. Division 00 - Procurement and Contracting Requirements.
2. Division 01 - General Requirements.
3. Section 11 55 10 - Vacuum Swing Adsorption Oxygen Generation System
4. Section 11 55 20 - Liquid Oxygen Storage and Vaporization System
5. Section 40 90 00 - Instrumentation and Control: General Requirements
6. Section 40 90 02 - Programmable Logic Controllers: Hardware and Software
7. Section 40 90 08 - Control Strategies
8. Section 40 90 10 - Process Control System Factory Testing
9. Section 40 90 12 - Process Control System Start-Up and Commissioning

- C. The I/O list shall include all signals communicated to/from the control system using digital or serial communication protocols (Ethernet TCP/IP, Modbus, etc.).

- D. The I/O list shall not include internal software points generated by the control system and used solely within the control system.
- E. The Seller, through the services of its Systems Integrator, shall use the I/O list as the starting point in development of the final PCS I/O database.

## 1.02 QUALITY ASSURANCE

### A. Referenced Standards:

- 1. The International Society of Automation (ISA)

- B. Any proposed deviations from the I/O List format, content and attributes stipulated in this Section shall be submitted to the Owner and/or Engineer for approval. Systems Integrator shall not proceed with the I/O List development until the deviation has been approved by the Owner and/or Engineer.

## 1.03 SUBMITTALS

- A. See Specification Section 01 33 00 – Submittals for requirements for the mechanics and administration of the submittal process.

### B. Shop Drawings (see Section 3.01 below):

- 1. Pre-fabrication I/O List for Owner and Engineer approval

- a. For each I/O attribute listed in the minimum I/O list in Section 11 55 10 – Vacuum Swing Adsorption Oxygen Generation System and Section 11 55 20 – Liquid Oxygen Storage and Vaporization System that cannot be used exactly as listed, submit an explanation of the reason for the deviation and propose a method to modify the I/O list information. Do not proceed with any configuration until a method of resolving deviations is accepted by the Engineer.
- b. Include the control system I/O database information in the specific submittals for Programmable Logic Controller Systems.
- c. The I/O List shall have all data fields completed, including identification of all soft I/O for digital communication networks including Ethernet I/P, Modbus, and Ethernet. The Listing shall include the node address and addresses within the device. The addresses shall be coordinated such that node and segment addresses are unique within the Process Control System.

### C. Contract Closeout Information

- 1. Product technical data including acknowledgement that products submitted meet requirements of standards referenced.
- 2. Post-Commissioning Final I/O List. Submit bound I/O Lists in pdf and native format (Microsoft Excel) indexed by facility, PLC/RTU, and I/O Rack.

3. Operation and Maintenance Manuals
  - a. Provide O&M manuals in accordance with Section 01 78 23 - Operation and Maintenance Manual and Section 40 90 00 - Instrumentation for Process Control - Basic Requirements.

D. Record Documents

1. Provide Record Documents in accordance with Section 01 78 18 – Contract Closeout and Section 40 90 00 – Instrumentation for Process Control - Basic Requirements.

1.04 I/O POINT LIST DESCRIPTION

A. The I/O point list required by this section shall contain I/O point information. The I/O List shall be organized in columns as follows:

1. I/O TAG describes the point name that will be used throughout the PCS to identify the point.
2. PANEL indicates the control panel in which the I/O module is located.
3. P&ID NUMBER references the Seller's Process and Instrumentation Diagram on which the point is depicted in relation to the process and equipment.
4. I/O DESCRIPTION is a concise English language description the point's function in relation to the process in terms that an operator can readily understand. Cryptic codes and abbreviations shall be avoided.
5. I/O TYPE denotes the signal type such as
  - a. Hardwired analog input or output, discrete input or output, pulse
  - b. Communication (via data-link) analog input or output, discrete input or output, communication type (Ethernet TCP/IP, Modbus, etc.
6. INPUT FROM / OUTPUT TO is the source or destination of the signal dependent upon whether the signal is an input or output.
7. PANEL/DEV TERM indicates the endpoint panel or device terminals associated with the I/O point.
8. POWER SOURCE denotes the supply power source.
9. PLC PANEL TERMINALS indicates the control panel terminals associated with the I/O point.
10. PLC PHYSICAL ADDRESS indicates the physical location on the PLC.
11. PLC INTERNAL ADDRESS indicates the internal PLC address.

12. MIN-MAX RANGE is the minimum and maximum (range) limit in engineering units of an analog input or output signal.
13. ENGINEERING UNITS lists the units associated with the point value.
14. DIGITAL ZERO STATE is the state descriptor associated with the open or zero (0) state of a discrete signal. Ex. ALARM, OFF, HIGH, FAILED
15. DIGITAL ONE STATE is the state descriptor associated with the closed or one (1) state of a discrete signal. Ex. NORMAL, ENERGIZED, FLOW
16. ALARM LIMITS indicates the setpoint for alarms.
17. ALARM PRIORITY indicates the alarm priority.
18. REMARKS is for any pertinent notations that help in identification or understanding of the signal source, features or new/existing status.

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION

### 3.01 I/O DATABASE DEVELOPMENT

- A. It shall be the responsibility of the Systems Integrator to develop the complete I/O List containing all information needed to facilitate panel building, testing and programming, and to fully document the I/O layout and interconnections.
- B. Prior to the start of PLC/RTU panel fabrication, the Systems Integrator shall submit an I/O List for Owner and Engineer review and approval that shall include for each I/O point, at a minimum, the following information:
  1. I/O Tag
  2. Panel
  3. P&ID Number
  4. Point Description
  5. Point Type
  6. Input From / Output To
  7. Signal to PLC
  8. Min. – Max. Value Range
  9. Engineering Units
  10. Alarm Limits (HH, H, L, LL)
  11. Remarks
- C. Maintain a copy of the complete Input/Output List with modifications during construction in Excel format. I/O List shall be accessible to Owner and Engineer on demand.

- D. Additionally, for soft I/O communicated over Ethernet and Modbus the submittal shall include similar information coordinated with all equipment vendors and suppliers. For soft I/O include, but not be limited to:
  - 1. Alarm settings and class
  - 2. Communication segment tag
  - 3. Node address on segment coordinated with all vendors and suppliers with equipment on that segment.
  - 4. Final PLC register location
- E. Spare I/O: For each PLC, provide type and quantity of I/O as required to perform the operational and functional requirements plus 25% spare (minimum of one module) for each type of module utilized. Spare points shall be mounted and wired ready for use and shall require only field wiring connections and software configuration to place each spare point in service.
- F. Following successful project Commissioning, submit an “As Installed” final I/O Point list, with all fields listed in 1.04A representing the updated information, including all field-updated information.

### 3.02 I/O HARDWARE CONFIGURATION

- A. It shall be the responsibility of the Seller and Systems Integrator to obtain the Owner’s tag naming conventions, abbreviations, facility codes, standard state descriptors, and other information that is needed for guidance.
- B. Partition the signals among I/O modules as described in Section 40 90 02- Programmable Logic Controllers – Hardware and Software to provide enhanced process control and monitoring resiliency.
- C. Partition the I/O among cards within an I/O enclosure to provide control loop integrity.
  - 1. Put all inputs of the same I/O type associated with a device (e.g. pump, blower, clarifier or other piece of equipment) on the same card.
  - 2. Put all inputs of the same I/O type for devices arranged in process trains (e.g. a pump, its inlet valve and its outlet valve, or a pump and its associated macerator) on the same card or adjacent cards if more than one card is required to accommodate the points.
  - 3. Put all outputs of the same I/O type associated with a device or group of devices in a process train on the same card or adjacent cards if more than one card is required to accommodate the points.
  - 4. Where the preceding requirements specified in this paragraph would cause more than 20 percent spare points on a card, points for a device or process train may be split between two consecutive cards.

5. Make unused terminals resulting from partitioning the I/O into pre-wired spares. Provide pre-wired spare points with all cabling and termination internal to the PLC as done for other I/O points.

### 3.03 POINT DATA FIELDS

- A. Information in the I/O List data fields may be subject to review and modification by the Owner and Engineer during the Shop Drawing review phase. Incorporate changes directed by the Owner and Engineer throughout the system and associated documentation, at no additional cost to Owner and Engineer, subject to the following limitations:
  1. Requested modifications will be limited to 20% of the total number of I/O points. This 20% shall not include changes to I/O List prior to the Shop Drawing phase. Corrections for errors by the Seller or Systems Integrator shall not count towards the 20% modification limit.
  2. Each unique change will count as one modification. For example, modifying the description, range, and engineering unit on an analog input count as three modifications.
  3. Analog input alarm limit adjustments will not be counted as modifications.

NO FURTHER INFORMATION ON THIS PAGE





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SECTION 40 90 08  
CONTROL STRATEGIES

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section is intended to aid in the Seller's understanding of the functional and operational requirements of the process control system, and to define the Seller's responsibilities related to the work described herein.
- B. The Seller shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish, install, calibrate, test, start-up, and place in satisfactory operation a complete process control system.
- C. Section Includes:
  - 1. Instrumentation control loops.
- D. Related Specification Sections include but are not necessarily limited to:
  - 1. Division 00 - Procurement and Contracting Requirements.
  - 2. Division 01 - General Requirements.
  - 3. Section 11 55 10 – Vacuum Swing Adsorption Oxygen Generation System
  - 4. Section 11 55 20 – Liquid Oxygen Storage and Vaporization System
  - 5. Section 40 90 00 – Instrumentation and Control: General Requirements.
  - 6. Section 40 90 02 – Programmable Logic Controllers: Hardware and Software
  - 7. Section 40 90 07 – Input/Output Lists
  - 8. Section 40 90 10 – Process Control System – Factory Acceptance Testing
  - 9. Section 40 90 12 – Process Control System – Start-Up and Commissioning

1.02 ABBREVIATIONS

- A. The following commonly used standard instrumentation and control abbreviations have been adopted by the Owner.

A/M	Auto/Manual
H/O/A	Hand-Off-Auto
HMI	Human-Machine Interface
L/R	Local/Remote

LCP	Local Control Panel
LCS	Local Control Station
MCC	Motor Control Center
O/S/C	Open/Stop/Close
OIT	Operator Interface Terminal
PID	Proportional-Integral-Derivative
P&ID	Process and Instrumentation Diagram
PCS	Process Control System
PLC	Programmable Logic Controller
RTU	Remote Terminal Unit
RVSS	Reduced Voltage Solid-state Starter
SCADA	Supervisory Control and Data Acquisition
S/S	Start/Stop
UPS	Uninterruptible Power Supply
VFD	Variable Frequency Drive

### 1.03 SYSTEM DESCRIPTION

- A. The Control Strategies provided in this section include, but are not limited to:
1. Process summary
  2. General Control Strategies
  3. Local and remote control mode capabilities
  4. Hardwired and software-based interlock descriptions
  5. PCS-based manual and automatic control mode descriptions
  6. Detailed process control algorithms
  7. Equipment power failure/recovery
  8. Process display descriptions
  9. Process report content requirements
  10. Process, system, and ancillary equipment alarms.
- B. The Control Strategies are not intended to be an inclusive listing of all elements and appurtenances required to execute process control functions but are rather intended to supplement and complement the Drawings and other Specification Sections. The Control Descriptions shall be the base document for the Seller's creation of the Control Strategies.
- C. The Control Strategies describe the operational interface and functional requirements of the Process Control System (PCS) and of the control loops and other PCS functions represented in the Contract Documents. They are intended to be a starting point for required system programming workshops, and then will be more fully detailed to support the development of process control logic, I/O database, alarms, reports, and the Human-Machine Interface (HMI) and Operator Interface Terminal (OIT) displays. The final version of each Control Strategy is intended to become part of the deliverable Training materials and the Operation and Maintenance documentation for the completed project.
- D. The Control Strategies are not considered equal to a bill of materials.

## 1.04 SUBMITTALS

- A. See Specification Section 01 33 04 – Operation and Maintenance Data for requirements for the format and content of Operation and Maintenance Manuals.
- B. Submit Control Strategies for Owner and Engineer review following workshops with the Owner’s staff, and prior to initiation of programming. This submittal shall expand on the Control Strategies included herein, including detailed calculations, tag names, setpoints and other information required to facilitate programming and configuration.
- C. Shop Drawings
  - 1. Submittals shall be in accordance with Section 01 33 00 – Submittals.
  - 2. Product Data: Submit manufacturer’s official and published product data, specifications, and installation recommendations for each item.
  - 3. Shop Drawings Include the following information in each submittal:
    - a. Complete control descriptions/strategies developed from the Control Descriptions specified.
    - b. I/O List complete with Instrument Ranges and Alarm levels, setpoints.
    - c. Each permissive detailed.
    - d. Provide complete control description for all areas of control. Including sufficient detail for a complete understanding of each operator controllable set point, failure modes, flow balancing and level controls.
    - e. Submit complete control descriptions for all areas of control within control parameters as described within.
    - f. All screens for all control strategies shall be completed and included in the submittal.
- D. Contract Closeout Information Submittals: Provide submittals as required below.
  - 1. Operation and Maintenance Manuals
    - a. Provide O&M manuals in accordance with Section 01 78 23 – Operation and Maintenance Manual and Section 40 90 00 – Instrumentation and Control system General requirements.
    - b. Incorporate the final Control Description(s) in the Operation and Maintenance Manual.
    - c. Include the following information:
      - (1) Recommended spare parts list
      - (2) Manufacturer approved repair and service centers list

- (3) Replacement parts' sources
- (4) Recommended maintenance procedures and frequencies.

2. Warranty: Provide warranty certificate as described in Section 01 78 32 - Warranties and Bonds.

B. Record Documents

1. Provide Record Documents in accordance with Section 01 78 18 - Contract Closeout and Section 40 90 00 - Instrumentation and Control System General Requirements.

2. Program documentation: Provide paper copies of all software development and configuration including listing of all register tables.

1.05 RESPONSIBILITY

A. Responsibilities

1. The Seller shall provide the Process Control System (PCS) complete and operable, in accordance with the Contract Documents.

2. PCS hardware and standard system software necessary to perform the control and monitoring functions described in this and other Sections of the Contract Documents and shown on the Drawings shall be supplied.

3. The Control Strategies do not necessarily address every PCS point or alarm point associated with the process or equipment. It is the responsibility of the Seller to provide and incorporate all hard-wired, networked and internal equipment alarms as shown and specified on the Contract Documents as well as other points required to meet the intent of the system control.

4. Where vendor packages are supplied as part of the Contract, the vendor packages that are supplied with a PLC-based control panel shall be programmed by the respective vendors for integration into the PCS. However, it shall be the Seller's responsibility to develop screens (graphics) for vendor equipment on the PCS HMI. Graphics shall include but not limited to the ability for the plant personnel to enter/change setpoints and alarm limits that are available at the vendor supplied control panel, view all statuses and alarms that are available at the vendor supplied control panel and shall include but not limited to supervisory control ability such as placing the vendor system in local or remote mode, or enable/disable remote operation, adjust sequence of operation for sub-components of the vendor package/system, acknowledge alarms generated at the vendor PLC/RTU and silence horns or flashing beacons at the vendor PLC/RTU.

5. Certain vendor packages may require no remote operator input and no remote PCS control, while other vendor packages may include select functions that must be accessed remotely via the PCS. In either case, all available vendor package I/O points shall be integrated into the PCS for display, alarm, and monitoring unless Owner determines selected parameters are not needed. Reference the Contract Documents for PCS interface requirements.

## 1.06 UPDATE TO CONTROL STRATEGIES

- A. Control Strategies shall be updated as follows:
  - 1. As needed following any workshops, working sessions, and/or related submittal reviews.
  - 2. As needed during the course of programming, start-up and testing to reflect all refinements and changes that occur due to specific operational needs and the characteristics of specific equipment and systems supplied under this Contract.
- B. At each stage of development and submittal of new versions of the Control Strategies, all revisions made subsequent to the previously submitted version of the document must be tabulated.
- C. The up-to-date version of the Control Strategies and tabulation of changes shall be made available to the Owner and Engineer.

## PART 2 -PRODUCTS

### 2.01 SOURCE QUALITY CONTROL

- A. See Section 40 90 10 - Process Control System Factory Acceptance Testing (FAT).

## PART 3 -EXECUTION

### 3.01 PROCESS CONTROL SYSTEM INSTALLATION AND OPERATION

- A. Develop, install and test all PLC, HMI and OIT programming, operator interface features, and software functionality needed to implement the process control and monitoring functions described in the Control Strategies.
- B. Initial values for alarm limits, operating limits, software timers and other control parameters included in the Control Strategies herein shall be reviewed and modified as needed by the Seller and/or Engineer and Owner. Each party shall notify the other two parties and the Seller when any updates are made.
- C. After observation of the operation during commissioning and testing of PCS control logic, modify the alarm limits, operating limits, software timers and other control parameters in the control logic as directed by the Engineer and/or Owner and document all changes. Provide the Owner access to any portions of the PCS during construction as needed.

### 3.02 FIELD QUALITY CONTROL

- A. Provide field quality control in accordance with Specification Section 40 90 00 - Instrumentation for Process Control - Basic Requirements and 40 90 12 - Process Control System Start-Up and Commissioning.

### 3.03 GENERAL REQUIREMENTS

- A. The Contract Documents do not indicate all PLC functions. Major requirements and elements are included. Provide all monitoring and control functions required for a complete operating system.
- B. Provide the following information at the HMI for all control loops:
  - 1. Analog Inputs: Full screen trends with Operator-selectable value and time intervals. Real time digital values on graphic displays and digital display of totalized flow values.
  - 2. Motor status: Status displayed as color change in graphic displays.
  - 3. Alarms: Alarms displayed as flashing symbols.
  - 4. Control switches: Switches shown with control modes labeled.
  - 5. Graphic displays: Provide real time, animated graphic displays as required/described in the specifications. Number of separate displays to be as required for system complexity. Related equipment and piping shall be shown.
  - 6. Control Logic: All control functions (interlocks, timing, etc.) shall be implemented in PLC software to allow process operation to continue in the event of HMI failure.
  - 7. Motor run times: PLC shall calculate/accumulate motor run times for display on the HMI.
  - 8. Change of State Alarms (fail-to-start/stop, fail-to-open/close, etc.): Alarm whenever a command is sent and no confirming status is returned.
- C. All calculations, trip points from analog values, timers, numeric manipulations, etc. shall be accomplished in the PLC and not in the operator interface software.
- D. Alarms
  - 1. All open/close valves and on/off motors monitored by the PLC system shall have a maximum time value allowed to either open/close or start/stop.
  - 2. Failure to achieve the control function within this maximum time value shall result in a time out alarm for each piece of equipment.
  - 3. An alarm will be generated from the PLC to the HMI for indication of the control function time out failure.
  - 4. Other specific alarms are designated in the control loop descriptions.
  - 5. All alarms are to be sealed in the PLC until acknowledged via the HMI.
- E. Analog inputs: All analog inputs to the PLC shall be configured in the HMI for historical trending.



- F. Analog outputs: All setpoints for minimum and maximum values shall be operator-adjustable via the HMI.
- G. Operator entries: Entries made by the operator (such as operation modes, setpoints, etc.) shall be displayed on the process screens.
- H. HMI Screens
  - 1. HMI screen development shall match Owner's existing graphic standards.
  - 2. Plant Overview: Bird's eye view of the plant with selectable zones for navigation to process areas screens.
  - 3. Process screens: The Process Screens shall be developed to show the full status for each piece of equipment within the process displayed and generally match the process flow diagram shown in the drawings.
  - 4. Equipment control detail pop-up: Equipment controlled from the HMI shall have a detailed control pop-up including control mode, function and associated setpoints.
  - 5. The HMI screens shall be animated as necessary to clearly convey equipment status, operation modes, process displays, alarms, etc. Follow Owner's established standards for equipment status color, numeric representation of process signals, equipment tagging, graphical animation, and other HMI screens and features.
  - 6. The contract documents may contain additional equipment, instrumentation and I/O that, although not specifically listed in the control loop descriptions, is required to be included on the HMI screens.
  - 7. Develop the HMI design to convey accurate information to the plant operations staff so they can make informed process control decisions and provide the platform to execute the control decisions required for the oxygen generation system and the liquid oxygen storage and vaporization system.
  - 8. The following outlines key objectives in designing the HMI graphics displays:
    - a. Easily navigated menus
    - b. Provide no more than three mouse actions to navigate to any control display.
    - c. Maintain consistency in graphic display and controls design within the new displays and with the existing displays for the plant-wide SCADA system.
    - d. Maintain consistent and predictable window operations.
    - e. Accurate representation of the plant and its operations
    - f. Represent control options in an easily understood fashion.
    - g. A pleasant and engaging interface that conforms to the operators "Mental Model"

- h. Where possible, design overview displays similar to the physical layout of the facility.
- i. Provide operator access to process and alarm setpoints, including the following:
  - 1) Process alarms (High-High, High, Low, and Low-Low)
  - 2) Pump and equipment control setpoints
  - 3) Process timer setpoints
  - 4) Sequence setpoints for volume, level, time etc.

### 3.04 CONTROL STRATEGIES

- A. The following Appendices to this Section contain the Control Strategies that define the PCS procedural and operational requirements of the process:

NO FURTHER TEXT ON THIS PAGE

## 40 90 08 APPENDIX A

### CONTROL STRATEGY

#### VACUUM PRESSURE SWING ADSORPTION PROCESS

##### A. Process Overview:

1. VPSA Oxygen plants separate oxygen from air through a unique Vacuum Pressure Swing Adsorption (VPSA) process. The VPSA process uses an advanced molecular sieve (synthetic zeolite), which attracts (adsorbs) nitrogen from air at elevated pressure and releases (Desorbs) it at sub-atmospheric (vacuum) pressure.

##### B. Equipment

###### 1. Summary of Components

- a. Feed Air Blower: Feed air blower supplies air to the VPSA system at a pressure higher than the atmospheric pressure.
- b. Vacuum Blower: Vacuum blower is used to remove the waste gases and regenerate the molecular sieve.
- c. Induction Motors: A high efficiency, fixed speed induction motor(s), is used to drive the feed and vacuum blowers.
- d. Inlet Air Filter
- e. Inlet/Outlet Silencers: The silencers reduce gas pulsations and attenuate entrained noise produced by the blowers.
- f. Feed and Waste Manifold: The air from the feed air blower is directed to the feed and waste manifold. The feed and waste manifolds contain high cycle, high performance automatic switching valves which allow feed air to enter and waste gas to be expelled from the adsorber vessels. .
- g. Adsorber Vessels: The adsorber vessels contain the advanced molecular sieve that separates the product oxygen from the feed air.
- h. Low Pressure Oxygen Receiver: The low-pressure oxygen receiver stores the oxygen produced by the adsorber vessels and delivers it to the aeration tanks as a continuous supply of oxygen.
- i. Instrument Air System: The instrument air system typically consists of the compressor, desiccant dryers, filters, and the air receiving tank.

C. Instrumentation

1. VPSA Control System: The main VPSA control panel contains the instrumentation, PLC and HMI to control, monitor and alarm the operation of the VPSA Oxygen Generating System.
2. See Section 11 55 10 - Vacuum Pressure Swing Adsorption Oxygen Generation system for minimum required field instruments.

D. Control Modes:

1. While equipment shall be provided with Local/Remote selector switches for maintenance purposes, the VPSA unit is a complex system and can be operated only when the PLC is in the Auto mode.

E. Control Strategy: See the control strategy in Section 11 55 10 – Vacuum Pressure Swing Adsorption Oxygen Generation System.

F. Interlocks: See the control strategy in Section 11 55 10 – Vacuum Pressure Swing Adsorption Oxygen Generation System.

G. Alarms: See the control strategy in Section 11 55 10 – Vacuum Pressure Swing Adsorption Oxygen Generation System.

H. HMI

1. VPSA System - Required Graphic Displays

- a. The displays shall include at a minimum all the equipment shown in the Process Flow Diagrams and described in the control narratives. All equipment shall be labeled as shown on the drawings or as listed in the I/O list.
- b. Displays shall be formatted in accordance with the Owner's standard display formatting.
- c. Provide graphics to depict the monitoring and control scope. The following color graphic displays shall be provided as a minimum for this project. All graphic displays shall be available on the VPSA Control Panel and on the HMI in the Oxygen Production Facility Main Control Room.
  - 1) Overview Display. Provide a display showing critical data for all VPSAs.
  - 2) Process Displays. Provide a display for each VPSA unit, showing all important data for the VPSA.
  - 3) Sub-Process Displays. Provide a display for each sub-process. Display shall show all current I/O for that sub-process.
    - a) When viewing the overview display, clicking near a site shall call the sub-process display.

- b) Where a sub-process display indicates quantities of data so as to be overcrowded, provide multiple screens for the sub-process.
- 4) Pop-up displays for control actions, in accordance with the plant's standard HMI design.
- 5) One spare display to be defined by OWNER during the Instrumentation and Control System coordination meetings specified in Section 40 90 00 - Process Control System General Requirements.

**40 90 08 APPENDIX B**  
**CONTROL STRATEGY**

**LIQUID OXYGEN STORAGE AND VAPORIZATION PROCESS**

A. Process Overview:

1. Liquid oxygen is stored in an insulated storage tank. When liquid oxygen is required, the liquid oxygen is vaporized to gaseous oxygen and piped to the aeration tanks.

B. Equipment

1. Summary of Major Components
  - a. Insulated Storage Tank.
  - b. Remote Fill Station.
  - c. Vaporizers.
  - d. System Shut-off Valve.
  - e. Pressure Control Valves.

C. Instrumentation

1. LOX System Control System: The LOX system control panel contains the instrumentation, PLC and HMI to control, monitor and alarm the operation of the Liquid Oxygen Storage and Vaporization System.
2. See Section 11 55 20 – Liquid Oxygen Storage and Vaporization System for minimum required field instruments.

D. Control Modes:

1. The Liquid Oxygen Storage and Vaporization System operates passively. The shut-off valve is the only controlled equipment.

E. Control Strategy: See the control strategy in Section 11 55 20 – Liquid Oxygen Storage and Vaporization System .

F. Interlocks: See the control strategy in Section 11 55 20 – Liquid Oxygen Storage and Vaporization System .

G. Alarms: See the control strategy in Section 11 55 20 – Liquid Oxygen Storage and Vaporization System.

## H. HMI

### 1. LOX System - Required Graphic Displays

- a. The displays shall include at a minimum all the equipment shown in the Process Flow Diagrams and described in the control narratives. All equipment shall be labeled as shown on the drawings or as listed in the I/O list.
- b. Displays shall be formatted in accordance with the Owner's standard display formatting.
- c. Provide graphics to depict the monitoring and control scope. The following color graphic displays shall be provided as a minimum for this project. All graphic displays shall be available on the LOX Control Panel and on the HMI in the Oxygen Production Facility Main Control Room.
  - 1) Overview Display. Provide a display showing critical data for the LOX system.
  - 2) Sub-Process Displays. Provide a display for each sub-process. Display shall show all current I/O for that sub-process.
    - a) When viewing the overview display, clicking near a site shall call the sub-process display.
    - b) Where a sub-process display indicates quantities of data so as to be overcrowded, provide multiple screens for the sub-process.
  - 3) Pop-up displays for control actions, in accordance with the plant's standard HMI design.
  - 4) One spare display to be defined by OWNER during the Instrumentation and Control System coordination meetings specified in Section 40 90 00 – Instrumentation for Process Control – Basic Requirements.

END OF SECTION

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## SECTION 40 90 09

### PROCESS CONTROL SYSTEM UNINTERRUPTIBLE POWER SUPPLY (UPS)

#### PART 1 - GENERAL

##### 1.01 SUMMARY

###### A. Section Includes:

1. Uninterruptible Power Supply (UPS) shall be furnished to provide a reliable source of uninterruptible power with no break in AC output power during a complete or partial interruption of incoming line power, and to provide power conditioning for electronic components.

###### B. Applicable Specification Sections include but are not necessarily limited to:

1. Division 00 - Procurement and Contracting Requirements.
2. Division 01 - General Requirements.
3. Section 40 90 00 - Instrumentation and Control: General Requirements
4. Section 40 90 05 - Control Panels and Enclosures

##### 1.02 QUALITY ASSURANCE

###### A. Referenced Standards:

1. Canadian Standards Association (CSA).
2. FM Global (FM).
3. The International Society of Automation (ISA):
  - a. S5.1, Instrumentation Symbols, and Identification.
  - b. S5.2, Binary Logic Diagrams for Process Operations.
  - c. S5.3, Graphic Symbols for Distributed Control/Shared Display Instrumentation, Logic and Computer Systems.
  - d. S5.4, Standard Instrument Loop Diagrams
  - e. S20, Standard Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves.
4. National Electrical Manufacturers Association (NEMA):
  - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
5. National Fire Protection Association (NFPA):
  - a. 70, National Electrical Code (NEC).

6. National Institute of Standards and Technology (NIST).
7. Underwriters Laboratories, Inc. (UL):
  - a. 508, Standard for Industrial Control Equipment.
  - b. 508A, Standard for Industrial Control Panels
  - c. 698, Standard for Industrial Control Equipment for Use in Hazardous Locations
  - d. 698A, Standard for Industrial Control Panels Relating to Hazardous Locations
  - e. 913, Standard for Safety, Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous (Classified) Locations.

### 1.03 SUBMITTALS

#### A. Shop Drawings

1. See Specification Section 01 33 00 - Submittals for requirements for the mechanics and administration of the submittal process.
2. Product technical data including:
  - a. Affirmation statement that submitted products meet requirements of referenced standards and the Specifications.
  - b. Load calculations and manufacturer's runtime chart shall be provided to substantiate UPS sizing.
  - c. Temperature calculations shall be provided for the enclosure in which the UPS is to be housed to confirm the minimum and maximum operating conditions do not exceed the UPS's rating.

#### B. Contract Closeout Information

1. Operation and Maintenance Manuals
  - a. Provide O&M manuals in accordance with Section 01 78 23 - Operation and Maintenance Manual and Section 40 90 00 – Instrumentation and Control system General requirements.

#### C. Record Documents

1. Provide Record Documents in accordance with Section 01 78 18 - Contract Closeout and Section 40 90 00 – Instrumentation and Control System General Requirements.

## PART 2 - PRODUCTS

### 2.01 UPS SYSTEM

- A. Provide a rack mounted, single-phase, uninterruptible power supply (UPS), with battery rack and automatic transfer switch to supply continuous regulated power to the PLC/PCS Network Equipment Rack and other components as specified herein and shown in the Drawings. The UPS shall sustain full power to UPS-powered loads listed below following loss of primary power. The UPS shall prevent transient power surges and dips that may affect the operation of the PLC/RTU system.
- B. UPS Powered Loads
  - 1. All rack mounted PLC/RTU components.
  - 2. Local panel-mounted OIT.
  - 3. All power supplies furnished with the PLC/RTU and associated loads (i.e. includes all instruments powered from power supply in the PLC/RTU Cabinet).
  - 4. All 120V field instrumentation powered from a PLC/RTU control panel such that the field instrument may remain fully operational.
  - 5. All components within a control panel that have an internal processor.
  - 6. All components within or directly powered by, a network (communications) panel such that the (network) panel may remain fully operational while on UPS power. These could include network core equipment including but not limited to backbone switches, routers, firewalls, gateways.
- C. Locate UPS and related components within PLC/RTU Cabinet.
- D. Design and Fabrication
  - 1. Size UPS to provide minimum 30 minutes sustained power at 200% of connected load.
  - 2. UPS shall be compatible with Schneider Electric StruxureOn APC software.
  - 3. Frequency range: 45-65 Hz.
  - 4. Input protection:
    - a. Fuse or circuit breaker.
  - 5. Output voltage regulations:
    - a. +/- 2 percent online.
    - b. +/- 3 percent on battery mode.

6. Extended Battery Module:
  - a. Sealed, lead-acid; maintenance free.
  - b. Compatible with selected UPS unit.
  - c. Rack- or Panel-mounted as required.
7. Operating temperature: 32 to 104 °F.
8. Relative humidity: 0-95 percent non-condensing.
9. Utilize Ethernet communication module to communicate the following information to the PLC/RTU:
  - a. UPS on battery.
  - b. Battery low.
  - c. UPS on Bypass.
  - d. UPS batteries disconnected.
  - e. UPS overload.
  - f. UPS high temperature.
  - g. Battery over voltage.
  - h. UPS fault.
10. Control panel mount:
  - a. If the UPS cannot be mounted within the PLC/RTU control panel due to space constraints, the UPS rack assembly may be mounted in separate dedicated enclosure. The dedicated enclosure:
    - 1) Shall be permanently mounted in close proximity to the PLC/RTU enclosure it serves. UPS enclosure shall not be a cart type enclosure or an enclosure with wheels.
    - 2) Shall maintain the same NEMA rating as the PLC/RTU panel, assuming the PLC/RTU panel NEMA rating is suitable for the UPS panel location.
    - 3) Shall have the same access requirements (lockable, etc.) as the panel it serves.
    - 4) Prefer wall-mount type enclosure where possible.
    - 5) Conduit shall be sealed to avoid heat transfer between enclosures.

## 2.02 ACCESSORIES

### A. Maintenance Bypass Switch

1. Provide a maintenance bypass switch to allow disconnection of the UPS from the power source and load in the event of needed maintenance or replacement of components.
2. Sized for maximum UPS VA or greater.

B. Extended Battery

1. Provide an extended battery or batteries as necessary to achieve the specified on battery run time. Battery shall be by same manufacturer as UPS.

C. Communications Modules

1. Provide an Ethernet communications module for network connectivity.
2. Communication card shall also include the following configurable Form C Relay (dry) contacts which shall be hardwired to the associated PLC for alarm at the PCS:
  - a. UPS on battery power
  - b. Low battery
  - c. General UPS fault

D. Power Management Software

1. Provide a licensed version of the manufacturer's software for communicating UPS status to PCS.
  - a. If current licensed version of the software already exist at the owner's facility additional copies/licenses are not required.
2. Provide UPS with a USB port to allow connection to a computer to use with manufacturer provided diagnostics and configuration software. Software shall be capable of running full diagnostics on the connected UPS to display the battery health and available battery life on full charge as well as any alarms and warnings of imminent failure.

E. Mounting Hardware

1. Provide mount assembly for mounting inside control or auxiliary panel.

END OF SECTION

NO TEXT ON THIS PAGE

## SECTION 40 90 10

### PROCESS CONTROL SYSTEM FACTORY ACCEPTANCE TESTING (FAT)

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. Systems Integrator shall demonstrate the entire control systems operation and networking to illustrate the capabilities and functioning of the control system as called out in the Contract Documents.
- B. The Owner/Engineer will witness test all equipment covered by this Specification Section at any time during manufacturing, assembling and/or testing. The System Integrator shall provide the Owner/Engineer with copies of the factory test procedures and subsequent results. The factory test procedures will be reviewed and accepted by the Owner/Engineer prior to scheduling the testing date. The Seller shall provide the Owner/Engineer, with the factory testing date, in writing. A minimum of two weeks advance notice shall be given prior to the factory testing.
- C. Related Specification Sections include but are not necessarily limited to:
  - 1. Division 00 - Procurement and Contracting Requirements.
  - 2. Division 01 - General Requirements.
  - 3. Section 40 90 00 - Instrumentation and Control: General Requirements
  - 4. Section 40 90 02 - Programmable Logic Controllers: Hardware and Software
  - 5. Section 40 90 03 - Operator Interface Terminals, Operator Work Stations and Programming Work Stations
  - 6. Section 40 90 04 - Primary Sensors and Field Instruments
  - 7. Section 40 90 05 - Control Panels and Enclosures
  - 8. Section 40 90 06 - Panel Instruments and Devices
  - 9. Section 40 90 07 - Input/Output Lists
  - 10. Section 40 90 08 - Control Strategies
  - 11. Section 40 90 09 - Uninterruptible Power Supplies (UPS)
  - 12. Section 40 90 11 - Process Control System Network Hardware and Software
  - 13. Section 40 96 52 - Configuration Requirements: HMI and Reports
  - 14. Section 40 99 00 - Surge Protection Devices for I&C Equipment

- D. Process Control System Factory Acceptance Testing provided by manufacturer as part of package control systems:
  - 1. Certain control panels are furnished by manufacturers of equipment specified under other Sections as part of a packaged system. In general, those panels shall be tested according to the requirements of the manufacturer and this specification section.

## 1.02 QUALITY ASSURANCE

- A. See Specification Section 40 90 00 - Instrumentation for Process Control - Basic Requirements.
- B. All PLC based control panels, consoles and cabinets shall be inspected. Inspection shall include, but not limited to:
  - 1. Panel tags
  - 2. Panel internal wiring size and color coding
  - 3. Terminal block contact ratings and numbers
  - 4. Proper wiring practices and grounding
  - 5. Panel condition and finish
  - 6. HMI and/or OIT configuration including graphic screens, symbols, navigation and security
  - 7. PLC logic functionality and commenting
  - 8. Historian configuration
  - 9. Report configuration
  - 10. Network component configuration
- C. The Factory Acceptance Test (FAT) shall not commence until the two graphic configuration and database review workshops per Section 40 96 52 have been completed and programming for all associated PLCs has been completed including all outstanding comments from the Owner and/or Engineer made during the workshops have been addressed.

## 1.03 FACTORY ACCEPTANCE TEST (FAT) - SYSTEM HARDWARE TESTING

- A. The hardware test shall demonstrate the functioning of the control panel hardware as per the requirements of the Contract Documents.
- B. All hardware components shall be tested to verify proper operation of the equipment as stand-alone units. Test shall include, but not limited to:
  - 1. AC/DC power check
  - 2. Power fail/restart tests
  - 3. Diagnostic testing
  - 4. UPS test



5. Panel exterior and interior tagging check
6. Panel internal wiring check
7. A/C and/or Heating functionality

1.04 FACTORY ACCEPTANCE TEST (FAT) - SYSTEM SOFTWARE AND NETWORK TESTING

- A. Systems Integrator shall demonstrate the entire control systems operation and networking at the Factory Acceptance Test (FAT) to illustrate the capabilities and functioning of the control system as called out in the Contract Documents.
- B. Systems Integrator shall utilize the simulation software as described in 2.1 of this section and the HMI software as per Section 40 96 52 to demonstrate the fully functioning control system. Simulation software and HMI shall be installed and configured on the new Workstation that is to be supplied under Section 40 90 03.
- C. Simulation software and HMI shall utilize the Contract tagging for all I/O points and HMI statuses and alarms as per the Contract Documents.
- D. The software simulation shall include, but not limited to:
  1. Simulation of all hardwired inputs and outputs (process simulation) as described in the Contract Specifications and Drawings.
  2. Dynamic HMI symbols that change color according to their real-time status.
  3. Graphic symbols that represent the process as shown on the Contract Drawings.
  4. Graphic symbols that represent each field instrument, valve, pump, equipment, alarm and control stations and panel as shown on the Contract Drawings.
  5. Tag numbers for all panels, alarm and control stations, equipment, pumps, valves, field instruments, consoles and cabinets as shown on the Contract specifications, schedules and drawings.
  6. The stand-alone workstation shall model and simulate the entire process feedback and real-time status using dynamic graphics, text and symbols.
  7. Alarm list including demonstration of new and acknowledged alarms.
  8. Historical trends of all I/O points.
- E. Systems Integrator shall demonstrate the communication of the PLCs in the network and also demonstrate the self-healing ring feature of the network. Fiber cable break and Ethernet switch failures shall also be demonstrated to illustrate the resiliency of the communication network as per the Contract Documents.

- F. Systems Integrator shall demonstrate the diagnostics and monitoring of all PLCs including vendor supplied PLCs that are connected to the network. Systems Integrator shall make provision for at least one (1) model of every vendor supplied PLC type to be available for the FAT and connected to the system.
  - 1. Where PLC to PLC communications are required for control, Systems Integrator shall demonstrate communications and communications failure mode response.
- G. The Owner and/or Engineer shall have full authorization to take control of the testing workstation and make changes via the HMI software for the entire duration of the Factory Acceptance Test (FAT).
- H. System performance shall be tested as a full integrated system including all software and hardware. To achieve this, the entire control system including all the peripheral devices such as the Network Interface Panels (NIP), servers, and Ethernet switches shall be assembled on the factory test floor.
- I. The Factory Acceptance Test (FAT) shall be performed at the Systems Integrator's factory and the duration of the FAT shall be for a period of no less than four (4) business days.
- J. Seller shall retain the services of the Systems Integrator project PLC and HMI programmer(s) for the entire duration of the FAT. The Seller shall bear all costs for the FAT.
- K. Seller shall provide a written notice to the Owner and Engineer at least thirty (30) days prior to the commencement of FAT for the Owner and Engineer to make necessary arrangements.

#### 1.05 SUBMITTALS

- A. See Specification Section 01 33 00 - Submittals for requirements for the mechanics and administration of the submittal process.
- B. See Specification Section 40 90 00 - Instrumentation for Process Control - Basic Requirements.
- C. Systems Integrator shall submit a detailed FAT plan for review to the Owner and Engineer at least thirty (30) days prior to scheduled FAT. Any comments by the Owner and/or Engineer shall be addressed prior to commencement of FAT. FAT plan shall include at a minimum the following:
  - 1. Schedule of activities
  - 2. Control panel hardware and components including but not limited to UPS, networking equipment, servers, workstations, etc. inspection checklist
  - 3. HMI and OIT graphics screen layout, configuration, security, and navigation check
  - 4. PLC logic checklist subdivided per Functional Description sequence. Each Functional Description shall have a separate checklist. Each checklist shall include one line item for each associated I/O point described in the Functional Descriptions as well as on the I/O List (See Section 40 90 07 - Input-Output List).

5. Each testing procedure shall be broken into steps. Each step shall include an explanation of how the test is to be performed, a description of the expected result of the test, a space to record test results or comments, and a space for initials.
  6. Historian configuration
  7. Report configuration
- D. Systems Integrator shall submit Instrument loop diagrams for all control and I/O loops, including vendor furnished instrument loops, using ISA standard symbols in accordance with ISA Standard S5.4. Loop diagrams shall include the following:
1. Instrument tag numbers as described in the I/O List Section 40 90 07
  2. Tag name and description of each I/O point
  3. Manufacturer's model, product, or catalog number for each item
  4. Location of each item
  5. PLC I/O address of each I/O point. Include PLC rack, chassis and slot number
  6. Calibrated range of instrument

## PART 2 - PRODUCTS

### 2.01 REAL TIME SIMULATION SOFTWARE

- A. The Systems Integrator shall furnish, install, configure, test, develop and deploy the stand-alone project Engineering Workstation for the FAT. The Engineering Workstation shall be loaded with the fully configured, tested and deployed simulation software with all network and PLC hardware linked, configured and communicating with the Engineering Workstation.
- B. The simulation software shall be one that is acceptable to the Owner and approved by the Owner.
- C. If simulation software manufactured by the HMI software manufacturer is not available Systems Integrator shall utilize Matlab/Simulink by Mathworks Inc. or solidThinking Embed (VisSim) software, or equal as a simulation software to make simulations to fully simulate process operations.
- D. Simulation shall have the following features:
  1. Configuring personalities of discrete and analog field instruments, pumps, valves, MCC, VFD, devices and equipment to simulate the real time plant process.
  2. Full control of behavior of each modeled object within the simulation environment from the Engineering Workstation.
  3. Point-and-click access to object parameters as they are being executed in the background.

4. Simulation software shall be able to communicate with the HMI and all PLCs within the network including vendor supplied PLCs for packaged equipment.
5. Simulation software shall have the capability to develop custom graphics as needed.
6. Simulation software with final configuration shall be turned over to the Owner after project closeout.

## PART 3 - EXECUTION

### 3.01 DEMONSTRATION

- A. The factory acceptance test is to be performed by the Seller and Systems Integrator and is to include hardware and software testing of all control panels included in the project, including all network components and associated interfaces.
- B. Replicate and simulate the control system network to demonstrate network communication between PLC systems, packaged control systems, instruments, process control equipment and all other interfacing devices.
- C. System programming is to be complete prior to each factory test.
- D. In-Factory inspection and testing will be performed at site of panel fabrication and will be witnessed by Engineer and/or Owner
- E. Process Control System PLCs are required to pass in-factory inspection and testing prior to shipment to job site.

### 3.02 TEST PREPARATION

- A. In-Factory Testing Aids and Equipment:
  1. Provide following documents:
    - a. One copy of approved submittals applicable to equipment to be tested
    - b. One copy of Drawings and Specifications, with Addenda and Change Orders
    - c. One master copy of approved test procedure
    - d. Complete inventory of equipment to be tested including make, model, and serial number. Identify firmware revision.
  2. Provide following support facilities:
    - a. Desk with key-lock or lockable room with table for Owner/ Engineer's use
    - b. Meeting room
    - c. Reproduction facilities for copying test information
- B. Meet following criteria prior to start of test:

1. Complete submittals and resolve disputes, if any.
2. Engineer's review of test procedure
3. Include all processors, network interfaces, I/O cards and HMI computer in testing.
4. Set test date agreeable to each party.

C. Schedule

1. Limit testing to 8 hours of testing to 10 hours maximum on location days.
2. Meet each morning to review day's test schedule.
3. Meet each evening to review day's test results and to review or revise next day's test schedule.
4. At end of test, meet to review list of deficiencies. Engineer will indicate those items which shall be corrected prior to shipment.
5. Confirm in writing, locations, times and dates of test 2 weeks before tests.

D. Prior to the scheduling of the witnessed factory test, the Seller and Systems Integrator shall perform a complete and successful non-witnessed factory test, using the approved factory test plan. The non-witnessed factory test shall be documented, and the documentation shall be submitted along with the scheduling request for the witnessed factory test.

E. I/O Testing

1. Testing of all input and output signals from the field terminal strip to the PLC and HMI.
  - a. Discrete Inputs: Test change of state
  - b. Analog Inputs: Test inputs at 4, 12, and 20 mA<sub>dc</sub>
  - c. Discrete Outputs: Manipulate PLC data table/Force discrete outputs from the PLC
  - d. Analog Outputs: Manipulate data table to test outputs at 4, 12, and 20 mA<sub>dc</sub>

F. PLC Logic Testing

1. Test all PLC logic to demonstrate that the process control logic functions in accordance with the Contract Documents and approved shop drawings.
2. Demonstrate each specified functional requirement using simulated inputs and outputs, including but not limited to, alarm generation and handling, mode selection, and operator entries.
3. Demonstrate all equipment control functionality, including all manual and automatic control functionality, using simulated inputs and outputs.

G. Communication Failure Testing

1. Test will demonstrate communication failure alarm when a network connection is lost
  - a. Each data highway will be disconnected.

- b. Communication alarms and failure modes will be verified.

#### H. Power Failure / System Restart Testing

- 1. Main power to system will be removed and then reconnected. System will re-boot and demonstrate recovery, start-up services and sequence.

#### I. Machine Interface Software/PLC Configuration:

##### 1. General:

- a. All calculations, trip points from analog values, timers, numeric manipulations, etc., shall be accomplished in the PLC and not in the operator interface software.
- b. Alarms:
  - 1) All open/close valves and on/off motors monitored by the PLC system shall have a maximum time value allowed to either open/close or start/stop.
  - 2) Failure to achieve the control function within this maximum time value will result in a time out alarm for each piece of equipment.
  - 3) An alarm will be generated from the PLC to the operator interface software for indication of the control function time out failure (i.e., Pump XXX-XXX FAIL TO START or Valve XXX-XXX FAIL TO CLOSE, etc.).
  - 4) Other specific alarms are designated in the control loop descriptions.
  - 5) All alarms are to be sealed in at the PLC until acknowledged via the operator interface.
- c. Analog inputs: All analog inputs to the PLC shall be configured in the operator interface software for historical trending.
- d. Analog outputs: All setpoints for minimum and maximum values shall be operator adjustable via the operator interface software.
- e. Operator entries: Entries made by the operator (such as operation modes, setpoints, etc.) shall be displayed on the process screens for information.

##### 2. Screens:

###### a. General:

- 1) The screens for process control/observation shall be configured using a 3-level hierarchy plus an alarm screen, PLC System status screen, Report Selection screen, and real-time/historical trend displays.
- 2) The top level is the plant overview.

- 3) The second level is the process screens with the equipment control detail screens the bottom level.
- b. Process Overview:
- 1) The process overview screen shall consist of a full schematic of the process and contain active displays for the major process flows and levels.
  - 2) Each process flow area shall be "active" so that clicking with the mouse will take the operator to a process screen showing full status for all of the items in that process area.
  - 3) At the bottom of the process overview screen shall be a button to move to the alarm screen, a button to move to the historical/real time trend display, a button to move to report generation, and a button to move to the PLC system status screen.
- c. Process Screens:
- 1) The Process Screens shall be developed to show the full status for each train within the process displayed.
    - a) If the Process Train cannot be depicted on one screen, provide multiple screens to show the process train. Provide Forward and Back push buttons to toggle between the separate displays of a process train.
  - 2) The color of the equipment shall vary as well as a text indicator to show the status of each valve, pump, etc.
  - 3) All analog values associated with the process displayed shall be shown.
  - 4) Each piece of equipment which can be controlled shall be "active" and allow the operator to click on the equipment and bring up a pop-up equipment changes control detail screen.
  - 5) There shall be three (3) buttons in the same location at the bottom of each process screen to move back to the plant overview screen, the alarm screen, and the trend screen.
- d. Equipment Control Detail Pop-up:
- 1) Develop a set of standard equipment control detail pop-ups to be used for each type of equipment controlled from the HMI.
  - 2) Each pop-up shall include a DONE button that hides the pop-up when done.
  - 3) Equipment symbol elements in the pop-up shall be animated to show when the equipment changes state to the command state.
- e. Alarm Screen:

- 1) Regardless of which screen an operator is on, a flashing red ALARM box will come up on the current screen directing the user to the alarms screen.
  - 2) The flashing red ALARM box will not go away until the alarm is acknowledged by a user.
  - 3) All alarms will have a time date stamp and will be printed to a dedicated printer.
  - 4) Alarm designation names are called out in the respective control loop description
  - 5) By clicking the alarm box on any screen, the operator will view the Alarm Screen.
- f. Screen List:
- 1) Process Overview
  - 2) Process Screens (5 minimum):
    - a) Minimum of one (1) screen per VPSA
    - b) Minimum of one (1) screen for the LOX system
  - 3) Equipment Detail Control Pop-Ups:
    - a) Blower Start/Stop.
    - b) Valve Open/Close
3. The OIS displays shall be animated as necessary to clearly convey equipment status, operation modes, process displays, alarms, etc.
- a. Equipment Status Color:
    - 1) Equipment Off but Available: White
    - 2) Valve Closed: Yellow
    - 3) Valve Open: Blue
    - 4) Valve in Transition: Gray
    - 5) Equipment/Motor/Pump Running: Green
    - 6) Alarm/Overload/Lockout/Tagout: Red
    - 7) Power: White
  - b. Provide numeric representation of process signals in engineering units.
    - 1) Graphical animation shall also be used to depict levels in tanks, wetwells, and sumps where these signals are available.
  - c. All HMI displays shall use consistent styles to convey information to operator, and for operator entry.



4. Demonstrate that the graphical interface is configured in accordance with the Contract Documents and approved shop drawings. Using simulated inputs and outputs, demonstrate complete monitoring and control capabilities from the graphical interface.

END OF SECTION

NO TEXT ON THIS PAGE

## SECTION 40 90 11

### PROCESS CONTROL SYSTEM NETWORK HARDWARE AND SOFTWARE

#### PART 1 - GENERAL

##### 1.01 SUMMARY

###### A. Section Includes:

1. PCS network and HMI hardware requirements, which include, but are not necessarily limited to:
  - a. Managed Ethernet Switches
  - b. Rack Mounted UPS
  - c. Rack Mount Fiber Optic Patch Panels
  - d. Software.
  - e. Accessories and Maintenance Materials.

###### B. Related Specification Sections include, but are not necessarily limited to:

1. Division 00 - Procurement and Contracting Requirements.
2. Division 01 - General Requirements.
3. Section 40 90 00 - Instrumentation and Control General Requirements
4. Section 40 90 02 - Programmable Logic Controllers Hardware and Software

##### 1.02 QUALITY ASSURANCE

###### A. Referenced Standards

1. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
  - a. 802.3, Information Technology - Local and Metropolitan Area Networks - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications.
    - 1) 802.3u: IEEE Standards for Local and Metropolitan Area Networks: Supplement to Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications Media Access Control (MAC) Parameters, Physical Layer, Medium Attachment Units, and Repeater for 100 Mb/s Operation, Type 100BASE-T.
    - 2) 802.3x: IEEE Standards for Local and Metropolitan Area Networks: Specification for 802.3 Full Duplex Operation.
    - 3) 1394, High Performance Serial Bus.

### 1.03 DEFINITIONS

- A. HMI: Human Machine Interface.
- B. LED-backlit LCD: Light Emitting Diode backlit Liquid Crystal Display.
- C. OIT: Operator Interface Terminal.
- D. OPC: “OLE for Process Control”, a software standard utilizing a client/server model that makes interoperability possible between automation/control applications and field systems/devices.
- E. PC: Personal Computer.
- F. RAID: Redundant Array of Independent Disks, a method of storing the same data in different places on multiple hard disks.
- G. RAM: Random Access Memory.
- H. SDRAM: Synchronous Dynamic RAM.
- I. SNMP: Simple Network Management Protocol, a set of protocols for managing complex networks.

### 1.04 SUBMITTALS

- A. Shop Drawings
  - 1. See Specification Section 01 33 00 - Submittals for requirements for the mechanics and administration of the submittal process.
  - 2. See Specification Section 40 90 00 – Instrumentation and Control System General Requirements.
  - 3. Product technical data including:
    - a. Acknowledgement that products submitted meet requirements of standards referenced.
    - b. Manufacturer's installation instructions.
  - 4. Fabrication and/or layout drawings.
  - 5. Provide all documentation corresponding to PCS communication configuration.
  - 6. Provide digital copy of the fully configured system or modifications submitted in CD-ROM format.
  - 7. Submit fully documented electronic editable and paper copy of PLC, HMI, OIT data tables and system addressing lists to Owner for their support of the system. These submittals shall be provided before each factory test, each system acceptance, and updated at the end of the warranty period.

8. Submit requests for network address for each system and obtain these addresses from the Owner.
9. Submit proof of software licenses demonstrating that the license is held by the Owner for all licensed software.
10. Submit detailed project specific datasheets on hardware, software packaged by system, panel, and application.
11. Electronic (editable copy) of PLC code and HMI application program.
12. Submit OEM software supplied by the manufacturer for each component, including operating system, application programs, diagnostic tools, etc.

B. Contract Closeout Information

1. Operation and Maintenance Data:
  - a. See Specification Section 01 78 23 - Operation and Maintenance Manuals for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
2. Submit fully documented electronic editable and paper copy of PLC, HMI, OIT programs, data tables, system addressing, and I/O Point lists to Owner for their support of the system. Provide these submittals before each factory test, each system acceptance, and updated at the end of the warranty period.
3. Provide electronic (editable copy) of the fully configured PLC code and HMI application program in CD-ROM format and USB storage drive format.
4. Provide digital copy of the fully configured system or modifications submitted in CD-ROM format and USB storage drive format.
5. Provide proof of software licenses demonstrating that the license is held by the Owner for all licensed software.
6. Submit OEM software supplied by the manufacturer for each component, including operating system, application programs, diagnostic tools, etc.
7. Provide trouble-shooting procedures for hardware supplied as specified herein.
8. Provide recommended preventive maintenance tasks, schedules, and instructions for hardware supplied as specified herein.

C. Record Documents

1. Provide Record Documents in accordance with Section 01 78 18 - Contract Closeout and Section 40 90 00 -Instrumentation for Process Control - Basic Requirements.

## 1.05 WARRANTY

- A. The warranty on the hardware and software shall be three years, minimum.

## 1.06 MAINTENANCE

- A. Provide recommended preventive maintenance tasks, schedules, and instructions for hardware supplied. The PM documentation shall be clear, applicable to hardware provided, concise and accurate.
- B. Provide maintenance of the PCS during the warranty period.

## 1.07 TROUBLESHOOTING

- A. Provide trouble-shooting procedures for hardware supplied. Provide accurate procedures, easy to understand and follow, current, and comprehensive in scope. If links to vendor website or technical support is necessary, provide up-to-date phone numbers and links.

## PART 2 - PRODUCTS

### 2.01 MANAGED ETHERNET SWITCHES

- A. Acceptable Manufacturers
  - 1. Cisco IE 3000
  - 2. Rockwell Automation Stratix 5700
  - 3. Moxa
  - 4. Or Equal
- B. Provide managed Ethernet switches as shown on the Drawings and the Schedule herein.
- C. Managed Ethernet Switches
  - 1. Design and fabrication:
    - a. Support Ethernet 100 Mbit/s.
    - b. Support SNMP and Web based management.
    - c. Rapid Spanning Tree Protocol and VSS.
    - d. Unmanaged Ethernet switches shall not be used.
    - e. IGMP (Internet Group Management Protocol) support for IP multicast filtering to enable switches to automatically route messages only to appropriate ports.
    - f. AT least Four (4) 10/100 BASE-FX backbone fiber ports for connection to multimode fiber via type ST LC Design Revision No. 22 connectors.
      - 1) Quantity as required for communication with devices as depicted in the Contract Documents.

- g. At least eight (8) 10/100/1000 BASE-TX twisted pair ports (RJ45) as required for communication with devices as depicted in the Contract Documents.
  - 1) Unless otherwise noted, provide at least two (2) spare 10/100/1000 MBit/s port (twisted pair) at each Ethernet switch.
- h. Check all received data for validity.
  - 1) Discard invalid and defective frames or fragments.
- i. Monitor connected TP/TX line segments for short-circuit or interrupt using regular link test pulses in accordance with IEEE 802.3.
- j. Monitor attached fiber optic lines for open circuit conditions in accordance with IEEE 802.3.
- k. As applicable, meet requirements of IEEE 802.3.
- l. Power switch with 24 Vdc power input.
- m. Provide LED status lights to indicate:
  - 1) Power: Supply voltage present.
  - 2) Fault.
  - 3) Port status.
- n. Environmental rating:
  - 1) Operating temperature: 32 Deg F to 122 Deg F.
  - 2) Humidity: 95 percent relative humidity, non-condensing.
- 2. Two 10 GB backbone ports for connection to multimode fiber via type SC connectors.
- 3. 10/100/1000 MBit/s twisted pair ports as required for communication with other devices as depicted in the Contract Documents.
- 4. Function in self-healing ring structure.
  - a. If one section in the ring fails, the ring structure changes to a line structure within 0.5 seconds.
- 5. Seller shall identify necessary network addresses, masking, and required custom configuration requirements for each network. Owner will assign these configuration requirements and Seller shall implement using addresses, etc. furnished by the Owner.

D. Schedule

EQUIPMENT NO.	DESCRIPTION	LOCATION	SUPPLIED BY
VPSA1 NS-A & VPSA1 NS-B	VPSA-1 Network Switches	VPSA-1 Control Room	Seller
VPSA2 NS-A & VPSA2 NS-B	VPSA-2 Network Switches	VPSA-2 Control Room	Seller
VPSA3 NS-A & VPSA3 NS-B	VPSA-3 Network Switches	VPSA-3 Control Room	Seller
VPSA4 NS-A & VPSA4 NS-B (if required)	VPSA-4 Network Switches	VPSA-4 Control Room	Seller
LOX NS-A & LOS NS-B	LOX System Network Switches	LOX Control Panel	Seller

2.02 RACK MOUNTABLE UPS

A. Acceptable Manufacturers:

1. APC by Schneider Electric Smart-UPS 3000 VA
2. Or Equal

B. Provide rack mount UPS as shown on the Drawings and the Schedule herein.

C. Design Requirements:

1. Nominal input voltage: 120 VAC
2. Nominal output voltage: 120 VAC
3. Output voltage distortion: Less than 5%
4. Battery type: Maintenance-free sealed lead-acid battery. Leakproof battery.
5. Recharge time: < 3 hours
6. Expected battery life: 3-5 years
7. ENERGY STAR® qualified model
8. Built-in power factor correction and frequency conversion
9. Manual bypass capability
10. Support for up to four battery cabinets



11. Capability to handle:
  - a. Power spikes and transients
  - b. EMI/RFI noise
  - c. Voltage sags and brownout conditions
  - d. Harmonics
12. User replaceable hot-swappable batteries
13. UPS shall be sized for 200 % of associated rack full-load power. UPS shall provide power for a minimum of 30 minutes following loss of primary power.
14. At a minimum UPS shall provide the following Form C relay (dry) contacts:
  - a. UPS on battery power
  - b. Low battery
  - c. UPS general fault
  - d. Provide APC Dry Contact I/O SmartSlot Card for the above-described dry contacts.
15. UPS shall be provided with a USB port to allow connection to a computer to use with manufacturer provided diagnostics and configuration software. Software shall be capable of running full diagnostics on the connected UPS to display the battery health and available battery life on full charge as well as any alarms and warnings of imminent failure.

D. Schedule

EQUIPMENT NO	LOCATION	CAPACITY (VA)
OPRCP UPS	Oxygen Production Facility Control Room	By Seller

2.03 RACK MOUNT FIBER OPTIC PATCH PANELS

A. Acceptable Manufacturers:

1. Corning™ model CCH-04U
2. Or Equal

B. Rack Mount Fiber Optic Patch Panels:

1. Design and fabrication:
  - a. Closet Connector Housings (CCH) shall provide interconnect or cross-connect capabilities between outside panel, rise or distribution fiber cables.
  - b. Housings shall accept up to 12 Corning™ CCH connector panels.

- c. Units shall be designed for rack mounting in 19” racks.
- d. Unit shall be 4U (4 rack units).
- e. Unit shall feature a clear-door, removable front and rear enclosures and a platinum-painted interior for maximum visibility and access.
- f. Manufacturer provided strain relief brackets, routing clips and guides and mounting brackets shall be furnished.
- g. Manufacturer provided documentation labels shall be furnished.
- h. Unit shall be provided with a removable tinted polycarbonate front door.
- i. Furnish manufacturer provided CCH splice cassettes model CCH-CS. PCS Systems Integrator shall determine quantity.
- j. Furnish at least 8 Corning™ CCH connector panels in each unit or as required.

C. Schedule

EQUIPMENT NO.	LOCATION	SUPPLIED BY
OPRCP PP	Oxygen Production Facility Control Room	Seller

2.04 PANEL MOUNT FIBER OPTIC PATCH PANELS

A. Acceptable Manufacturers

- 1. Corning™ model SPH-01P
- 2. Or Equal

B. Cabinet (Panel) Mount Fiber Optic Patch Panels

- 1. Design and fabrication:
  - a. DIN rail mountable single panel housing shall allow fiber optic cable protection and connectivity in control panels.
  - b. Metal housing with smooth, black powder coat finish.
  - c. Housings shall accept at least 2 Corning™ CCH connector panels.

C. Schedule

EQUIPMENT NO.	DESCRIPTION	LOCATION	SUPPLIED BY
VPSA1 PP	VPSA-1 Patch Panel	VPSA-1 Control Room	Seller
VPSA2 PP	VPSA-2 Patch Panel	VPSA-2 Control Room	Seller
VPSA3 PP	VPSA-3 Patch Panel	VPSA-3 Control Room	Seller
VPSA4 PP (if required)	VPSA-4 Patch Panel	VPSA-4 Control Room	Seller
LOX PP	LOX Patch Panel	LOX Control Panel	Seller

2.05 SOFTWARE

A. Provide all software and associated programming/configuration required to meet performance requirements of the Contract Documents.

1. At substantial completion of the Project:

- a. Turn current licenses for all software over to the Owner in the Owner's name and install the latest version, upgrade or service pack for all software.
- b. Provide the respective software supplier's Comprehensive Support Contract for all software covering a full one (1) year warranty period following substantial completion which shall provide no cost software upgrades, service packs and tech support from the software supplier.

B. HMI Software

1. Subject to compliance with the Contract Documents, the following HMI software packages are acceptable:

- a. Rockwell Automation FactoryTalk SE 500 Display with RSLinx bundle
- b. Schneider Electric WonderWare InTouch.
- c. Or Equal

2. The HMI software shall be the manufacturers standard off-the-shelf software and the latest stable version released at the time of procurement.

3. The HMI software shall load and run on operator and engineering workstations running Microsoft Windows® 10 Pro 64-bit Operating System.

4. The HMI and Data Servers will have the ability to run in a redundant mode as well as virtualization mode with load sharing and redundancy in this mode.

5. HMI software shall have built-in security features compatible with Microsoft Windows® security.

6. HMI software shall be able to browse all tags in the associated PLC controllers.
7. Seller shall develop HMI screens and graphics in accordance with the requirements of Specification Section 40 96 52.
8. The HMI shall support multiple HMI servers in an application. HMI servers can also be redundant.
9. The HMI editor should allow for simultaneous collaboration by multiple developers.
10. The HMI shall provide a tool to show the status of installed product patch file versions currently installed on a computer.
11. The HMI shall provide the ability to design high-level graphics for complex applications either by using its own drawing editor or by importing graphic files from other drawing packages such as AutoCAD®, CorelDRAW® and Photoshop™. Specifically, the HMI shall allow importing of the following file formats: WMF, .CLP, .BMP, .TIF, .GIF, .PCX, and .JPEG. The HMI shall include, but not be limited to, the following graphic object animations: position, rotation, size, visibility, color, fill, slider, and touch.
12. The HMI shall support data servers as a means to communicate with any OPC server.
13. The HMI clients shall be able to view tag data from any HMI server or data server in the application as well as displays.
14. The HMI shall support remote editing. Any computer with sufficient security and the configuration software installed can add, change or delete any configuration information on any computer in the distributed application.
15. The HMI server shall store HMI project components (such as graphic displays) and shall serve these components to clients. The HMI server shall also contain the tag database, perform alarm detection and manage historical data.
16. Runtime HMI Software:
  - a. Provide server/client individually licensed software with capability for all HMIs to be active simultaneously. Runtime licenses shall be installed on all operator workstations.
17. Development Software:
  - a. Install development licenses and software on all Engineering workstations.
18. All HMI software and licenses shall be purchased by the Seller and licensed to the Owner and shall be turned over to the Owner upon final acceptance by the Owner.

19. Data Historian Software:

- a. Provide data historian software compatible with the furnished HMI software package.
- b. The Historian application shall provide with data capture, management and analytical capabilities to help generate improved decision-making.
- c. The Historian shall be capable of providing point trending and the operator shall be able to add multiple trends to a single trend screen. Operator shall be able to adjust the trend time period from a few minutes to many months to analyze various parameter performance over time.
- d. Historian shall include OSI PI Server release 2016 or later.
- e. Historian servers shall be redundant and shall have failover ability.
- f. Historian shall be an SQL database that shall run on Microsoft Windows® OS.
- g. Acceptance Historian products shall be:
  - 1) Rockwell Automation FactoryTalk® Historian Site Edition (SE).
  - 2) Wonderware Historian
  - 3) Or Equal
  - 4) Historian shall support a minimum I/O point tag count of at least 5000 tags and shall be future expandable to support at least 50,000 tags.

20. I/O Capacity Requirements:

- a. As required to meet performance requirements of the Contract Documents.
- b. Capable of handling an additional 50 percent more points (future expansion) without impacting the license.
- c. HMI software shall be licensed to handle 1,000 points.

C. Ethernet Network Management Software

1. Provide Industrial SNMP Expert Edition manufactured by COI Software.
2. Software to include an OPC Server, capable of integrating real-time SNMP data into OPC client enabled HMI software databases.
3. Software shall allow control of polling rate for SNMP requests, as well as limit access to write SNMP data on each SNMP point.
4. Software shall have pre-developed databases for several manufacturer's Ethernet network devices, as well as generic MIB (Management Information Base) databases.

5. Software shall have integrated OPC client data viewer software, so that SNMP data may be viewed without having to create HMI points.
- D. Provide each operator and engineering workstation and server with the latest edition of the following software:
1. Operating system: Microsoft Windows 10 Pro Enterprise 64-bit operating system with latest service pack installed.
  2. Microsoft Office Suite 2016 Office 365.
  3. Microsoft Visio Professional 2016.
- E. All software must be latest edition and licensed to the Owner.

## 2.06 ACCESSORIES AND MAINTENANCE MATERIALS

- A. Provide all accessories required to furnish a complete computer-based network for the control system to accomplish the requirements of the Drawings and Specifications.
- B. Furnish Owner with the following extra materials:
1. One (1) spare Ethernet switch of each type utilized.
  2. One (1) spare toner cartridge per laser printer provided.

## PART 3 - EXECUTION

### 3.01 DEMONSTRATION

- A. Demonstrate system in accordance with Specification Section 01 75 00.

### 3.02 INSTALLATION AND CHECKOUT

- A. Provide installation and checkout in accordance with Specification Section 40 90 00.
- B. Process Control System
1. Seller shall be responsible for furnishing all required hardware, software, and tools for configuring, testing, and troubleshooting the monitoring and control system.
  2. Seller shall complete a full setup, including node and network addresses, equipment identification, and document the setup on configuration sheets. The configuration sheets shall clearly identify parameter settings, switch settings and software settings. These configuration sheets shall be submitted for record purposes.

END OF SECTION

SECTION 40 90 12

PROCESS CONTROL SYSTEM START-UP AND COMMISSIONING

PART 1 - GENERAL

1.01 SUMMARY

- A. Installation Contractor shall test the entire control systems operation and networking to illustrate the capabilities and functioning of the control system as called out in the Contract Documents.
- B. Seller shall be retained by the Installation Contractor to schedule, coordinate and supervise the Site Acceptance Testing of all instrumentation and control components under the scope of this project.
- C. As part of these services, the services of an authorized manufacturer's representative to check the equipment installation and place the equipment in operation is required. The manufacturer's representative shall be thoroughly knowledgeable about the installation, operation and maintenance of the equipment.
- D. Site Acceptance Testing requirements apply, but are not limited to, the following components:
  - 1. Programable controllers: Hardware, software, configuration, and programming
  - 2. HMI/OIT: Hardware, software, configuration, and programming
  - 3. Networking and communication systems: Hardware, software, configuration, and programming
  - 4. Control panels and cabinets provided: Hardware, configuration of internal components.
- E. The Seller shall submit information on field testing procedures to verify that testing shall fulfill the requirements as specified herein. Submittal shall be made at least one month in advance of any scheduled testing and shall include dates of scheduled tests.
- F. Owner and the Engineer may elect to be present during field testing of system equipment, either for individual units or as an integrated system. Presence of PVSC and the Engineer during testing does not relieve the Seller from conforming to the requirements of the Contract Documents and shall in no way imply acceptance of the equipment.
- G. When the field tests have been successfully completed, a report shall be submitted to the Engineer.
- H. Related Specification Sections include but are not necessarily limited to:
  - 1. Division 00 - Procurement and Contracting Requirements.
  - 2. Division 01 - General Requirements.

3. Section 40 90 00 - Instrumentation for Process Control - Basic Requirements
4. Section 40 90 02 - Programmable Logic Controllers: Hardware and Software
5. Section 40 90 03 - Operator Interface Terminals, Operator Work Stations and Programming Work Stations
6. Section 40 90 04 - Primary Sensors and Field Instruments
7. Section 40 90 05 - Control Panels and Enclosures
8. Section 40 90 06 - Panel Instruments and Devices
9. Section 40 90 07 - Input/Output Lists
10. Section 40 90 08 - Control Strategies
11. Section 40 90 09 - Uninterruptible Power Supplies (UPS)
12. Section 40 90 10 - Process Control System Factory Testing
13. Section 40 90 11 - Process Control System Network Hardware and Software
14. Section 40 96 52 - Configuration Requirements: HMI and Reports
15. Section 40 99 00 - Surge Protection Devices for I&C Equipment

## 1.02 QUALITY ASSURANCE

- A. See Specification Section 40 90 00 - Instrumentation for Process Control - Basic Requirements.
- B. All PLC based control panels, local control stations, local alarm stations, consoles and cabinets shall be tested. Testing shall include, but not limited to:
  1. Panel tags
  2. Proper wiring practices and grounding
  3. Panel condition
  4. HMI and/or OIT configuration including graphic screens, symbols, navigation and security.
  5. PLC and/or RTU logic functionality and commenting.
  6. Historian Configuration
  7. Report configuration
  8. Network component configuration



- C. The Site Acceptance Test (SAT) shall not commence until:
  - 1. Installation Contractor has completed and submitted all test forms for control systems structured cabling (fiber optics, CAT6, other communications networks) .
  - 2. The Factory Acceptance Test (FAT) has been completed and all FAT comments from the Engineer and/or Owner and punch list items are addressed by the Seller.
  - 3. System Checkout and Loop Checkout have been completed and all loop checkout forms are signed by the Seller and Installation Contractor and submitted and approved by the Engineer.
  - 4. Instrument certification sheets have been completed and all forms signed by Seller and Installation Contractor, submitted, and approved by engineer.

### 1.03 SYSTEM CHECKOUT AND LOOP CHECKOUT

- A. System checkout shall not commence until all loop diagrams are submitted and approved by the Engineer and/or Owner.
- B. The Seller and the Installation Contractor shall perform the following:
  - 1. Checkout and approval of the installation of all field instruments, local control stations, alarm stations, PLC and RIO control panels and all cable and wiring interconnects between various panels and the Process Control System.
  - 2. Conduct a complete system checkout and field adjustment, including calibration of instruments for instruments that have calibration drift from the time of factory calibration, tuning of control loops, adjustment of alarm and control setpoints in the Process Control System and testing of final control actions.
  - 3. Any issues arising during field checkout and testing shall be promptly corrected.
- C. After the completion of field checkout the Installation Contractor shall begin loop testing. Installation Contractor shall verify with the Seller whether point to point test of the installed wiring has been completed by the Electrical Seller prior to commencing loop testing.
  - 1. Follow loop testing requirements as described in Specification 40 90 00 3.2 F.
  - 2. Submit final instrument loop diagrams for all control loops. Updated loop diagrams shall be available during Site Acceptance Test (SAT).
- D. The Seller and Installation Contractor shall provide any equipment necessary for field checkout and loop testing.

#### 1.04 SITE ACCEPTANCE TEST (SAT)

- A. Following the system checkout the Seller and the Installation Contractor shall perform an integrated Site Acceptance Test (SAT) to verify that all equipment and programmed software are operating as described in the Contract Documents and equipment manufacturers recommendations. The intended monitoring and control functions of the process control system shall also be checked including all statuses, alarms, trends and recording of historical tags at the Process Control System.
- B. The Seller shall demonstrate continuous operation of the Process Control System and all associated equipment including all vendor furnished packaged systems. SAT shall be witnessed by the Owner and/or Engineer including the Owner's plant personnel. Seller shall provide at least a thirty (30) day notice to the Owner and Engineer prior to commencing the SAT for the Owner and Engineer to make preparations.
- C. Duration of the SAT shall be for a period of 30 days. Note to Engineer: Engineer to determine SAT duration depending on the complexity of the project. Delete this Note after before printing.
- D. Process Control System availability at the SAT shall meet or exceed 99.9 percent for the entire duration of the SAT. No system failure shall be permitted during the SAT which shall result in starting the SAT over again. During the SAT the system shall be available to the plant operators for use in normal plant operation. The Seller shall notify the Engineer and Owner at least thirty (30) days in advance if any active plant processes are deemed to interfere with the SAT.
- E. Conditions listed below shall constitute system failures which shall result in a SAT restart. The SAT shall be terminated if one or more of the below conditions occur. Following correction of the problem and written notification by the Seller to the Owner and Engineer a new SAT shall begin:
  - 1. Failure to repair a hardware or software problem within 120 consecutive hours from the time of notification of a system failure.
  - 2. Recurrent hardware or software problems: if the same type of problem occurs three times or more.
  - 3. Software problem causing a processor to halt execution of logic.
- F. Following conditions shall constitute a system failure in determining the system availability based on the equation specified below:
  - 1. Failure of any non redundant operator interface or PLC.
  - 2. Loss of communications between devices on the communications network.
  - 3. Failure of one or more PLC I/O cards.
  - 4. Failures of any type affecting 5 or more input/output points simultaneously.
  - 5. Failure of any logic causing a halt in the automatic control logic.
  - 6. Failure of power supply.
  - 7. Failure of three or more field instruments simultaneously.

G. System availability shall be calculated based on the following equation:

$$A = \frac{TTO}{(TTO + TTR)} \times 100\%$$

where: A = System availability in percent  
TTO = Total time in operation  
TTR = total time to repair

- H. Time to repair shall be the period between the time that Seller is notified of a system failure and the time that the system has been restored to proper operation in terms of hours with an allowance for the following dead times which shall not be counted as part of the time to repair period.
- I. The Installation Contractor shall create and maintain an incident log which shall be submitted with the SAT plan. The incident log shall be used to perform availability calculations.
- J. Any issues and incompletions arising during the SAT shall be promptly addressed and re-tested during the SAT and confirmed completed by the Owner and/or Engineer.
- K. The SAT shall be deemed complete only after all Process Control System functions including programmed logic, HMI graphics, all communication between interconnected panels including vendor furnished panels is successfully tested.

#### 1.05 SUBMITTALS

- A. See Specification Section 01 33 00 - Submittals for requirements for mechanics and administration of the submittal process.
- B. See Specification Section 40 90 00 - Instrumentation for Process Control - Basic Requirements.
- C. Installation Contractor shall submit a detailed SAT plan for review to the Owner and Engineer at least thirty (30) days prior to scheduled SAT. Any comments by the Owner and/or Engineer shall be addressed prior to commencement of SAT. SAT plan shall include at a minimum the following:
1. Schedule of activities
  2. Control panel hardware and component inspection checklist
  3. HMI and/or OIT graphics screen layout, configuration, security and navigation check
  4. PLC logic checklist subdivided per Functional Description sequence. Each Functional Description shall have a separate checklist. Each checklist shall include one line item for each associated I/O point described in the Functional Descriptions as well as on the I/O List (Section 40 90 02A).
  5. Historian configuration

6. Reports Configuration
7. Network Testing and Verification Plan

D. Record Documents

1. Provide Record Documents in accordance with Section 01 78 18 – Contract Closeout and Section 40 90 00 – Instrumentation and Control System General Requirements.
2. Installation Contractor shall submit final Instrument loop diagrams for each loop following successful completion of SAT.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

A. Operator Interface Software/PLC Configuration

1. General:
  - a. All calculations, trip points from analog values, timers, numeric manipulations, etc., shall be accomplished in the PLC and not in the operator interface software.
  - b. Alarms:
    - 1) All open/close valves and on/off motors monitored by the PLC system shall have a maximum time value allowed to either open/close or start/stop.
    - 2) Failure to achieve the control function within this maximum time value will result in a time out alarm for each piece of equipment.
    - 3) An alarm will be generated from the PLC to the operator interface software for indication of the control function time out failure (i.e., Pump XXX-XXX FAIL TO START or Valve XXX-XXX FAIL TO CLOSE, etc.).
    - 4) Other specific alarms are designated in the control loop descriptions.
    - 5) All alarms are to be sealed in at the PLC until acknowledged via the operator interface.
  - c. Analog inputs: All analog inputs to the PLC shall be configured in the operator interface software for historical trending.
  - d. Analog outputs: All setpoints for minimum and maximum values shall be operator adjustable via the operator interface software.
  - e. Operator entries: Entries made by the operator (such as operation modes, setpoints, etc.) shall be displayed on the process screens for information.

2. Screens:
  - a. General:
    - 1) The screens for process control/observation shall be configured using a 3-level hierarchy plus an alarm screen, PLC System status screen, Report Selection screen, and real-time/historical trend displays.
    - 2) The top level is the plant overview.
    - 3) The second level is the process screens with the equipment control detail screens the bottom level.
  - b. Plant Overview:
    - 1) The process overview screen shall consist of a full schematic of the process and contain active displays for the major plant flows and levels.
    - 2) Each process flow area shall be "active" so that clicking with the mouse will take the operator to a process screen showing full status for all of the items in that process area.
    - 3) At the bottom of the process overview screen shall be a button to move to the alarm screen, a button to move to the historical/real time trend display, a button to move to report generation, and a button to move to the PLC system status screen.
  - c. Process Screens:
    - 1) The Process Screens shall be developed to show the full status for each piece of equipment within the process displayed.
    - 2) The color of the equipment shall vary as well as a text indicator to show the status of each valve, pump, etc.
    - 3) All analog values associated with the process displayed shall be shown.
    - 4) Each piece of equipment which can be controlled shall be "active" and allow the operator to click on the equipment and bring up a pop-up equipment changes control detail screen.
    - 5) There shall be three (3) buttons in the same location at the bottom of each process screen to move back to the plant overview screen, the alarm screen, and the trend screen.
  - d. Equipment Control Detail Pop-up:
    - 1) Develop a set of standard equipment control detail pop-ups to be used for each type of equipment controlled from the HMI.

- 2) Each pop-up shall include a DONE button that hides the pop-up when done.
  - 3) Equipment symbol elements in the pop-up shall be animated to show when the equipment changes state to the command state.
- e. Alarm Screen:
- 1) Regardless of which screen an operator is on, a flashing read ALARM box will come up on the current screen directing the user to the alarms screen.
  - 2) The flashing red ALARM box will not go away until the alarm is acknowledged by a user.
  - 3) All alarms will have a time date stamp and will be printed to a dedicated printer.
  - 4) Alarm designation names are called out in the respective control loop description.
  - 5) By clicking the alarm box on any screen, the operator will view the Alarm Screen.
- f. Screen Llist:
- 1) Plant Overview Modifications (1).
  - 2) Process Screens (minimum 4):
    - a) VPSA Screen (one per VPSA)
    - b) LOX Screen
  - 3) Equipment Detail Control Pop-Ups (3):
    - a) PID Controller (with Auto/Manual selection).
    - b) Blower Start/Stop.
    - c) Valve Control.
3. The HMI displays shall be animated as necessary to clearly convey equipment status, operation modes, process displays, alarms, etc.
- a. Equipment Status Color:
- 1) Equipment Off but Available: White
  - 2) Valve Closed: Yellow
  - 3) Valve Open: Blue
  - 4) Valve in Transition: Gray
  - 5) Equipment/Motor/Pump Running: Green
  - 6) Alarm/Overload/Lockout/Tagout: Red
  - 7) Power: White

- b. Provide numeric representation of process signals in engineering units.
    - 1) Graphical animation shall also be used to depict levels in tanks, wetwells, and sumps where these signals are available.
  - c. All OIS displays shall use consistent styles to convey information to operator, and for operator entry.
4. Manual Control:
- a. Supply each preparation system with:
    - 1) HAND/OFF/AUTO selector for pumps/valves/equipment.
    - 2) START and STOP pushbuttons for pumps/equipment.
    - 3) E-STOP pushbutton at the field control panel.
  - b. When in HAND position, the pumps will operate continuously.
5. Automatic Control:
- a. With HAND/OFF/AUTO selector switches at the local control stations are placed in the AUTO position the associated equipment will operate based on logic in the associated PLC.

END OF SECTION

NO TEXT ON THIS PAGE



## SECTION 40 90 13

### PROCESS CONTROL SYSTEM TRAINING

#### PART 1 - GENERAL

##### 1.01 SUMMARY

###### A. Section Includes:

1. Training for process control systems.

###### B. Applicable Specification Sections include but are not necessarily limited to:

1. Division 00 - Procurement and Contracting Requirements.
2. Division 01 - General Requirements.
3. Section 40 90 00 - Instrumentation for Process Control - Basic Requirements
4. Section 40 90 02 - Programmable Logic Controllers: Hardware and Software
5. Section 40 90 03 - Operator Interface Terminals, Operator Work Stations and Programming Work Stations
6. Section 40 90 04 - Primary Sensors and Field Instruments
7. Section 40 90 05 - Control Panels and Enclosures
8. Section 40 90 06 - Panel Instruments and Devices
9. Section 40 90 07 - Input/Output Lists
10. Section 40 90 08 - Control Strategies
11. Section 40 90 09 - Uninterruptible Power Supplies (UPS)
12. Section 40 90 10 - Process Control System Factory Testing
13. Section 40 90 11 - Process Control System Network Hardware and Software
14. Section 40 90 12 - Process Control System Start-Up and Commissioning
15. Section 40 96 52 - Configuration Requirements: HMI and Reports
16. Section 40 99 00 - Surge Protection Devices for I&C Equipment

## 1.02 REQUIREMENTS AND RESPONSIBILITIES

- A. Systems Integrator shall provide all labor, materials, equipment and incidentals as shown, specified and required to schedule, perform and coordinate all required training.
- B. Training classes shall be conducted at times and durations acceptable to Owner.
- C. Systems Integrator shall provide operation and maintenance training for all PCS equipment and software supplied under this Contract as specified herein.
- D. As scheduled, the Seller shall provide on-site and/or factory training by authorized representatives of equipment and software manufacturers. The manufacturer's representative shall be fully knowledgeable in the operation and maintenance of the equipment and/or software.
- E. Seller shall be responsible for all costs, including cost of travel, meals and lodging, if required, associated with training, both on-site and at the manufacturer's facilities, and shall provide all required materials, texts and required supplies.

## 1.03 QUALITY ASSURANCE

- A. Systems Integrator Qualifications
  - 1. The Systems Integrator shall demonstrate and adhere to the qualifications stated in Section 40 90 00 Instrumentation and Control General Requirements.
- B. Training Instructor Qualifications
  - 1. The Systems Integrator shall supply detailed resumes and work experience for all proposed instructors. Because of the highly technical and skilled nature of the training, the Owner shall retain the right of approval and removal of all Systems Integrator staff.
  - 2. Instructors shall be factory certified (certified by the manufacturer) on the hardware and/or software covered by the course(s) which they are teaching. Certifications shall be provided with resumes.
  - 3. Notification of change of instructor shall be submitted to OWNER no less than ten (10) days prior to the scheduled training date. Resume for alternate instructor shall be provided. OWNER shall retain the right to reject alternate instructor and/or reschedule training.

## 1.04 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 - Submittals.
- B. Training Submittals: The Seller shall submit a training plan within 180 days of the effective date of the Notice to Proceed which includes:
  - 1. Detailed agendas and topics covered for each course.
  - 2. Schedule of training courses including dates, durations, and locations of each class.

3. Format for the training defining curricula, lecture format, hands-on training, off-site and field training segments.
4. A detailed Sequence of Operation for each process unit or equipment.
5. A copy of associated O&M manuals for that process unit or equipment. All O&M manuals shall be submitted and approved by the Owner and Engineer prior to training.
6. Materials to be distributed to accompany the training such as vendor and Seller -produced manuals, record documentation, programming documentation, calibration documentation, etc.
7. Resumes of the instructors who will actually perform the training of the Owner's personnel.
8. Paragraph 1.05 G requirements

1.05 GENERAL DESCRIPTION

- A. Training plan development shall be coordinated with the Owner and shall conform to PVSC's training program.
- B. Instruction: The Seller shall provide training for the purpose of familiarizing the Owner's management, maintenance and operating staff with the use, maintenance, calibration, and repair of all components of the Process Control System (PCS).
- C. To the extent practicable, field training shall be scheduled concurrent with the calibration, equipment testing, and process control system testing phases of the project.
- D. The training shall be performed by qualified representatives of the Systems Integrator or the Manufacturer as noted in the table below. Training shall be specifically tailored to this project and reflect the PCS installation and configuration. The table below summarizes training hours required, which shall be furnished as part of the work. All training shall be conducted at the Site unless another location is approved by the Owner.

TRAINING CLASSES REQUIRED	CLASS DURATION (HOURS)	CONDUCTED BY
PCS System Hardware/Software General Familiarity	24 (See Note 1)	SYSTEMS INTEGRATOR
Operator HMI/OIT Training	12 (See Note 2)	SYSTEMS INTEGRATOR
O&M Training – Control Panels	8	SYSTEMS INTEGRATOR
Electrical Training – UPS and related power systems	8	SYSTEMS INTEGRATOR & SELLER

TRAINING CLASSES REQUIRED	CLASS DURATION (HOURS)	CONDUCTED BY
Historical Data/PDMS Reports, Trends, Data Management	8	SYSTEMS INTEGRATOR
Miscellaneous	4	SYSTEMS INTEGRATOR
Project Specific Networks and Troubleshooting and Maintenance	4	SYSTEMS INTEGRATOR'S qualified network technicians
Notes: <ol style="list-style-type: none"> <li>1. Where Allen Bradley PLCs are provided, training for PLCs can be deleted.</li> <li>2. Where Wonderware HMI software is provided, training for HMI training can be deleted.</li> </ol>		

- E. Each training session shall be a maximum of 8 hours in duration. Separate classes shall be conducted for the Owner's maintenance and operating personnel. Maintenance classes shall emphasize troubleshooting, repair, calibration, and other technical aspects of the PCS system. Operator classes shall emphasize operational theory and use of the PCS. Each of the training classes listed above for operations shall be conducted four (4) times during separate weeks to allow for scheduling of Owner's personnel on various shifts.
- F. The training classes shall be scheduled a minimum of 4 weeks in advance of when they are to be conducted. Proposed training material, including a resume for the proposed instructor(s) (indicating previous instructional experience) and a detailed outline of each lesson shall be submitted to the Owner at least 30 days in advance of when the lesson is to be given. The Owner will review the submitted data for suitability and provide comments that shall be incorporated into the course. Final materials will be provided at least four (4) weeks in advance of the training sessions.
- G. Within 10 days after the completion of each class the Systems Integrator shall present to the Owner the following:
1. A list of all Owner personnel that attended the class.
  2. An evaluation of Owner personnel that attended the class via written testing or equivalent evaluation.
  3. Three hard copies of material utilized during the class with all notes, diagrams, and comments shall be provided. Content to also be provided in electronic format. One copy in assembled PDF format. One copy in editable native format of all files (Word, Excel, AutoCAD 2022, etc.). This documentation shall be contained in the Training Manual.

- H. Directed Training: After completion of all PCS training specified above, the Systems Integrator shall provide directed training for up to 4 persons to be selected by the Owner. This training shall be conducted by the individual most familiar with the configuration of this project and who was significantly involved in performing this configuration.
- I. The Systems Integrator shall provide 16 hours of on-site directed training for each selected group of personnel at no separate additional cost to the Owner. This training shall be conducted during two separate one week sessions which shall be scheduled with Owner a minimum of 4 weeks in advance. This training shall have the audio and video digitally recorded by the Seller.
- J. The Owner reserves the right to digitally record any or all portions of training performed for future usage by the Owner's staff.
- K. Training Performance evaluations shall be conducted in accordance with the Owner's PCS Training Program guidelines.

#### 1.06 TRAINING SESSIONS

- A. Conduct training sessions covering at least the following topics:
  - 1. PCS System Overview and Core Competencies
  - 2. Instrumentation - Primary Sensors/Transducers & Field Instruments
  - 3. MCCs, VFDs & Control Panels
  - 4. PCS HMI System
    - a. Operation, monitoring, control modes
    - b. Adjustments: changing set points, passwords, etc.
    - c. Security
  - 5. PLC/RTU Training
    - a. Hardware overview.
    - b. Software overview.
    - c. Maintenance.
    - d. Trouble shooting.
  - 6. Ethernet Network Management Software Training
  - 7. Uninterruptible Power Supply
  - 8. Management of Change

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 40 93 50

FIBER OPTIC CABLE AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Scope

1. This section specifies the fiber optic cabling requirements for the Process Control System.
2. The PVSC WWTP has a fiber optic SCADA network. The fiber network utilizes single-mode fiber optic cable. The Contractor shall coordinate with the Owner to integrate all new components to the existing fiber network under the installation contract.

B. Related work specified in other sections includes, but is not limited to the following:

1. Section 40 90 00 - Instrumentation for Process Control - Basic Requirements

1.02 QUALITY ASSURANCE

A. Not Used

1.03 DEFINITIONS

A. Not Used

1.04 SYSTEM DESCRIPTION

A. Not Used

1.05 SUBMITTALS

A. Shop Drawings

1. Provide submittals as specified in Section 01 33 00 – Submittals and Section 40 90 00 - Instrumentation for Process Control - Basic Requirements.
2. Include the following information in the submittal for fiber optic cabling:
  - a. Manufacturer's product data sheets and complete construction details including physical characteristics of optical fiber, strength members, and jackets.
  - b. Overall dimension of cable.

c. Provide an optical link analysis for each fiber optic link. Calculate point-to-point (transmit/receive) optical power loss of each fiber link using proposed installed cable lengths. Include all losses through connectors.

3. For fiber optic patch panels, submit complete construction details including physical characteristics of each patch panel.

4. Provide end-to-end connection drawings for the fiber optic system extension provided under this Contract. The drawings shall uniquely identify each cable and fiber from the connection point to the existing fiber network, to each patch panel, and from the patch panel to each end user or device.

5. All submittals for this section shall be reviewed and signed by an engineer or technical specialist with a Building Industry Consulting Service International (BICSI) Registered Communications Distribution Designer (RCDD) certification.

B. Reports

1. Not Used

C. Operations and Maintenance Data:

1. Not Used

D. Record Documents:

1. Not Used

1.06 DESIGN REQUIREMENTS

A. Not Used

1.07 DELIVERY, STORAGE AND HANDLING

A. Not Used

1.08 WARRANTY

A. Not Used

1.09 MAINTENANCE

A. Not Used

1.10 SPARE PARTS

A. Not Used



## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Single-Mode Fiber Optic Cable
  - 1. Inter-Building
    - a. Corning Systems FREEDM One Tight Buffered, Interlocking Armored Cable, 024E8F-31131-A1
    - b. Or approved equal
  - 2. Intra-Building
    - a. Corning Systems FREEDM One Tight Buffered, 012E8F-31131-29
    - b. Or approved equal.
- B. Fiber Optic Patch Panel
  - 1. Leviton
  - 2. Draka
  - 3. Corning
  - 4. Or approved equal.
- C. Compact Fiber Optic Patch Panels
  - 1. SNAP and/or SNAP-XL as manufactured by DIN-Space
  - 2. Or approved equal
- D. Terminal Connectors
  - 1. 3M
  - 2. Leviton
  - 3. Or approved equal
- E. Fiber to Copper Media Converters
  - 1. Magnum CSN14 or approved equal

### 2.02 GENERAL

- A. Fiber optic patch cable and hardware provided under this section shall be compatible for use indoor and outdoor with the existing fiber optic cables, patch panels, and devices. Unless otherwise required, the fiber optic patch cables shall be provided with ST connectors on each end.
- B. Design the fiber optic system using the fiber optic cable, patch cable and hardware specified herein. The fiber optic system will be furnished and installed by the Install Contract.

## 2.03 SINGLE-MODE FIBER OPTIC CABLE

- A. Design the fiber optic system using single mode (SM) fiber-optic cable suitable for use with both 1,300 and 1,550 nm transmission equipment.
- B. Inter-Building Fiber Optic Cable
  - 1. Minimum 24 strands
  - 2. OS2 single-mode fiber optic cable
  - 3. Fiber Type: G.652.D
  - 4. Rated for indoor/outdoor use in cable tray, conduit, and ductbanks
  - 5. Rodent resistant
  - 6. Interlocking Armored Cable
  - 7. Gel-Free
  - 8. Riser rated
  - 9. Water blocking
  - 10. Core-locked, Tight-buffered
  - 11. Flame-retardant
  - 12. Operating Temperature: -40° to +70°C
  - 13. Maximum Nominal Outside Diameter of 0.54 inch
  - 14. Manufacturer 25-year warranty
- C. Intra-Building Fiber Optic Cable
  - 1. Minimum 12 strands
  - 2. OS2 single-mode fiber optic cable
  - 3. Fiber Type: G.652.D
  - 4. Rated for indoor/outdoor use
  - 5. All-dielectric
  - 6. Gel-Free
  - 7. Riser rated
  - 8. Water blocking
  - 9. Core-locked, Tight-buffered
  - 10. Flame-retardant
  - 11. Operating Temperature: -40° to +70°C
  - 12. Maximum Nominal Outside Diameter of 0.31 inch
  - 13. Manufacturer 25-year warranty

## 2.04 FIBER OPTIC PATCH CABLE

- A. Design fiber optic system using 2-fiber FO patch cables.
- B. Patch cables shall be duplex type with LC connectors.

## 2.05 FIBER OPTIC PATCH PANELS

- A. Design fiber optic system using rack-mounted or rail-mounted (as required) fiber optic patch panels meeting the following minimum specifications.
  - 1. Capacity for 24 connectors and jumpers. Provide 25% spare ports for future use.
  - 2. For rack-mounted patch panels, provide universal mounting brackets for 19 and 23 inch EIA racks and cabinets. For rail-mounted patch panels, provide mounting brackets for rail-mounting to panel interior.
  - 3. Modular low profile splice tray shall accommodate splicing for fusion and mechanical splices
  - 4. Panels shall be manufactured from 16-gauge, cold rolled steel.
  - 5. Patch panels include the following accessories:
    - a. Sliding tray with tray glides
    - b. Cable strain relief and grounding lugs
    - c. Bend radius protectors
    - d. Routing guides
    - e. Grommetted cable entries
    - f. ST adapters and adapter plates
    - g. Sufficient working space for removal of connectors
    - h. Identification labels
    - i. All cable management hardware required to accomplish the installation
  - 6. Modular low profile splice tray shall accommodate splicing for fusion and mechanical splices.

## 2.06 COMPACT FIBER OPTIC PATCH PANELS

- A. Mounting: DIN rail or surface mounted
- B. UL Listed 1863
- C. Insertion Loss: No greater than 0.2 dB (single mode)
- D. Enclosure Housing: 18 gauge powder-coated steel
- E. Faceplate slide-out mechanism – include a mechanism to support the faceplate while it is opened, permitting hands-free access to the fiber optic adapter connections on the rear of the faceplate.
- F. Terminations: Provide sufficient terminations for the fiber optic cable supplied.
- G. Provide splice tray and connectors for all fibers.

## 2.07 TERMINAL CONNECTORS

A. Design fiber optic system with LC type connectors.

1. Connector specifications:

- a. Insertion Loss: Less than 0.30 dB
- b. Repeatability: Less than 0.2 dB.
- c. Operating Temperature: -40 to +80 degrees C
- d. Body Material: Nickel-plated brass

## 2.08 FIBER TO COPPER MEDIA CONVERTERS

A. Where required for proper operation, shown or specified, design fiber optic system with media converters to convert fiber optic signals to copper.

B. Converters capable of connecting a 10MB (current plant SCADA network speed) fiber link to 10/100MB copper device.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

A. Not Used

### 3.02 INSTALLATION

A. Not Used

### 3.03 FIELD QUALITY CONTROL

A. Not Used

END OF SECTION

## SECTION 40 96 52

### CONFIGURATION REQUIREMENTS - HUMAN MACHINE INTERFACE (HMI) AND REPORTS

#### PART 1 - GENERAL

##### 1.01 SUMMARY

###### A. Section Includes:

1. Configuration requirements for HMI and reports which includes but is not necessarily limited to.
  - a. Specific software functional descriptions.
  - b. Graphics requirements.
  - c. HMI functionality requirements.
  - d. Plant overview screens.
  - e. Process overview screens.
  - f. Detail displays.
  - g. Trend displays.
  - h. PLC hardware/HMI status screen.
  - i. Alarm monitoring.
  - j. Report generation.
  - k. Configuration standards and conventions.
  - l. Screen configuration review meetings.
  - m. Report configuration review meetings.
  - n. Coordination.

###### B. Related Specification Sections include but are not necessarily limited to:

1. Division 00 - Procurement and Contracting Requirements.
2. Division 01 - General Requirements.
3. Section 40 90 00 - Instrumentation for Process Control: Basic Requirements.

##### 1.02 QUALITY ASSURANCE

###### A. Qualifications

1. Programmer(s) shall have had experience in software configuration and installation for at least two (2) projects of similar size and complexity.

##### 1.03 DEFINITIONS

A. HMI: Human Machine Interface.

B. I/O: Input/Output.

C. OLE: Object Linking and Embedding, a document standard developed by Microsoft that enables the creation of an object with one application and the linking or embedding of the object in a second application.

- D. OPC: "OLE for Process Control"; a software standard utilizing a client/server model that makes interoperability possible between automation/control applications and field systems/devices.
- E. PC: Personal Computer.
- F. PLC: Programmable Logic Controller.

#### 1.04 SUBMITTALS

##### A. Shop Drawings

1. See Specification Section 01 33 00 - Submittals for requirements for the mechanics and administration of the submittal process.
2. See Specification Section 40 90 00 - Instrumentation for Process Control - Basic Requirements.
3. Product technical data including:
  - a. Acknowledgement that products submitted meet requirements of standards referenced.
4. Software Configuration Standards and Conventions document.
5. Graphic screen displays; provide in actual colors utilized.
6. Sample reports.
7. Certifications:
  - a. Qualifications of programmer(s).

##### B. Contract Closeout Information

1. Operation and Maintenance Data:
  - a. See Specification Section 01 78 23 – Operation and Maintenance Manuals for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
2. Software Configuration Standards and Conventions - final version.

##### C. Informational Submittals

1. Results of factory testing procedures.
2. Proposed training agendas and schedule.

##### D. Record Documents

1. Provide Record Documents in accordance with Section 01 78 18 – Contract Closeout and Section 40 90 00 - Instrumentation for Process Control - Basic Requirements.

## 1.05 GENERAL FUNCTIONAL REQUIREMENTS

### A. Software Functional Requirements

1. General functional requirements for system configuration are indicated on the Drawings and described in the Specifications.
2. The information presented herein and indicated on the Drawings illustrates the general functional intent of the system and may not be sufficient to fully configure the system.
3. The Seller is responsible for determining what additional information may be required to complete the configuration tasks, and for obtaining this information from the Owner.

### B. Available Process Values

1. All process alarm, equipment status, and process variable values shall be available at any HMI.
2. If communications to a particular I/O point has failed for any reason, then wherever that data is displayed, the software shall post a visual indication that the point is not valid.

### C. Provide comprehensive on-line help for all development functions.

### D. Manual Entry of Data

1. All PC-based HMIs must allow manual entry of surrogate data and other variables, which must then be available for display and use in reports.
  - a. Operator-entered commands from any of the operator workstations must be logged by the computer servers.

### E. System Failure

1. Failure of any PLC, remote I/O hardware, or network communication link must be individually alarmed at HMIs.
2. Unless otherwise specified, each alarm must be specific to a single point of failure.

### F. Software licensing shall allow a minimum of 4 plant HMIs to be active simultaneously.

### G. All process related functions, calculations, timers, and numeric manipulations, shall be accomplished in the PLC hardware and not in the HMI.

1. The HMI shall function as a monitoring system, not as a process controller.
2. The HMI shall transfer data to the PLC system and the PLC system shall perform all control algorithms.

## 1.06 SECURITY

### A. Fully integrate security at all levels into the PCS system to allow only users with appropriate security levels access to individual parts of the system.

## PART 2 - PRODUCTS

### 2.01 SPECIFIC SOFTWARE FUNCTIONAL DESCRIPTIONS

- A. Specific functional requirements for various software control blocks within the computer system are as follows.
- B. Descriptions are general and are not intended to fully indicate the complete functionality of the system.
  - 1. Monitoring of process values:
    - a. Process values derived from analog process variable signals must be historically archived.
      - 1) Store all historical data with time and date of occurrence.
      - 2) Make values available for use in reports.
      - 3) Assign high and low alarms to process values as defined below and otherwise deemed appropriate.
    - b. Provide capability for computer server(s) to retrieve real-time values from the PLC system at adjustable time periods.
    - c. Alarm limits:
      - 1) Set per direction from the Owner.
      - 2) An operator having proper security authorization must be able to enable, disable, and adjust the setpoint of any individual alarm.
- C. Utilize graphic screen displays at the HMI(s) to provide monitoring and control functionality.
  - 1. Hierarchy of HMI screens is in descending order as follows:
    - a. Plant overview screen(s).
    - b. Process overview screens.
    - c. Process screens.
    - d. Pop-up/control screens.
- D. HMI operator interface functionality shall include:
  - 1. Indication of process variables.
  - 2. Configuration of control loop parameters (e.g., setpoints, gains, etc.).
  - 3. Adjustment of controller output.
  - 4. Display of real time and historical process trends.



5. Selector switch and pushbutton station controls.
6. System and process status indicators.
7. Graphic representation of plant operations with interactive status and measurement symbols.
8. Annunciation.

E. Graphics

1. Utilize dynamic variables with unique tags per graphic.
2. Utilize concepts from High Performance Graphics for enhanced situational visualization.
3. Systems Integrator shall follow existing Plant HMI guidelines.
4. Dragging the mouse over designated process areas of screen shall allow the operator to select predetermined processes or equipment and drill down to site-specific detail screens.
5. Critical "overview" information such as tank levels, flows and pressures shall be indicated through data fields or animation effects such as level fills or color change.
6. All monitored and or controlled process equipment shall be animated or color-highlighted to indicate status changes.
  - a. For example, a pump "running" condition shall be signified by the pump color changing to bright red.
7. Tank and vessel levels shall be indicated with a tabular data field and by graphic "fill" simulating a rising or falling level within the tank or vessel.
8. Provide the ability to "drill down" to detail screens or graphics.
  - a. Clicking on a device or process area shall generate a detail graphic or pop-up window to access specific data or control functions.
  - b. All operator adjustments (e.g., set point adjustment, mode selection) shall be accomplished via a pop-up display, and shall not be allowed on the process screen.
9. Standard symbol library:
  - a. User defined.
  - b. Must not require software programming.
10. Single keystroke access from graphic to group display or other custom graphic displays.
11. Capable of being edited by moving, copying, or grouping user defined areas of screen.

12. Utilize a navigation bar.
  - a. Navigation bar utilized on every screen.
  - b. Navigation bar to include navigation functions, active alarm notification, security functions, current date/time display and other functions as required and as agreed upon at the Screen Configuration Review Meetings.

F. Process Overview Screens:

1. As a minimum, provide screens as listed below.
  - a. This list is meant to serve as an initial guide; final determination of process and equipment screen requirements will be made during the Configuration Conferences.
    - 1) Oxygen Production System
2. At a process overview screen, the operator shall be able to select a specific process screen for monitoring/control purposes.
  - a. Monitoring and control functions available at the selected process screen include but are not limited to the following:
    - 1) Select individual equipment items for monitoring and control.
    - 2) Select a control loop or point for control action.
    - 3) Change control mode of loop selected (manual, automatic, cascade).
    - 4) Change setpoint.
    - 5) Issue commands to start/stop and open/close two-state equipment.
    - 6) For manual loading output stations, the operator shall be able to manipulate analog output values.
    - 7) Select a loop and initiate further display, such as the detail display, trend, or hourly averaging.
    - 8) Display and change ratio and bias values.
    - 9) Control field equipment such as motor-operated valves and switches.
  - b. As a minimum, provide screens as listed below:
    - 1) VPSA Overview Screen (one per VPSA unit)
    - 2) LOX Overview Screen

## G. Detail Display

1. Provide separate display for each point.
  - a. Representations of each analog and digital point shall be single user configured faceplate.
  - b. Display shall include alphanumeric representations of all variables and parameters for single loops including but not limited to:
    - 1) Alarm points.
    - 2) Limits.
    - 3) Constants.
    - 4) Interconnections to other loops.
    - 5) Calculating functions.

## H. Trend Displays

1. Real time historical trend displays.
2. Real time on-line trend displays.
3. Capable of displaying multiple points per display.
4. Operator shall be able to select any desired sample time interval.
5. Provide flexibility and easy access to real time and historical trend information for any variable TAG defined within the PCS application.
  - a. As a minimum, provide the following:
    - 1) Provide capability for the user to define trend scenarios.
    - 2) Provide a button to open a dialog window to select multiple variable TAGS and save them as a trend scenario for future use.
    - 3) Provide a pull-down menu to allow the user to open saved trend scenarios.
    - 4) Provide a button to allow the user to select real-time or historical trends.
    - 5) Provide a button to save displayed trend info to a file for export to external software applications (such as Microsoft Excel).
    - 6) Provide a Print Trend button to allow user to print current trend.
6. Utilize Historical Data Server(s) to collect and manage data.

I. PLC Hardware/HMI Status Screen

1. Provide a status screen to depict status conditions and diagnostic information for all major networked equipment.
2. Depict communication status for all networked communicating devices, such as PLC processors, Ethernet switches, PCs, and radios.

J. Alarm Monitoring

1. Provide standard alarm screen functionality to ensure flexibility and quick access to live alarms, alarm history and alarm grouping parameters.
  - a. As a minimum, include the following features and functionality:
    - 1) An Alarm Screen header bar to head all alarm pages and reside below the Navigation Bar.
    - 2) Buttons to dynamically switch between Alarm Summary and Alarm History.
    - 3) A menu to allow user to select and open historical alarm archives.
      - a) Utilize a time-date stamp file structure.
    - 4) Pull-down menu bar to select operator configured alarm groups.
    - 5) Capability to sort alarms by priority and to define priority for all system alarms.
    - 6) Capability to filter or group alarms.
  2. Analog alarms:
    - a. The PCS software shall monitor analog and discrete variables and calculated conditions, and determine if the variable is in an alarm condition.
    - b. For each Analog Tag, an alarm for each of the following conditions shall be assignable:
      - 1) Low-low.
      - 2) Low.
      - 3) High.
      - 4) High-high.
      - 5) Deviation low.
      - 6) Deviation high.
      - 7) Rate of change.
    - c. Provide adjustable dead bands and delay timers for all analog alarms.

3. Present alarms in order of:
  - a. Priority.
  - b. Time of occurrence.
  - c. Non-acknowledged presented ahead of acknowledged.
4. Utilize single keystroke or pushbutton to:
  - a. Acknowledge alarms.
5. Alarm list presented to operator shall include:
  - a. Time of occurrence.
  - b. Time of acknowledgement.
  - c. Description.
  - d. Acknowledgement status.
6. Alarm list printed by either of the following:
  - a. On command.
  - b. Periodically.
7. Audible alarming capability for user selected alarms.

K. Report Generation

1. Base bid on the generation of the following reports:
  - a. Minimum of 3 formatted reports.
    - 1) Report form and content shall be determined at the Report Configuration Review Meetings.
    - 2) Each report shall contain daily, weekly, and monthly average calculated values.
    - 3) Each report shall contain between 25 and 100 measured parameters.
  - b. List of all entries initiated by operator including the following:
    - 1) Console key changes.
    - 2) Beginning and final values of setpoint and output changes.
    - 3) Mode changes (i.e., auto to manual).
    - 4) Time change was made.
  - c. Event list:
    - 1) Description of selected events.
    - 2) Time of event.

2. Custom report capabilities:
  - a. User configurable.
  - b. Contain selected information from any log, event, or alarm list.
  - c. Capable of producing custom log report for periodic and on-demand printing of a list of process or calculated variables.
  - d. Reports shall not require software programming by the user to setup.
3. Control of programs:
  - a. Protect access to configuration via password protection.

## 2.02 SOURCE QUALITY CONTROL

- A. Include performance test of HMI software in factory with the overall PLC System test.
  1. Conduct a test where the system is operated continuously and checked for correct operation including loop controls, displays, printing, keyboard functions, alarm responses, and on/off sequencing control.
  2. Allow for Owner and Engineer representatives to witness testing program.
    - a. Provide minimum of 15 days notice prior to testing.

## PART 3 - EXECUTION

### 3.01 CONFIGURATION REQUIREMENTS

- A. Provide all programming and configuration required for all HMIs furnished under this Contract:

### 3.02 CONFIGURATION STANDARDS AND CONVENTIONS

- A. Prepare and submit a "Software Configuration Standards and Conventions."
  1. Submit for review and approval prior to commencing with software configuration.
  2. Describe and define such items as:
    - a. Proposed graphic display process colors/representations.
    - b. Color standards for "ON," "OFF," and "ALARM" conditions.
    - c. Font type and size.
    - d. Alarm handling conventions.
    - e. Methods for navigation between displays.
    - f. Address usage/naming conventions.
    - g. Security setup.
  3. Prior to submitting the initial draft document, the Seller must meet with the Owner to review any of the Owner's existing standards and conventions.

4. In addition to submitting the initial document for review, submit an updated version of the document as part of the Operation and Maintenance Manuals.
  - a. Revise this document to include any additional standards that are established throughout the configuration process.
- B. It is the intent of these specifications to provide the end user with state-of-the-art functionality.
  1. Minimum standards are as follows:
    - a. Depict the actual process equipment configuration as accurately as possible.
    - b. Incorporate 3D images accurately depicting pumps, tanks, piping and process equipment representative of being controlled and/or monitored by the HMI Software.
    - c. Base all 3D screen development upon isometric architectural drawings, illustrations, or digital photographs of actual process equipment.
    - d. Utilize graphic art software to develop all 3D effects, using proportional perspective, light source and shadowing.
  2. All overview and site-specific screens shall incorporate a "navigational header bar" similar in function and appearance to Microsoft Internet Explorer.
    - a. The intention of this Specification is to provide a familiar, user-friendly navigation throughout the graphical displays.

### 3.03 SCREEN CONFIGURATION REVIEW MEETINGS

- A. Conduct a minimum of two configuration workshops with the Owner to review and discuss system configuration programming and related topics.
  1. The purpose of the workshops will be to discuss, in detail, how each I/O point will be handled and the types, quantities, hierarchies, and functioning of display screens.
  2. Review and discuss communication network and topology for the Plant PLC communication network and fiber ring. Preferred topology shall be to establish a redundant self healing ring topology such that communication between the Plant PLCs shall remain intact in the event of a failure on the backbone whether in the fiber ductbank or in the switch or anywhere in between. Ethernet Channel bonding topology in a ring configuration shall also be explored.
  3. Discussion of use of high performance HMI concepts and elements. High performance HMI elements shall be utilized for HMI development.
  4. Review of the Owner's existing systems, standards, conventions, file and tag naming requirements, font type and size requirements, and reporting requirements must be part of each workshop.
  5. Review the navigation bar to be utilized.

6. Review and identify critical alarms and determine the alarm priority to be used in the HMI Alarm Summary graphic.
  7. Workshops will be held at the plant.
  8. Each screen will be reviewed at each conference.
    - a. If required, to review all screens, each conference will occur on multiple days.
  9. Submit 10 color copies of printed screens via shop drawing submittal process 10 calendar days before each workshop.
  10. Bring equipment to project screens on wall or provide multiple monitors for viewing by attendees.
  11. Systems Integrator shall conduct the second workshop prior to the Factory Acceptance Test (FAT). Reasonable gap (at least 30 working days) shall be allowed between the second workshop and the FAT to allow for the Systems Integrator to make any updates resulting from the first workshop. Duration of second workshop shall be one (1) to two (2) days. If required, to review all screens, the workshop shall occur on multiple days.
    - a. Systems Integrator shall have completed all graphic screens associated with this project at the time of the workshop.
    - b. The Owner and/or Engineer shall reserve the right to postpone the workshop if significant deficiencies are found in the graphics and database development.
    - c. Various equipment vendors may choose to attend the second workshop to present their respective OIT graphic screens. The Systems Integrator shall coordinate the Plant PLC to vendor PLC communication with any vendor that is present for the workshop.
    - d. Submit all graphic screenshots to the Owner and Engineer at least 14 working days prior to the workshop. All comments made by the Owner and/or Engineer after the first workshop shall be addressed prior to submitting these graphic screenshots.
    - e. All comments by the Owner and Engineer during the second workshop shall be promptly addressed by the Systems Integrator and an updated set of all graphics in color pdf format shall be submitted to the Owner and Engineer for review.
    - f. The Systems Integrator shall not commence the FAT until all comments by the Owner and/or Engineer from all workshops have been addressed.
- B. Proposed graphic screens and report formats must be reviewed with the Owner throughout the configuration process.



### 3.04 REPORT CONFIGURATION REVIEW MEETINGS

- A. Conduct a configuration conference minimum of two (2) configuration conferences with the Owner to review and discuss the reports and report formats.
  - 1. Review of the Owner's existing systems, standards, conventions, and reporting requirements must be part of each conference.
  - 2. The conference(s) will be held at the plant.
  - 3. Each report will be reviewed at each conference.
    - a. If required, to review all reports, each conference will occur on multiple days.
  - 4. Provide 10 copies of printed sample reports via shop drawing submittal process 10 calendar days before each conference.
- B. Proposed report formats must be reviewed with the Owner throughout the configuration process.

### 3.05 COORDINATION

- A. Coordinate as required with other contractors and vendors to seamlessly integrate all HMI monitoring and control functions.
  - 1. To the greatest extent possible, integrate graphics presentation for all systems into screens utilizing one common HMI software.
- B. Examples of systems that utilize separate application software packages and thus require coordination include, but are not necessarily limited to:
  - 1. Generator Controls.
  - 2. Digital Metering Package.
  - 3. Distributed UPS System.
  - 4. Packaged control systems:

### 3.06 FIELD QUALITY CONTROL

- A. Employ and pay for services of equipment manufacturer's field service representative(s) to:
  - 1. Inspect equipment covered by this Specification Section.
  - 2. Supervise adjustments and installation checks.
  - 3. Maintain and submit an accurate daily or weekly log of all commissioning functions.
    - a. All commissioning functions may be witnessed by the Engineer.
    - b. All reports shall be cosigned by the Seller and the Engineer if witnessed.
  - 4. Conduct startup of equipment and perform operational checks.

5. Provide Owner with a written statement that manufacturer's equipment has been installed properly, started up, and is ready for operation by Owner's personnel.

### 3.07 DEMONSTRATION

#### A. On-Site Training

1. Provide employee of the manufacturer or certified representative to provide 1 week of operation and maintenance training at the Project site after the system has successfully undergone all field testing and acceptance procedures.
  - a. As a minimum, training shall cover:
    - 1) Hardware overview.
    - 2) Software overview.
    - 3) Maintenance.
    - 4) Trouble shooting.
    - 5) Operation, e.g., changing set points, passwords, etc.
  - b. Refer to Specification Section 40 90 13 – Process Control System Training for additional training requirements.

END OF SECTION

## SECTION 40 99 00

### SURGE PROTECTION DEVICES (SPD) FOR INSTRUMENTATION AND CONTROL EQUIPMENT

#### PART 1 - GENERAL

##### 1.01 SUMMARY

###### A. Section Includes:

1. Type IC1 SPD - Dedicated 120 VAC circuit, series connection, control panel mounted.
2. Type IC2 SPD - Individual equipment plug-in device (point of use protection).
3. Type IC3 SPD - Discrete 120 VAC control signal, control panel mounted.
4. Type IC4 SPD - Analog instrumentation signal, field mounted.
5. Type IC5 SPD - Analog instrumentation signal, control panel mounted.
6. Type IC6 SPD - Combination 120 VAC circuit and analog signal, field mounted.
7. Type IC7 SPD - Discrete low voltage control signal, control panel mounted.
8. Type IC8 SPD - Data line, control panel mounted.

###### B. Related Sections include but are not necessarily limited to:

1. Division 00 - Procurement and Contracting Requirements.
2. Division 01 - General Requirements.
3. Section 40 90 00 - Instrumentation for Process Control: Basic Requirements.

##### 1.02 QUALITY ASSURANCE

###### A. Referenced Standards

1. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
  - a. C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits
  - b. C62.41.1, Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits.
  - c. C62.41.2, Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits.
  - d. C62.45, Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits.
2. National Electrical Manufacturers Association (NEMA):
  - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
  - b. LS 1, Low Voltage Surge Protection Devices.

3. Underwriters Laboratories, Inc. (UL):
  - a. 497B, Standard for Safety Protectors for Data Communications and Fire-Alarm Circuits.
  - b. 1283, Standard for Safety Electromagnetic Interference Filters.
  - c. 1363, Standard for Safety Relocatable Power Taps.
  - d. 1449, Standard for Safety Transient Voltage Surge Suppressors.

B. Qualifications

1. Provide devices by a manufacturer who has been regularly engaged in the development, design, testing, listing and manufacturing of SPDs of the types and ratings required for a period of 10 years or more and whose products have been in satisfactory use in similar service.
2. Upon request, suppliers or manufacturers shall provide a list of not less than three (3) customer references showing satisfactory operation.

1.03 DEFINITIONS

- A. Clamping Voltage: The voltage measured at the end of the 6 IN output leads of the SPD and from the zero voltage reference to the peak of the surge when the applied surge is induced at the 90 degree phase angle of the applied system frequency voltage.
- B. Let-Through Voltage: The voltage measured at the end of the 6 IN output leads of the SPD and from the system peak voltage to the peak of the surge when the applied surge is induced at the 90 degree phase angle of the applied system frequency voltage.
- C. Maximum Continuous Operating Voltage (MCOV): The maximum steady state voltage at which the SPD device can operate and meet its specification within its rated temperature.
- D. Maximum Surge Current
  1. The maximum 8 x 20 microsecond surge current pulse the SPD device is capable of surviving on a single-impulse basis without suffering either performance degradation or more than 10 PCT deviation of clamping voltage at a specified surge current.
  2. Listed by mode, since number and type of components in any SPD may vary by mode.
- E. Protection Phase
  1. The per phase rating is the total surge current capacity connected to a given phase conductor.
  2. For example, a wye system surge current per phase would equal L-N plus L-G; a delta system surge current per phase would equal L-L plus L-G.
    - a. The N-G mode is not included in the per phase calculation.

- F. System Peak Voltage: The electrical equipment supply voltage sine wave peak (i.e., for a 120 V system the L-N peak voltage is 170 V).

#### 1.04 SUBMITTALS

##### A. Shop Drawings

1. See Specification Section 01 33 00 - Submittals for requirements for the mechanics and administration of the submittal process.
2. For named products, submit only a catalog cut sheet.
  - a. For all other products, submit the data required below.
3. See Specification Section 40 90 00 - Instrumentation for Process Control - Basic Requirements.
4. Product technical data for non-specified models:
  - a. Manufacturer's experience.
  - b. Standard catalog cut sheet.
  - c. Electrical and mechanical drawing showing unit dimensions, weights, mounting provisions, connection details and layout diagram of the unit.
  - d. Create a Product Data Sheet for each different model number of SPD provided.
    - 1) Data in the Product Data Sheet heading:
      - a) SPD Type per PART 2 of the Specification.
      - b) Manufacturer's Name.
      - c) Product model number.
    - 2) Data in the Product Data Sheet body:
      - a) Column one: Specified value/feature of every paragraph of PART 2 of the Specification.
      - b) Column two: Manufacturer's certified value confirming the product meets the specified value/feature.
    - 3) Data in the Product Data Sheet closing:
      - a) Signature of the manufacturer's official (printed and signed).
      - b) Title of the official.
      - c) Date of signature.

##### B. Contract Closeout Information

1. Operation and Maintenance Data:
  - a. See Specification Section 01 78 23 - Operation and Maintenance Manuals for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.

C. Record Documents

1. Provide Record Documents in accordance with Section 01 78 18 - Contract Closeout and Section 40 90 00 - Instrumentation for Process Control - Basic Requirements.

1.05 WARRANTY

- A. The manufacturer shall provide a minimum of a five (5) year Limited Warranty from date of shipment against failure when installed in compliance with applicable national/local electrical codes and the manufacturer's installation, operation and maintenance instructions.

PART 2 - PRODUCTS

2.01 TYPE IC1 SPD

- A. Standards: UL 1449.

- B. Design

1. General:

- a. Mounted internally to control panels for point-of-use loads.
- b. MOV based or multi-stage hybrid solid state high performance suppression system.
- c. Designed for series connection.
- d. Enclosure: Metallic or plastic, flange or DIN rail mounting.
- e. Field connection: Provide unit with external terminal screws for each phase, neutral and ground that will accept #14 through #12 conductors.
- f. Device monitoring: Long-life, solid state, externally visible indicators that monitors the on-line status of the units suppression filter system or power loss in any of the phases.

2. Operating voltage: 120 VAC.

3. Operating current: 15 A minimum.

4. Operating frequency: 45 to 65 Hz.

5. Modes of protection: All modes, L-N, L-G and N-G.

6. Maximum continuous operating voltage: Less than 130 PCT of system peak voltage.

7. Maximum surge current: 20,000A per phase, 10,000A per mode minimum.

8. Minimum repetitive surge current capacity: 1000 impulses with no degradation of more than 10 PCT deviation of the clamping voltage.

9. Fusing: Optional integral unit level and/or component level short circuit and/or thermal overload protection.
  - a. External protection as recommended by manufacturer.
10. Maximum clamping voltages, dynamic test with voltages measured from the zero voltage reference and 90 degree phase angle:

SYSTEM VOLTAGE	TEST MODE	IEEE C62.41		UL 1449
		B COMB. WAVE	A RING WAVE	
L-N = 120 V	L-N	400 V	300 V	330 V
	L-G	500 V	400 V	400 V
	N-G	500 V	400 V	400 V

11. EMI-RFI Noise Rejection: Attenuation greater than 30 dB for frequencies between 100 kHz and 100 MHz.

## 2.02 TYPE IC2 SPD

- A. Standards: UL 1283, UL 1363 and UL 1449.
- B. Design
  1. General:
    - a. Multi-stage hybrid solid state high performance suppression system.
    - b. Point of use protection, designed for plug-in devices.
    - c. Enclosure: Metallic or impact resistant plastic.
    - d. Field connection:
      - 1) The minimum line cord shall be #14 three (3) conductors, 6 FT in length, with a single piece strain relief NEMA 5-15P plug.
      - 2) The minimum plug-in strip shall have six (6) single NEMA 5-15R receptacles.
    - e. ON/OFF toggle switch.
    - f. Device monitoring:
      - 1) Long-life, solid state, externally visible indicators that monitor the on-line status of the units suppression filter system or power loss in any of the phases.
      - 2) A fuse or circuit breaker status only monitor system is not acceptable.
  2. Operating voltage: 120 VAC.
  3. Modes of protection: All modes, L-N, L-G and N-G.
  4. Maximum continuous operating voltage: Less than 130 PCT of system peak voltage.

5. Operating frequency: 45 to 65 Hz.
6. Maximum surge current: 20,000 A per phase, 10,000A per mode minimum.
7. Minimum repetitive surge current capacity: 1000 impulses with no degradation of more than 10 PCT deviation of the clamping voltage.
8. Overcurrent protection: The SPD may contain internal fuses or circuit breaker, but an IEEE B3 combination wave shall not cause the fuse or circuit breaker to open and render the SPD inoperable.
9. Maximum clamping voltages, dynamic test with voltages measured from the zero voltage reference and 90 degree phase angle:

SYSTEM VOLTAGE	TEST MODE	IEEE C62.41		UL 1449
		B COMB. WAVE	A RING WAVE	
L-N = 120 V	L-N	400 V	300 V	330 V
	L-G	500 V	400 V	400 V
	N-G	500 V	400 V	400 V

10. EMI-RFI noise rejection: Attenuation greater than 30 dB for frequencies between 100 kHz and 100 MHz.

### 2.03 TYPE IC3 SPD

- A. Standards: UL 497B or UL 1449.
- B. Design
  1. General:
    - a. Mounted internally to control panels for point-of-use loads.
    - b. Multi-stage hybrid solid state high performance suppression system.
    - c. Designed for series connection.
    - d. Enclosure: Metallic or plastic, flange or DIN rail mounting.
    - e. Field connection: Provide unit with external terminal screws for each phase, neutral and ground that will accept #14 through #12 conductors.
    - f. Device monitoring: Long-life, solid state, externally visible indicators that monitors the on-line status of the units suppression filter system or power loss in any of the phases.
  2. Operating voltage: 120 VAC.
  3. Operating current: 3 A minimum.



4. Operating frequency: 45 to 65 Hz.
5. Modes of protection: L-N; when ground conductor is present L-G and N-G.
6. Maximum continuous operating voltage: Less than 130 PCT of system peak voltage.
7. Maximum surge current: 6000 A per phase, 3000A per mode minimum.
8. Minimum repetitive surge current capacity:
  - a. The SPD shall meet one (1) of the following:
    - 1) 1000 occurrences of a 200A, 10x1000 microsecond waveform.
    - 2) 400 occurrences of a 500A, 10x1000 microsecond waveform.
    - 3) 100 occurrences of a 400A, 10x700 microsecond waveform.
    - 4) 100 occurrences of a 2000A, 8x20 microsecond waveform.
9. Maximum clamping voltages, measured from the zero voltage reference:
  - a. The SPD shall meet one (1) of the following:
    - 1) 400A, 10x700 microsecond waveform: 200 PCT of system voltage.
    - 2) IEEE B3 combination wave: 250 PCT of system voltage.
    - 3) IEEE B3 ring wave: 200 PCT of system peak voltage.
    - 4) IEEE A3 ring wave: 200 PCT of system peak voltage.
    - 5) Mode N-G clamping voltage may be 175 PCT higher than the L-G levels.

#### 2.04 TYPE IC4 SPD

- A. Standards: None.
- B. Design
  1. General:
    - a. For protection of field mounted equipment connected to 4-20mA analog signal loops.
    - b. Mounted directly to an unused conduit entry on a process transmitter housing.
    - c. Multi-stage hybrid solid state high performance suppression system.
    - d. Designed for series connection.
    - e. Enclosure: 1/2 IN to 3/4 IN stainless steel conduit pipe nipple.
  2. Operating voltage: 24 VDC or as indicated on the Drawings.
  3. Modes of protection: All modes, L-L and L-G.
  4. Maximum continuous operating voltage: Less than 130 PCT of system peak voltage.
  5. Maximum surge current: 10,000 A.

6. Minimum repetitive surge current capacity:
  - a. The SPD shall meet one (1) of the following:
    - 1) 1000 occurrences of a 200A, 10x1000 microsecond waveform.
    - 2) 400 occurrences of a 500A, 10x1000 microsecond waveform.
    - 3) 100 occurrences of a 400A, 10x700 microsecond waveform.
    - 4) 100 occurrences of a 2000A, 8x20 microsecond waveform.
    - 5) 10 occurrences of a 10,000A, 8x20 microsecond waveform.
7. Maximum clamping voltages, L-L:
  - a. The SPD shall meet one (1) of the following:
    - 1) 400A, 10x700 microsecond waveform: 400 PCT of system voltage.
    - 2) 10,000A, 8x20 microsecond waveform: 400 PCT of system voltage.
    - 3) IEEE B3 combination wave: 250 PCT of system voltage.
8. Maximum clamping voltages, L-G:
  - a. The SPD shall meet one (1) of the following:
    - 1) 400A, 10x7 wave: 300 PCT of system voltage.

## 2.05 TYPE IC5 SPD

A. Standards: UL 497B.

B. Design

1. General:
  - a. Mounted internally to control panels for protection of equipment connected to analog signal loops.
  - b. Multi-stage hybrid solid state high performance suppression system.
  - c. Designed for series connection.
  - d. Enclosure: Metallic or plastic, flange or DIN rail mounting.
  - e. Field connection: The unit shall have external terminal screws for line and ground conductors.
2. Operating voltage: 24 VDC or as indicated on the Drawings.
3. Modes of protection: All modes, L-L and L-G.
4. Maximum continuous operating voltage: Less than 130 PCT of system peak voltage.
5. Maximum surge current: 10,000 A.

6. Minimum repetitive surge current capacity:
  - a. The SPD shall meet one (1) of the following:
    - 1) 1000 occurrences of a 200A, 10 x 1000 microsecond waveform.
    - 2) 400 occurrences of a 500A, 10 x 1000 microsecond waveform.
    - 3) 100 occurrences of a 400A, 10 x 700 microsecond waveform.
    - 4) 100 occurrences of a 2000A, 8 x 20 microsecond waveform.
    - 5) 10 occurrences of a 10,000A, 8 x 20 microsecond waveform.
7. Maximum clamping voltages, L-L:
  - a. The SPD shall meet one (1) of the following:
    - 1) 400A, 10x700 microsecond waveform: 400 PCT of system voltage.
    - 2) 10,000A, 8x20 microsecond waveform: 400 PCT of system voltage.
    - 3) IEEE B3 combination wave: 225 PCT of system voltage.
8. Maximum clamping voltages, L-G:
  - a. The SPD shall meet one (1) of the following:
    - 1) 400A, 10x700 microsecond waveform: 200 PCT of system voltage.
    - 2) 10,000A, 8x20 microsecond waveform: 200 PCT of system voltage.
    - 3) IEEE B3 combination wave: 300 PCT of system voltage.

## 2.06 TYPE IC6 SPD

### A. Product

1. Field mounted for protection of field mounted equipment connected to 120V power and 4-20mA analog signal loops.
2. Type IC1 and Type IC5 SPDs mounted in a common enclosure.
3. Enclosure: Metallic or nonmetallic NEMA 4X.

## 2.07 TYPE IC7 SPD

A. Standards: UL 497B.

### B. Design

1. General:
  - a. Mounted internally to control panels for protection of equipment connected to a discrete signal.
  - b. Multi-stage hybrid solid state high performance suppression system.
  - c. Designed for series connection.

- d. Enclosure: Metallic or plastic, flange or DIN rail mounting.
  - e. Field connection: Provide unit with external terminal screws for line and ground conductors.
2. Operating voltage: 24 VDC or 24 VAC or 120 VAC or as indicated on the Drawings.
  3. Modes of protection: All modes:
    - a. AC applications: L-N, L-G, N-G
    - b. DC applications: Pos-Neg, Pos-Gnd, Neg-Gnd.
  4. Maximum continuous operating voltage: Less than 130 PCT of system peak voltage.
  5. Maximum surge current: 10,000 A.
  6. Minimum repetitive surge current capacity:
    - a. The SPD shall meet one (1) of the following:
      - 1) 1000 occurrences of a 200A, 10 x 1000 microsecond waveform.
      - 2) 400 occurrences of a 500A, 10 x 1000 microsecond waveform.
      - 3) 100 occurrences of a 400A, 10 x 700 microsecond waveform.
      - 4) 100 occurrences of a 2000A, 8 x 20 microsecond waveform.
      - 5) 10 occurrences of a 10,000A, 8 x 20 microsecond waveform.
  7. Maximum clamping voltages, L-L (Pos-Neg):
    - a. The SPD shall meet one (1) of the following:
      - 1) 400A, 10x700 microsecond waveform: 400 PCT of system voltage.
      - 2) 10,000A, 8x20 microsecond waveform: 400 PCT of system voltage.
      - 3) IEEE B3 combination wave: 250 PCT of system voltage.
  8. Maximum clamping voltages, L-G:
    - a. The SPD shall meet one (1) of the following:
      - 1) 400A, 10x700 microsecond waveform: 200 PCT of system voltage.
      - 2) 10,000A, 8x20 microsecond waveform: 200 PCT of system voltage.
      - 3) IEEE B3 combination wave: 300 PCT of system voltage.

## 2.08 TYPE IC8 SPD

A. Standards: UL 497B.

B. Design

1. General:

- a. Mounted internally to control panels for protection of equipment connected to data lines (RS485, RS232, telephone line, etc.).

- b. Multi-stage hybrid solid state high performance suppression system.
  - c. Designed for series connection.
  - d. Enclosure: Metallic or plastic, flange or DIN rail mounting.
  - e. Field connection: Provide unit with external terminal screws for line and ground conductors.
- 2. Operating voltage: Nominal unit operating voltage and configuration as specified or as indicated on the Drawings.
  - 3. Modes of protection: All modes.
  - 4. Maximum continuous operating voltage: Less than 130 PCT of system peak voltage.
  - 5. Maximum surge current: 10,000 A.
  - 6. Minimum repetitive surge current capacity:
    - a. The SPD shall meet one (1) of the following:
      - 1) 1000 occurrences of a 200A, 10 x 1000 microsecond waveform.
      - 2) 400 occurrences of a 500A, 10 x 1000 microsecond waveform.
      - 3) 100 occurrences of a 400A, 10 x 700 microsecond waveform.
      - 4) 100 occurrences of a 2000A, 8 x 20 microsecond waveform.
      - 5) 10 occurrences of a 10,000A, 8 x 20 microsecond waveform.
  - 7. Maximum clamping voltages, L-L (Pos-Neg):
    - a. The SPD shall meet one (1) of the following:
      - 1) 400A, 10x700 microsecond waveform: 400 PCT of system voltage.
      - 2) 10,000A, 8x20 microsecond waveform: 400 PCT of system voltage.
      - 3) IEEE B3 combination wave: 250 PCT of system voltage.
  - 8. Maximum clamping voltages, L-G:
    - a. The SPD shall meet one (1) of the following:
      - 1) 400A, 10x700 microsecond waveform: 200 PCT of system voltage.
      - 2) 10,000A, 8x20 microsecond waveform: 200 PCT of system voltage.
      - 3) IEEE B3 combination wave: 300 PCT of system voltage.

## 2.09 SOURCE QUALITY CONTROL

- A. Performance tests to be performed or independently verified by a certified testing laboratory.
- B. The SPD are to be tested as a complete SPD system including integral unit level and/or component level fusing.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Type IC1 SPD:
  - 1. Provide on the following applications:
    - a. Incoming 120 V power to all control panels.
    - b. Line side of 120 V power terminals to equipment (e.g., PLCs, transmitters).
  - 2. Connected in series with the panel's or equipment's branch circuit.
  - 3. Provide fuse protection as recommended by manufacturer.
  - 4. Flange mount or DIN rail mount in control panel.
  - 5. Connect all SPDs in the panel to the same grounding point.
- C. Type IC2 SPD
  - 1. Provide on the following applications:
    - a. All desk top or rack mounted equipment that is cord and plug connected (e.g., computers, printers) except where power is sourced from a UPS.
  - 2. Locate near equipment to be protected.
- D. Type IC3 SPD
  - 1. Provide on the following applications:
    - a. 120 V discrete PLC signals into a control panel from float switches, position switches, etc., where the device is mounted outdoors or in a remote building or structure from the control panel and where the control conductors are routed above grade or underground.
    - b. 120 V discrete PLC signals into a control panel from float switches, position switches, etc., where both the device and control panel are mounted outdoors and the control conductors are routed above grade or underground.
  - 2. Connected in series with the equipment.

3. Provide fuse protection as recommended by manufacturer.
4. Flange mount or DIN rail mount in control panel.
5. Connect all SPDs in the panel to the same grounding point.

E. Type IC4 SPD

1. Provide on the following applications:
  - a. Loop powered transmitter (flow, level, etc.) where the transmitter is mounted outdoors or in a remote building or structure from the control panel and the signal conductors are routed above grade or underground.
  - b. Loop powered transmitter (flow, level, etc.) where both the transmitter and control panel are mounted outdoors and the signal conductors are routed above grade or underground.
2. Connect in series with the equipment.
3. Attach to spare conduit entry of transmitter or inline of conduit at the transmitter.
4. Bond transmitter to a grounded structure or provide a ground rod.
5. Ground shield at control panel end.
6. Verify SPDs series resistance and capacitance does not interfere with the transmitters signal.

F. Type IC5 SPD

1. Provide on the following applications:
  - a. Incoming 4-20mA signals into a control panel from transmitters (flow, level, etc.) where the transmitter is mounted outdoors or in a remote building or structure from the control panel and the signal conductors are routed above grade or underground.
  - b. Incoming 4-20mA signals into a control panel from transmitters (flow, level, etc.) where both the transmitter and control panel are mounted outdoors and the signal conductors are routed above grade or underground.
2. Connect in series with the equipment.
3. Flange mount or DIN rail mount in control panel.
4. Connect all SPDs in the control panel to the same grounding point.
5. Verify SPDs series resistance and capacitance does not interfere with the transmitters signal.

G. Type IC6 SPD

1. Provide on the following applications:
  - a. Outdoor field mounted transmitter (flow, level, etc.) that requires 120 V power and provides a 4-20mA signal to a control panel where the conductors are routed above grade or underground.
2. Connect in series with the equipment.
3. Mounted adjacent to equipment.
4. Bond transmitter to a grounded structure or provide a ground rod.
5. Ground shield at control panel end.
6. Verify SPDs series resistance and capacitance does not interfere with the transmitters signal.

H. Type IC7 SPD

1. Provide on the following applications:
  - a. Low voltage (e.g., 24 VAC, 24 VDC) discrete PLC signals into a control panel from float switches, position switches, etc., where the device is mounted outdoors or in a remote building or structure from the control panel and where the control conductors are routed above grade or underground.
  - b. Low voltage (e.g., 24 VAC, 24 VDC) discrete PLC signals into a control panel from float switches, position switches, etc., where both the device and control panel are mounted outdoors and the control conductors are routed above grade or underground.
2. Connect in series with the equipment.
3. Flange mount or DIN rail mount in control panel.
4. Connect all SPDs in the control panel to the same grounding point.

I. Type IC8 SPD

1. Provide on the following applications:
  - a. On both ends of data lines that interconnect devices that are located outdoors or in remote buildings or structures where the conductors are routed above grade or underground.
    - 1) PLC network (e.g., RS-485).
    - 2) Fieldbus (e.g., Profibus).
    - 3) Telephone modem.
2. Connect in series with the equipment.



3. Flange mount or DIN rail mount in control panel.
4. Connect all SPDs in the control panel to the same grounding point.
5. Verify SPDs series resistance and capacitance does not interfere with the data line signal.

END OF SECTION

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