Enprotec | Hibbs & Todd

September 26, 2024

CITY OF TOLAR, TEXAS
WASTEWATER TREATMENT PLANT IMPROVEMENTS

Addendum No. 2

Attention is called to the following modifications to the referenced Plans, Specification and Contract Documents for the above referenced project. The City of Tolar (City) will receive sealed Bids for the Wastewater Treatment Plant Improvements Project at **Tolar City Hall** located at **8712 W. Highway 377, Tolar, Texas 76476**, until **Tuesday, October 15, 2024**, at **2:00 p.m.** local time. We hereby modify the documents as follows:

BID DOCUMENTS:

1. **REPLACE** *Bid Form* in its entirety with the attached.

SPECIFICATIONS:

1. **ADD** Section 04200 – *Unit Masonry*.
2. **ADD** Section 04201 – *CMU Building Roofing.*
3. **REPLACE** Section 09800 – *Painting* in its entirety with the attached.
4. **REPLACE** Section 11220 – *Submersible Pump* in its entirety with the attached.
5. **REPLACE** Section 11260 – *Chlorination Equipment* in its entirety with the attached.
6. **REPLACE** Section 11317 – *Plant Water Pump Station Equipment* in its entirety with the attached.
7. **ADD** Section 13125 – *Metal Building Systems*.
8. **REPLACE** Section 13440 – *Instrumentation – Basic Requirements* in its entirety with the attached.
9. **REPLACE** Section 15104 – *Ball Valves* in its entirety with the attached.

DRAWINGS:

1. **REPLACE** drawing *02D-01 Influent Lift Station Plan* in its entirety with the attached.
2. **REPLACE** drawing *02D-02 Influent Lift Station Section* in its entirety with the attached.
3. **REPLACE** drawing *02S-01 Influent Lift Station Structural Plan and Section* in its entirety with the attached.
4. **REPLACE** drawing *03D-01 SBR Basin - Overall Plan* in its entirety with the attached.
5. **REPLACE** drawing *07Y-08 P&ID - Process Aeration System* in its entirety with the attached.

This addendum consists of one hundred ten (110) pages and becomes a part of the referenced plans, specifications and contract documents and shall be acknowledged by the proposer and attached to the sealed proposal submitted.

Brittany D. White

By Brittany White, P.E.
Project Engineer

9/26/2024

PE Firm Registration No. 1151
PG Firm Registration No. 50103
RPLS Firm Registration No. 10011900

BID DOCUMENTS

BID FORM FOR CONSTRUCTION CONTRACT

The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 1—OWNER AND BIDDER

1.01 This Bid is submitted to: **City of Tolar**
8712 W. Highway 377
Tolar, Texas 76476

Project: **Wastewater Treatment Plant Improvements**
Project Number: **8434**

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2—ATTACHMENTS TO THIS BID

2.01 The following documents are submitted with and made a condition of this Bid:

A. Required Bid security;

B. List of Proposed Subcontractors;

C. List of Proposed Suppliers;

D. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such authority within the time for acceptance of Bids;

E. Contractor's license number as evidence of Bidder's State Contractor's License or a covenant by Bidder to obtain said license within the time for acceptance of Bids;

F. Required Bidder Qualification Statement with supporting data; and

ARTICLE 3—BASIS OF BID—LUMP SUM BID AND UNIT PRICES

3.01 *Unit Price Bids*

A. Bidder will perform the following Work at the indicated unit prices:

BASE BID
Asphalt Pavement

Item No.	Estimated Quantity Total	Description and Unit Price (Price to be written in words)	Unit Price	Total Amount
1	1 LS	Mobilization, Bonds, and Insurance (not to exceed 5% of total base bid), for _____ _____ _____ Dollars and _____ Cents per lump sum.		$_____

Item No.	Estimated Quantity Total	Description and Unit Price (Price to be written in words)	Unit Price	Total Amount
2	1 LS	Furnish and install new Triplex influent lift station, including all related appurtenances, as shown and as specified, complete and in place, _____ _____ _____ Dollars and _____ Cents per lump sum.		$_____
3	1 LS	Furnish and install new mechanical coarse screening system per Specification 11075, including all related appurtenances, as shown and as specified, complete and in place, _____ _____ Dollars and _____ Cents per lump sum.		$_____
4	1 LS	Furnish and install new Sequencing Batch Reactor system per Specification 11375 with OIS SCADA, including all related appurtenances, as shown and as specified, complete and in place, Seven hundred forty nine thousand five hundred Dollars and Zero Cents per lump sum.		$ 749,500.00
5	1 LS	Furnish and install new Sequencing Batch Reactor Basin including all related appurtenances, as shown and as specified, complete and in place, _____ _____ _____ Dollars and _____ Cents per lump sum.		$_____
6	1 LS	Furnish and install new SBR Blower covered area including all related appurtenances, as shown and as specified, complete and in place, _____ _____ Dollars and _____ Cents per lump sum.		$_____
7	1 LS	Furnish and install new effluent disinfection system including all related appurtenances, as shown and as specified, complete and in place, _____ _____ _____ Dollars and _____ Cents per lump sum.		$_____

Item No.	Estimated Quantity Total	Description and Unit Price (Price to be written in words)	Unit Price	Total Amount
8	1 LS	Furnish and install solids holding system with concrete basin, decanter, and solids transfer pump and including all related appurtenances, as shown and as specified, complete and in place, _____ _____ _____ Dollars and _____ Cents per lump sum.		$_____
9	1 LS	Furnish and install new mechanical solids dewatering system per Specification 11144, including all related appurtenances, as shown and as specified, complete and in place, _____ _____ Dollars and _____ Cents per lump sum.		$_____
10	1 LS	Furnish and install new Supervisory Control and Data Acquisition (SCADA) system, including all related appurtenances, as shown and as specified, complete and in place, _____ _____ Dollars and _____ Cents per lump sum.		$_____
11	950 LF	Accommodate Trench Safety requirements for 950 linear feet of PVC, as shown and as specified, for _____ _____Dollars and _____Cents per linear foot.	$_____/LF	$_____
12	1 LS	Owners Allowance for work directed in writing by the City for legitimate project related issues at the direct cost for such work, at a lump sum amount of _____ Twenty-Five Thousand Dollars and Zero Cents per lump sum.		$ 25,000.00
13	1 LS	Demolition and disposal of existing structures, piping, equipment, and appurtenances, as shown and as specified, for _____ _____Dollars and _____Cents per lump sum.		$_____
TOTAL BASE BID (Items 1 thru 13)			$_____	

ALTERNATE BID ITEMS

Item No.	Estimated Quantity Total	Description and Unit Price (Price to be written in words)	Unit Price	Total Amount
A1 **In lieu of Base Bid Item 9**	1 LS	Furnish and install new 30 cubic yard dewatering trailers, solids holding basin, and solids transfer pump, including all related appurtenances, as shown and as specified, complete and in place, _____ _____ _____ Dollars and _____ Cents per lump sum.		$_____
A2 **In lieu of Base Bid Items 8 & 9**	1 LS	Furnish and install new 30 cubic yard dewatering trailers, including all related appurtenances, as shown and as specified, complete and in place, _____ _____ _____ Dollars and _____ Cents per lump sum.		$_____

If Bid Alternate A1 is selected, the price for Base Bid item 9 shall be removed and replaced with the cost of item A1. If Bid Alternate A2 is selected, the prices for Base Bid items 8 and 9 shall be removed and replaced with the cost of item A2.

B. Bidder acknowledges that:

1. Each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and

2. Estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Work will be based on actual quantities, determined as provided in the Contract Documents.

ARTICLE 4—TIME OF COMPLETION

4.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

4.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 5—BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

5.01 *Bid Acceptance Period*

A. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

5.02 *Instructions to Bidders*

Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security.

5.03 *Receipt of Addenda*

A. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Addendum Date

ARTICLE 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 *Bidder's Representations*

A. In submitting this Bid, Bidder represents the following:

1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.
2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
5. Bidder has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
6. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder's (Contractor's) safety precautions and programs.
7. Based on the information and observations referred to in the preceding paragraph, Bidder agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
8. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

9. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

6.02 *Bidder's Certifications*

A. The Bidder certifies the following:

1. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation.

2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.

3. Bidder has not solicited or induced any individual or entity to refrain from bidding.

4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 8.02.A:

a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.

b. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.

c. Collusive practice means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.

d. Coercive practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

BIDDER hereby submits this Bid as set forth above:

Bidder:

_____

(typed or printed name of organization)

By: _____

(individual's signature)

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Date: _____

(typed or printed)

If Bidder is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.

Attest: _____

(individual's signature)

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Date: _____

(typed or printed)

Address for giving notices:

_____

_____

Bidder's Contact:

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Phone: _____

Email: _____

Address:

_____

_____

_____

Bidder's Contractor License No.: (if applicable) _____

TECHNICAL SPECIFICATIONS

SECTION 04200

UNIT MASONRY

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Concrete Masonry Units.

B. Reinforcement, Anchorage, and Accessories.

1.2 REFERENCES:

A. ANSI/ASTM A82--Cold-Drawn Steel Wire for Concrete Reinforcement.

B. ASTM A123--Zinc (Hot-Dip Galvanized) Coating or Iron and Steel Products.

C. ASTM A525--Steel Sheet, Zinc Coated, (Galvanized) by the Hot-Dip Process.

D. ASTM A615--Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

E. ASTM B370--Copper Sheet and Strip for Building Construction.

F. ASTM C90--Hollow Load Bearing Concrete Masonry Units.

G. IMIAC--International Masonry Industry All-Weather Council: Recommended Practices and Guide Specification for Cold Weather Masonry Construction.

H. ASTM C270--Specification for Mortar for Unit Masonry.

I. ASTM C426--Test for Drying Shrinkage of Concrete Block.

J. ASTM C476--Specification for Grout for Masonry.

1.3 SUBMITTALS:

A. Submit shop drawings indicating bars sizes, spacings, locations, quantities of reinforcement, bending and cutting schedules, support and spacing devices.

B. Submit product data for concrete masonry units and fabricated wire reinforcement.

C. Submit color samples of concrete masonry units to illustrate color, texture, and extremes of color range.

D. Submit manufacturer's certificate under provisions of Section 01400 that products meet or exceed specified requirements.

1.4 QUALIFICATIONS:

A. Installer: Company specializing in performing the work of this Section with minimum 5 years documented experience.

1.5 REGULATORY REQUIREMENTS:

A. Conform to applicable code requirements for fire rated masonry construction at rated walls.

1.6 MOCK-UP:

A. Provide 48 inch by 48 inch mock-up of composite masonry construction under provisions of Section 01400 including, specified mortar and accessories.

B. When accepted, mock-up will demonstrate minimum standard for the work. Mock-up may not remain as part of the work.

1.7 PRE-INSTALLATION CONFERENCE:

A. Convene one week prior to commencing work of this Section, under provisions of Section 01039.

1.8 DELIVERY, STORAGE, AND HANDLING:

A. Deliver products to site under provisions of Section 01600.

B. Store and protect products under provisions of Section 01600.

1.9 ENVIRONMENTAL REQUIREMENTS:

A. Maintain materials and surrounding air temperature to minimum 50 degrees Fahrenheit (10 degrees Centigrade) prior to, during, and 48 hours after completion of masonry work.

1.10 SEQUENCING AND SCHEDULING:

A. Coordinate work under this Section as necessary with other related trades.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS--CONCRETE MASONRY UNITS:

A. Featherlite Building Products.

B. Acme Brick.

C. Elgin-Butler.

D. Or approved equivalent.

2.2 CONCRETE MASONRY UNITS:

A. Hollow Block Units: ASTM C90, Grade N, Type I--Moisture Controlled; normal weight, with integral water proofing agent.

B. Size: Nominal modular size of 8" x 8" x 16". Provide special units for bond beams, lintels, control joints, 90 degree corners.

C. Decorative Block Units: ASTM C90, Grade N, Type I--Moisture Controlled, color as selected to the following design:

1. Rock Flack Block.
2. Standard Block with integral color.

D. Polystyrene Insulation Inserts:

1. Meet or exceed ASTM C236-80 and Federal Specification HH-I-524C.
2. Equal to Korfil block insulation as manufactured by Korfil Incorporated, Chicopec, MA.

2.3 REINFORCEMENT AND ANCHORAGE:

A. Single Wythe Joint Reinforcement: Truss type; hot dip galvanized after fabrication, cold-drawn steel conforming to ANSI/ASTM A82, 3/16 side rods with 3/16-inch cross ties; Equal to Block-Trus as manufactured by AA Products.

B. Reinforcing Steel: Specified in Section 03200; unprotected finish.

C. Strap Anchors: As required for masonry to masonry wall anchorage.

2.4 FLASHING:

A. Copper/Kraft Paper Flashings: 3 oz/sq ft sheet copper bonded to fiber reinforced asphalt treated Kraft paper; Equal to Cop-A-Cote as manufactured by Afco Products, Inc.

B. Twenty-four (24) gauge flashing receiver as indicated.

2.5 ACCESSORIES:

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, heat fused joints.

B. Joint Filler: Closed cell polyvinylchloride; oversized 50 percent to joint width; self-expanding; size as indicated, or standard.

C. Building Paper: #30 asphalt saturated felt.

D. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.6 LINTELS:

A. Solid bottom bond beam-type.

B. Loose steel angles as specified in Section 05120 Structural Steel.

2.7 MORTAR:

A. Mortar mixes: Conform to ASTM C 270, and the following:

1. Type "S" Mortar, for all masonry. One part Portland Cement, 1/4 to 1/2 part hydrated lime, 2-3/4 to 4-1/2 parts damp, loose sand or 1/2 part Portland Cement, 1 part masonry cement, 3-3/8 to 4-1/2 parts damp, loose sand.

2. White Portland cement and/or lime shall be used in the mortar at all light colored block that will require tinting to match the block.

B. Portland Cement: ASTM C 150, Type 1, one sack 94# net, considered one cubic foot.

C. Masonry Cement: ASTM C 91 furnished in sacks containing one cubic foot each, marked with the weight. One sack considered one cubic foot. Exterior masonry cement shall contain integral waterproofing. Masonry cement shall be manufactured by Atlas, Lehigh, Lonestar, Trinity, or an approved equal.

D. Sand: (Fine Aggregate) 80# damp, considered one cubic foot ASTM C 144 of acceptable color graded within the following limits:

	Percent of Sand Retained (by weight)	
Sieve No.	Max.	Min.
4	0	0
8	5	0
16	40	0
30	65	0
50	85	65
100	98	85

E. Water: Clean and free from injurious amounts of oil acids, soluble salts, and organic impurities.

F. Colors shall be as selected by Engineer and shall closely match the color of the block.

G. Do not lower the freezing point of mortar by use of admixtures or antifreeze agents.

H. Do not use calcium chloride in mortar or grout.

2.8 GROUT:

A. Provide grout with a minimum compressive strength of 2500 psi at 28 days; 7-8 inch slump; premixed type in accordance with ASTM C94 or mixed in accordance with ASTM C476 coarse grout.

PART 3 EXECUTION

3.1 EXAMINATION:

A. Verify that field conditions are acceptable and are ready to receive work.

B. Verify items provided by other Sections of work are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

D. Beginning of installation means installer accepts existing conditions.

3.2 PREPARATION:

A. Direct and coordinate placement of metal anchors supplied to other Sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.3 COURSING:

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimensions. Form vertical and horizontal joints of uniform thickness.

C. Lay concrete masonry units in running bond. Course one unit and one mortar joint to equal 8 inches. Form concave mortar joints.

3.4 PLACING AND BONDING:

A. Lay hollow masonry units with face shell bedding on head and bed joints.

B. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.

C. Remove excess mortar as Work progresses.

D. Interlock intersections and external corners.

E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

G. Isolate masonry partitions from vertical structural framing members with a control joint.

H. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.5 REINFORCEMENT AND ANCHORAGES--REINFORCED UNIT MASONRY:

A. Install horizontal joint reinforcement 16 inches o.c.

B. Place masonry joint reinforcement in first horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place joint reinforcement continuous in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches. Extend minimum 16 inches each side of openings.

E. Support and secure reinforcing bars from displacement. Maintain position within 1/2-inch of dimensioned position.

F. Embed anchors attached to structural steel members.

G. Reinforce stack bonded unit joint corners and intersections with strap anchors.

H. Utilize low-lift grouting techniques in cells containing vertical reinforcing.

I. Remove insulating inserts from cells to receive vertical reinforcing.

3.6 MASONRY FLASHINGS:

A. Extend flashings through veneer, turn up minimum 8 inches and bed into mortar joint of masonry back-up.

B. Lap end joints minimum 6 inches and seal watertight.

C. Provide flashing receiver as indicated on the drawings.

3.7 LINTELS:

A. Install lintels over window openings, door openings, and louvers.

B. Install reinforced unit masonry lintels over openings where steel lintels are not scheduled.

C. Openings Up to 42 Inches Wide: Place two No. 5 reinforcing bars one inch from bottom web.

D. Openings Over 42 Inches Wide: Place two No. 6 reinforcing bars one inch from bottom web.

E. Use single piece reinforcing bars only.

F. Support and secure reinforcing bars from displacement. Maintain position within 1/2-inch of dimensioned position.

G. Place and consolidate grout fill without displacing reinforcing.

H. Allow masonry lintels to attain specified strength before removing temporary supports.

3.8 GROUTED COMPONENTS:

A. Reinforce bond beam as shown on the drawings.

B. Lap splices minimum 24 bar diameters.

C. Support and secure reinforcing bars from displacement. Maintain position within 1/2-inch of dimensioned position.

D. Place and consolidate grout fill without displacing reinforcing.

E. At opening locations, fill masonry cores with grout for a minimum 24 inches either side of opening.

3.9 ENGINEERED MASONRY:

A. Lay masonry units with core cells vertically aligned and cavities between wythes clear of mortar and unobstructed.

B. Place mortar in masonry unit bed joints back 1/4 inch (16 mm) from edge of unit grout spaces, bevel back and upward. Permit mortar to cure 7 days before placing grout.

C. Reinforce masonry unit cores with reinforcement bars and grout as indicated.

D. Retain vertical reinforcement in position at top and bottom of cells and at intervals not exceeding 100 bar diameters. Splice reinforcement in accordance with Section 03200.

E. Grout spaces less than 2 inches in width with fine grout using low-lift grouting techniques. Grout spaces 2 inches or greater in width with course grout using low-lift grouting techniques.

F. When grouting is stopped for more than one hour, terminate grout 1-1/2 inch below top of upper masonry units to form a positive key for subsequent grout placement.

G. Low-Lift Grouting: Place first lift of grout to a height of 16 inches and rod for grout consolidation. Place subsequent lifts in 16-inch increments and rod for grout consolidation.

3.10 CONTROL AND EXPANSION JOINTS:

A. Do not continue horizontal joint reinforcement through control and expansion joints.

B. Install preformed control joint devices in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

C. Size control joint as indicated, or under standard procedures.

3.11 BUILT-IN WORK:

A. As work progresses, build in metal door frames, window frames, anchor bolts, plates and other items furnished by other Sections.

B. Build in items plumb and level.

C. Bed anchors or metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

D. Do not build in organic materials subject to deterioration.

3.12 TOLERANCES:

A. Maximum Variation From Unit to Adjacent Unit: 1/32 inch.

B. Maximum Variation From Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.

C. Maximum Variation From Plumb: 1/4 inch per story noncumulative; 1/2 inch in two stories or more.

D. Maximum Variation From Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet, 1/2 inch in 30 feet.

E. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.

3.13 CUTTING AND FITTING:

A. Cut and fit for pipes, conduit, sleeves, and duct work. Coordinate with other Sections of work to provide correct size, shape, and locations.

B. Obtain Engineer's approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.14 CLEANING:

A. Clean work under provisions of Section 01700.

B. Remove excess mortar and mortar smears.

C. Replace defective mortar. Match adjacent work.

D. Clean soiled surfaces with cleaning solution.

E. Use non-metallic tools in cleaning operations.

3.15 PROTECTION OF FINISHED WORK:

A. Protect finished installation.

B. Without damaging completed work, provide protective boards at exposed external corners which may be damaged by construction activities.

END OF SECTION

SECTION 04201

CMU BUILDING ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Thermoplastic Polyolefin Single-Ply Roofing Membrane

B. Thermoplastic Polyolefin Flashings

C. Thermoplastic Polyolefin Accessories

D. Roof Insulation

1.2 REFERENCES:

A. American Society for Testing and Materials (ASTM) - Annual Book of ASTM Standards

1. ASTM D-751 – Standard Test Methods for Coated Fabrics

2. ASTM D-2137 - Standard Test Methods for Rubber Property—Brittleness Point of Flexible Polymers and Coated Fabrics

3. ASTM E-96 - Standard Test Methods for Water Vapor Transmission of Materials

4. ASTM D1204 - Standard Test Method for Linear Dimensional Changes of Non Rigid Thermoplastic Sheeting or Film at Elevated Temperature

5. ASTM D-471 - Standard Test Method for Rubber Property—Effect of Liquids

6. ASTM D-1149 - Standard Test Methods for Rubber Deterioration—Cracking in an Ozone Controlled Environment

7. ASTM C-1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer

8. ASTM C-1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.

B. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - Architectural Sheet Metal Manual

C. National Roofing Contractors Association (NRCA)

D. American Society of Civil Engineers (ASCE)

E. U.S. Green Building Council (USGBC)

1. Leadership in Energy and Environmental Design (LEED)

F. Factory Mutual (FM Global) - Approval Guide

G. Underwriters Laboratories (UL) - Roofing Systems and Materials Guide (TGFU R1306)

H. ENERGY STAR

I. Cool Roof Rating Council (CRRC)

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D1079 and the glossary of the National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual for definitions of roofing terms related to this section.

1.4 SUBMITTALS:

A. Product Data: Provide product data sheets for each type of product indicated in this section.

B. Shop Drawings: Provide manufacturers standard details and approved shop drawings for the roof system specified.

C. Samples: Provide samples of insulations, fasteners, membrane materials and accessories for verification of quality.

D. Certificates: Installer shall provide written documentation from the manufacturer of their authorization to install the roof system, and eligibility to obtain the warranty specified in this section.

1.5 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: GAF® shall provide a roofing system that meets or exceeds all criteria listed in this section.

B. Installer's Qualifications:
Installer shall be qualified by the selected product supplier to install the product.

C. Source Limitations: All components listed in this section shall be provided by a single manufacturer or approved by the primary roofing manufacturer.

D. Final Inspection: Manufacturer's representative shall provide a comprehensive final inspection after completion of the roof system. All application errors must be addressed and final punch list completed.

1.6 PRE-INSTALLATION CONFERENCE

A. Prior to scheduled commencement of the roofing installation and associated work, conduct a meeting at the project site with the installer, architect, owner, membrane supplier representative and any other persons directly involved with the performance of the work. The installer shall record conference discussions to include decisions and agreements reached (or disagreements), and furnish copies of recorded discussions to each attending party. The main purpose of this meeting is to review foreseeable methods and procedures related to roofing work.

1.7 PERFORMANCE REQUIREMENTS

A. Provide an installed roofing membrane and base flashing system that does not permit the passage of water, and will withstand the design pressures calculated in accordance with the most current revision of ASCE 7.

B. Provide an installed roofing membrane and base flashing system that does not permit the passage of water, and will withstand the design pressures determined in FM Global Loss Prevention Data Sheet 1-28, to meet a 1-60 or greater wind uplift rating as required by location.

C. Membrane supplier shall provide all primary roofing materials that are physically and chemically compatible when installed in accordance with manufacturers current application requirements.

1.8 REGULATORY REQUIREMENTS

A. All work shall be performed in a safe, professional manner, conforming to all federal, state and local codes.

B. Exterior Fire Test Exposure: Provide a roofing system achieving a UL Class B rating for roof slopes indicated.

C. Windstorm Classification: Provide a roofing system which will achieve a Factory Mutual 1-75 wind uplift rating, as listed in the current FM Approval Guide.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver all roofing materials to the site in original containers, with factory seals intact.

B. Store all pail goods in their original undamaged containers in a clean, dry location within their specified temperature range. Reference data sheets for product storage requirements.

C. Do not expose materials to moisture in any form before, during or after delivery to the site. Reject delivery of materials that show evidence of contact with moisture.

D. Use “breathable” type covers such as canvas tarpaulins to allow venting and protection from weather and moisture. Cover and protect materials at the end of each work day. Do not remove any protective tarpaulins until immediately before the material will be installed.

1.10 PROJECT CONDITIONS

A. Weather

1. Proceed with roofing only when existing and forecasted weather conditions permit.

2. Ambient temperatures must be above 45°F (7.2°C) when applying hot asphalt or water based adhesives.

1.11 JOB CONDITIONS

A. All steel beams, columns, and large pipes that project through the insulation should be vapor-sealed and insulated with a 4-foot high wrap of insulation. The height of insulation at conduits, small pipes, and rods should be four times the regular wall insulation thickness. In both cases, the thickness of insulation on the projection should be half that on the regular wall or ceiling.

1.12 WARRANTY/GUARANTEE

A. Provide manufacturers standard prorated material warranty

1. The manufacturer agrees to repair or replace the portion of the roofing materials that have resulted in a leak due to a manufacturing defect or defects caused by ordinary wear and tear.

a. Duration: 5 years

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. GAF

B. Genflex

C. Carlisle

D. Elevate TPO Roofs

E. Or engineering approved equivalent.

2.2 AIR AND VAPOR RETARDER SYSTEM

A. Proprietary formulated elastomeric styrene-butadiene-styrene (SBS) polymer modified bitumen in combination with a high tack self-adhesive.

2.3 INSULATION

A. Rigid polyisocyanurate board, with a strong white or black fibrous glass facer.

1. Polyiso Insulation

a. Board Thickness:
b. Thermal Resistance (LTTR value) of:
c. Compressive Strength: 20 PSI, meets ASTM C1289, Type II, Class 1, Grade 2*.

2. Tapered Polyiso Insulation by GAF®,

a. Board Thickness: tapered
b. Thermal Resistance (LTTR value) of:
c. Compressive Strength: 20 PSI, meets ASTM C1289, Type II, Class 1, Grade 2*.

2.4 ROOF BOARD

A. Underlayment or overlayment board with a water-resistant and silicone treated gypsum core with glass fiber facers embedded on both sides, and pre-primed on one side.

B. Underlayment or overlayment board with a water-resistant and silicone treated gypsum core with glass fiber facers embedded on both sides.

C. Underlayment or overlayment board with a water-resistant and silicone treated gypsum core with glass fiber facers embedded on both sides and a factory-applied low perm, integrated, durable coating that enhances bond strength of the membrane system.

2.5 SEPARATION SHEET

A. Fire Resistant non-woven fiberglass slip sheet used as a separation sheet over polystyrene foam insulation or beneath insulation over wood substrates providing a UL class A fire rating. Each roll contains ten (10) squares (1,000 sq. ft.) of material, 6' x 166.7' (1.83m x 50.8m), 110 lbs nominal weight.

B. Fire resistant glass fiber mat used as a separation sheet over polystyrene foam insulation or beneath insulation over wood substrates. Each roll contains ten (10) squares (1,000 sq. ft.) of material, 4' x 250' (1.2m x 76.9m), 80 lbs. (36.4 kg).

C. Fire resistant glass fiber mat used as a separation sheet over polystyrene foam insulation or beneath insulation over wood substrates. Each roll contains four (4) squares (420 sq. ft.) of material, 4' x 105' (1.2m x 32.3m), 79 lbs. (35.9 kg).

D. Non-woven polyester UV-stabilized mat, 3 oz. per sq. yd. used as a separation sheet beneath membranes as a protection layer and used over membranes in ballast applied assemblies. Each roll contains thirty (30) squares (3,000 sq. ft.) of material, 10' x 300' (3.07m x 92.3m), 75 lbs. (34.1 kg).

E. Non-woven polyester UV-stabilized mat, 6 oz. per sq. yd. used as a separation sheet beneath membranes as a protection layer and used over membranes in ballast or paver applied assemblies.

2.6 MEMBRANE MATERIALS

A. A smooth type, polyester scrim reinforced thermoplastic polyolefin membrane, for use as a single ply roofing membrane. Meets or exceeds the minimum requirements of ASTM D-6878. UL Listed, FM Approved, Dade County Product Approval, Florida Building Code Approved.

2.7 FLASHING MATERIALS

A. Advanced heat and UV protected, smooth type, polyester scrim reinforced thermoplastic polyolefin membrane, for use as a single ply roofing membrane. Meets or exceeds the minimum requirements of ASTM D-6878. UL Listed, FM Approved, Dade County Product Approval, Florida Building Code Approved.

2.8 ADHESIVES, SEALANTS and PRIMERS

A. Sprayable solvent-based adhesive for smooth TPO.

B. Low VOC Sprayable solvent-based adhesive for smooth TPO.

C. Water-based Bonding Adhesive.

D. Solvent-based bonding adhesive for use with smooth TPO membranes.

E. Low VOC solvent-based bonding adhesive for use with smooth TPO membranes.

F. Two-part VOC free low rise polyurethane foam adhesive for use with fleece-back membranes.

G. Low temp two-part VOC free low rise polyurethane foam adhesive for use with insulation and fleece-back membranes.

H. Sustainable low temp two-part VOC free low rise polyurethane foam adhesive for use with insulation and fleece-back membranes.

I. Solvent based primer for preparing surfaces to receive butyl based adhesive tapes.

J. Low VOC solvent based primer for preparing surfaces to receive butyl based adhesive tapes.

K. Solvent based seam cleaner used to clean exposed or contaminated seam prior to heat welding.

L. Low VOC solvent based cleaner used to clean exposed or contaminated seam prior to heat-welding or priming.

M. Solvent based, trowel grade synthetic elastomeric sealant. Durable and UV resistant suitable for use where caulk is typically used.

N. One-part moisture cure, self-leveling sealant designed for use in pitch pans.

O. One part butyl based high viscosity sealant suitable for sealing between flashing membrane and substrate surface behind exposed termination bars and for sealing between roofing membrane and drain flange.

2.9 PLATES & FASTENERS

A. Standard duty alloy steel insulation fastener with CR-10 coating with a .215" diameter thread. Factory Mutual Standard 4470 Approved, #3 Phillips head for use on steel and wood decks.

B. Assembled screw and 3" locking plastic plate. Alloy steel fastener with CR-10 coating with a .215" diameter thread. Factory Mutual Standard 4470 Approved, #3 Phillips truss head.

C. Assembled screw and 3" steel plate. Alloy steel fastener with CR-10 coating with a .215" diameter thread. Factory Mutual Standard 4470 Approved, #3 Phillips truss head.

D. Glass-filled nylon auger with 1" (25.4 mm) with major thread diameter of .675. To be used with 3" steel plate for insulation and 2" steel plate for single-ply membranes. Miami Dade and Factory Mutual Standard 4470 approved (for insulation attachment)

E. Heavy gauge alloy steel fastener with CR-10 coating with a .245" diameter thread. Miami Dade and Factory Mutual Standard 4470 Approved, #3 Phillips truss head for use on wood, concrete and steel decks.

F. Heavy gauge alloy steel fastener with CR-10 coating with a .275" diameter thread. Factory Mutual Standard 4470 Approved, #3 Phillips truss head for use on heavy steel decks, O.S.B or aluminum roof decks.

G. Heavy gauge alloy steel fastener with CR-10 coating with a .320" diameter thread. Factory Mutual Standard 4470 Approved, #3 Phillips truss head for use on specific FM assemblies on heavy steel decks.

H. A large diameter reinforced nylon screw with a #3 square drive flat head. Thread diameter of .375" and shank diameter of .312". Uses a 3" (76 mm) Metal Round Plate fastening system.

I. G-90 galvanized, CR-10 Corrosion resistant coating with 1.125" x1" (25.4 mm) head and 1 3/4" (44 mm) leg length. Preassembled with 2 3/4" (70 mm) diameter Galvalume steel roof disc.

J. G-90 galvanized, CR-10 Corrosion resistant coating with 1.125" x1" (25.4 mm) head and 1.2" leg length. Preassembled with 2 3/4" (70 mm) Diameter Galvalume steel roof disc.

K. Alloy steel fastener with CR-10 coating with a .210" diameter thread. Factory Mutual Standard 4470 Approved, ¼" hex head. For use when mechanically fastening single-ply membranes in metal-retrofit applications.

L. Self-locking one-piece fastener for securing base ply when roofing over existing poured gypsum roof decks. Shank: 1" (25.4 mm) tapered cone precision formed from corrosion resistant galvanized (G-90) steel. Cap: 1-1/4" round cap formed from corrosion resistant Galvalume (AZ-55) steel, reinforced to resist cupping during driving. The shank is securely wedged to cap forming rigid one-piece fastener, by E. S. Products.

M. Galvalume coated steel 3" square plates recessed or flat bottom.

N. Galvalume coated steel 3" diameter plates. Miami Dade and Factory Mutual Standard 4470 Approved.

2.10 ACCESSORIES

A. GENERAL FLASHING ACCESSORIES

1. A smooth type, unreinforced thermoplastic polyolefin based membrane for use as an alternative flashing/reinforcing material for penetrations and corners. Required whenever preformed vent boots cannot be used, available in White, 0.055 inches (55 mils) nominal thickness and sheet size:

2. An 8 inch (203 mm) wide smooth type, polyester scrim reinforced thermoplastic polyolefin membrane strip for use as a cover strip over coated metal and stripping-in coated metal flanges and general repairs: 0.045 inches (45 mils) nominal thickness with 100 foot length, available in White.

3. 25 mil TPO membrane laminated to galvanized sheet metal for fabrication into metal gravel stop and drip edge profiles, metal base and curb flashings, sealant pans, and scupper sleeves.

   a. Metal type: 24 gauge Stainless steel
   b. Sheet Color: White

4. Extruded aluminum termination bar with angled lip caulk receiver and lower leg bulb stiffener. Pre-punched slotted holes at 6" on center or 8" on center. ¾" x 10' with 0.090" cross section.

B. ROOF EDGE ACCESSORIES

1. Two-part assembly with a continuous cleat and a formed high-quality KYNAR 500® finish cover tested per ANSI/SPRI/FM4435/ES-1. The system shall have all concealed fasteners with no penetration on horizontal roof surface available in 10' lengths.

2. Two part decorative fascia edge metal tested per ANSI/SPRI/FM4435/ES-1. The system shall have all concealed fasteners with no penetration on horizontal roof surface available in 10' lengths.

3. Decorative metal fascia with continuous galvanized steel spring cant to terminate single-ply roofing at perimeter. The system shall be watertight with concealed splice plates and no exposed fasteners available in 10' lengths.

4. 20 gauge galvanized steel box with pre-punched holes and supplied with corrosion-resistant fasteners.

C. WALL & CURB ACCESSORIES

1. 045″ reinforced TPO membrane with pressure sensitive adhesive, to be installed on horizontal surfaces using plates and fasteners as a base attachment in fully adhered systems. Size 6″ x 100′.

2. 55 mil TPO membrane and 24 gauge coated metal prefabricated into standard and custom size thru wall scuppers. Available in two sizes: 4" x 6" x 12" (l x w x d) with a 5.75" x 3.75" opening and 8" x 10" x 12" (l x w x d) with a 9.75" x 7.75" opening.

3. .045″ or .060″ thick reinforced TPO membrane fabricated corners. Available in four standard sizes to flash curbs that are 24″, 36″, 48″, and 60″ in size. Four corners are required to flash the curb.

4. 0.060″ thick molded TPO membrane outside corners of base and curb flashing. Hot-air welds directly to EverGuard® TPO membrane. Size 4″ x 4″ with 6″ flange.

5. 0.055″ molded TPO membrane inside corners of base and curb flashing. Hot-air welds directly to EverGuard® TPO membrane. Size 6″ x 6″ x 5.5″ high.

6. 8″ diameter, nominal .050″ vacuum formed unreinforced TPO membrane for use in flashing outside corners of base and curb flashings.

D. PENETRATION ACCESSORIES

1. 0.075″ thick molded TPO membrane sized to accommodate most common pipe and conduits, (1″ (25.4 mm) to 6″ diameter pipes), including square tube. Hot-air welded directly to EverGuard® TPO membrane, supplied with stainless steel clamping rings.

2. 0.045″ or 0.60″ thick molded TPO membrane preformed boots are split to accommodate most common pipes and conduits and available in three standard sizes.

3. 0.045" or 0.60" thick molded TPO membrane preformed square boots are split to accommodate most common square penetrations and conduits and available in three standard sizes.

4. .070 thick molded penetration pocket to provide structure and foundation for the application of a pourable sealant for a variety of roof penetrations, weldable and 9" x 6" x 4" (l x w x h).

5. 055" thick smooth type, unreinforced thermoplastic polyolefin membrane designed for use as a conforming membrane seal over T-joints in 60 and 80 mil membrane applications.

E. FIELD OF ROOF ACCESSORIES

1. Pre-manufactured expansion joint covers used to bridge expansion joint openings in a roof structure. Fabricated to accommodate all roof to wall and roof to roof applications, made of .060" reinforced TPO membrane, available in 5 standard sizes for expansion joint openings up to 8" wide.

2. .055" thick smooth type, unreinforced thermoplastic polyolefin membrane designed for use as a conforming membrane seal over T-joints in 60, 70 and 80 mil membrane applications.

3. 1/8" thick extruded and embossed TPO roll 30" x 50', heat welds directly to roofing membrane. Unique herringbone traction surface. Gray in color.

PART 3 EXECUTION

3.1 EXAMINATION:

A. Verify that the surfaces and site conditions are ready to receive work.

B. Verify that the deck is supported and secured.

C. Verify that the deck is clean and smooth, free of depressions, waves, or projections, and properly sloped to drains, valleys, eaves, scuppers or gutters.

D. Verify that the deck surfaces are dry and free of ice or snow.

E. Verify that all roof openings or penetrations through the roof are solidly set, and that all flashings are tapered.

3.2 SUBSTRATE PREPARATION:

A. Plywood Deck

1. Plywood sheathing must be exterior grade, minimum 4 ply, and not less than 3/4" (19 mm) 19/32" (Miami Dade County) thick.

2. Preservatives or fire retardants used to treat the decking must be compatible with roofing materials.

3. The deck must be installed over joists that are spaced 24" (610 mm) o.c. or less.

4. The deck must be installed so that all four sides of each panel bear on and are secured to joist and cross blocking. The panels must be secured in accordance with APA–The Engineered Wood Association recommendations "H" clips are not acceptable.

5. Panels must be installed with a 1/8" to 1/4" (3mm – 6mm) gap between panels and must match vertically at joints to within 1/8" (3mm).

6. Decking should be kept dry and roofed promptly after installation.

7. Deck shall be attached with approved fasteners at required spacing. Consult local building codes for specific requirements.

B. Oriented Strand Board (OSB) Deck

1. Oriented Strand Board must carry a Structural 1 rating if it is to be used as a decking material.

2. Preservatives or fire retardants used to treat decking must be compatible with roofing materials.

3. The deck must be installed over joists that are spaced 24" (610 mm) o.c. or less.

4. The deck must be installed so that all four sides of each panel bear on and are secured to joist and cross blocking; the APA/Engineered Wood Association (APA) recommendations. "H" clips are not acceptable.

5. Panels must be installed with a 1/8" to 1/4" (3mm – 6mm) gap between panels and must match vertically at joints to within (1/8" (3mm).

6. Decking should be kept dry and roofed promptly after installation.

3.3 NAILER INSTALLATION

A. Acceptable Material

1. Solid Blocking: Non-pressure treated wood as required, #2 Grade or better, nominal 1 1 /4" (30 mm) x 4" (102 mm) with a minimum thickness of 3 1 /2" (88 mm).

2. Shim Material: Plywood, 1 /2" (13 mm) x width to match solid blocking.

3. Verify the condition of existing roof nailers and anchor to resist 250 lb. per ft. (550 kg) load applied in any direction. New nailers should meet same load requirements.

4. DRILL-TEC™ HD screws 18" (457 mm) o.c. attachment to structural wood, steel decks with a 1" (25 mm) thread embedment.

5. DRILL-TEC™ spikes or HD screws 18" (457 mm) o.c. attachment to concrete decks. Min. 1" (25 mm) shank or thread penetration.

6. Wood nailers attached to gypsum, concrete, cellular concrete and cementitious wood fiber must be fastened 12" (305 mm) o.c., through the nailer into the substrate with substrate approved DRILL-TEC™ fasteners.

7. Three anchors per length of wood nailer minimum.

3.4 INSTALLATION – GENERAL

A. Start the application of membrane plies at the low point of the roof or at the drains, so that the flow of water is over or parallel to, but never against the laps.

3.5 AIR/VAPOR BARRIER

A. GENERAL

1. Air/vapor retarder components must typically be installed when required by design professional to address internal building air pressure or humidity conditions on the structural deck or directly over a minimal layer insulation or fire barrier.

2. Insulation must be installed over the vapor retarder to raise the location of the dew point temperature above the level of the vapor retarder.

B. APPLICATION – LOOSE-APPLIED

1. Install air/vapor barrier sheet loose-applied to the deck or fire board so that wrinkles and buckles are not formed.

2. Overlap air/vapor barrier sheets a minimum of 6" for side and end laps. Tape laps together with duct tape or double sided tape.

3. Seal perimeter and penetration areas with foam sealant.

4. Seal all perimeter nailers with adhered roof membrane placed over the nailer and covering the exterior face of the nailer by 1" (25 mm).

5. Install insulation boards over the air/vapor retarder and mechanically attach the boards to the deck.

C. APPLICATION – ADHERED

1. Apply compatible adhesive to the structural deck or fire barrier board per air vapor retarder manufacturers' recommendations.

2. Install the air/vapor retarder components loose applied to the deck or fire barrier board so that wrinkles and buckles are not formed. Broom air/vapor barrier components to ensure embedment into the adhesive.

3. Overlap air/vapor retarder components a minimum of 6" (152 mm) for side and end laps. Adhere laps together with compatible adhesive.

4. Seal perimeter and penetration areas with foam sealant.

5. Install insulation boards over the air/vapor barrier and mechanically attach the boards to the deck or adhere the boards to the air/vapor retarder with compatible adhesive to achieve the desired roof system uplift resistance.

3.6 FIRE BARRIER/PROTECTION LAYER

A. GENERAL

1. Slip sheet protection layer must typically be installed when required by design professional or code authority to address code or approval requirements.

2. Install fiberglass sheet or polymat protection layer loose-applied over substrate surface so that wrinkles and buckles are not formed.

3. Overlap sheets a minimum of 6" (152 mm) for side and end laps.

4. The substrate must be clean, dry, and free of foreign matter.

3.7 INSULATION

A. GENERAL

1. Do not apply roof insulation or roofing until all other work trades have completed jobs that require them to traverse the deck on foot or with equipment. A vapor retarder coated lightly with asphalt may be applied to protect the inside of the structure prior to the insulation and final roofing installation. Before the application of the insulation, any damage or deterioration to the vapor retarder must be repaired.

2. Do not install wet, damaged or warped insulation boards.

3. Install insulation boards with staggered board joints in one direction (unless taping joint).

4. Install insulation boards snug. Gaps between board joints must not exceed ¼" (6 mm). All gaps in excess of ¼" (6 mm) must be filled with like insulation material.

5. Wood nailers must be 3-1/2" (89 mm) minimum width or 1" (25.4 mm) wider than metal flange. They shall be of equal thickness as the insulation, and be treated for rot resistance. All nailers must be securely fastened to the deck.

6. Do not kick insulation boards into place.

7. Miter and fill the edges of the insulation boards at ridges, valleys and other changes in plane to prevent open joints or irregular surfaces. Avoid breaking or crushing of the insulation at the corners.

8. Insulation should not be installed over new lightweight insulating concrete.

9. Roof tape, if required over insulation joints, must be laid evenly, smoothly and embedded in a uniform coating of hot steep asphalt with 4" (102 mm) end laps. Care must be taken to assure smooth application of tape, and full embedment of the tape in the asphalt.

10. Do not install any more insulation than will be completely waterproofed each day.

3.8 MEMBRANE APPLICATION

A. GENERAL

1. Substrates must be inspected and accepted by the contractor as suitable to receive and hold roof membrane materials.

2. Place roof membrane so that wrinkles and buckles are not formed. Any wrinkles or buckles must be removed from the sheet prior to permanent securement.

3. Membrane that has been exposed for more than 12 hours or has become contaminated will require additional cleaning methods.

a. Light Contamination - Membrane that has been exposed overnight up to a few days to debris, foot traffic, or dew or light precipitation must be cleaned.

b. Dirt-Based Contamination - Membrane that is dirt encrusted will require the use of a low-residue cleaner.

c. Exposure-Based Contamination - Membrane that is weathered or oxidized will require the use of a cleaner, a conditioner, and a mildly abrasive scrubbing pad to remove the weathered/oxidized top surface layer. Be sure to wait for solvent to flash off prior to welding.

d. Chemical-Based Contamination - Membrane that is contaminated with bonding adhesive, asphalt, flashing cement, grease and oil, and most other contaminants usually cannot be cleaned sufficiently to allow an adequate heat weld to the membrane surface. These membranes should be removed and replaced.

B. FULLY ADHERED

1. All work surfaces should be clean, dry, and free of dirt, dust, debris, oils, loose and/or embedded gravel, un-adhered coatings, deteriorated membrane, and other contaminants that may result in a surface that is not sound or is uneven.

2. Full-width rolls can be installed throughout the field and perimeter of the roof. Half sheets are not necessary.

3. Overlap roof membrane a minimum of 3" (76 mm) for end laps. For fleece-back membrane, butt ends together and cover joint. Membranes are provided with lap lines along the side laps.

4. Best practice is to install membrane so that the side laps run across the roof slope lapped toward drainage points.

5. All exposed sheet corners must be rounded a minimum of 1" (25 mm).

6. Use full-width rolls throughout the field and perimeter of the roof. Half sheets are not necessary.

7. Membrane laps shall be heat-welded together. All welds shall be continuous, without voids or partial welds. Welds shall be free of burns and scorch marks.

8. Weld shall be a minimum of 1" (25.4 mm) in width for automatic machine welding and a minimum 2" in width for hand welding.

9. Roof membrane must be mechanically attached along the base of walls with screws and plates 6" (152 mm) on center.

10. Adhesives should be applied to membrane at the rates listed on the pail.

11. Use appropriate bonding adhesive for substrate surface, applied with a solvent-resistant roller, brush or squeegee.

12. Adhere approximately one half of the membrane sheet at a time. One half of the sheet's length shall be folded back in turn to allow for adhesive application. Lay membrane into adhesive once the bonding adhesive is tacky to the touch.

13. Roll membrane with a weighted roller to ensure complete bonding between adhesive and membrane.

14. Prevent seam contamination by keeping the adhesive application a few inches back from the seam area.

15. Reference the Adhesive securement manufacturer's standard data for substrate adhesion and compatibility.

16. Apply LRF Adhesive directly to the substrate using a ribbon pattern. Space beads as required by job specification, typically 6" or 12" (152 mm or 305 mm) o.c.

17. Apply low rise foam in canisters should be applied in "spatter method" for fleece-back membrane applications ONLY.

18. Roll in membrane using a 150 lb. membrane roller or equivalent.

19. To reduce thermal bridging, a full spray of approved Low Rise Foam Adhesive may be used to attach individual insulation layers or adhere the top layer to a mechanically fastened bottom layer.

3.9 FLASHINGS

A. General

1. All penetrations must be at least 24" (610 mm) from curbs, walls, and edges to provide adequate space for proper flashing.

2. Flash all perimeter, curb, and penetration conditions with coated metal, membrane flashing, and flashing accessories as appropriate to the site condition.

3. All coated metal and membrane flashing corners shall be reinforced with preformed corners or non-reinforced membrane.

4. Heat-weld all flashing membranes, accessories, and coated metal. A minimum 2" (52 mm) wide hand weld or minimum 1" (25 mm) to 1-1/2" (39 mm) automatic machine weld is required.

5. Consult the EverGuard® Application and Specifications Manual or GAF® Technical Support Services for more information on specific construction details, or those not addressed in this section.

6. EverGuard Extreme® flashings and accessories are required for use with EverGuard Extreme® membranes.

7. Prior to placement of insulation boards, completely fill transition space between roof and any penetrations with foam pack a minimum of 12" from transition and up to level of cover board as shown in cold storage details to seal against moisture vapor drive.

B. Coated Metal Flashings

1. Coated metal flashings shall be formed in accordance SMACNA guidelines.

2. Coated metal sections used for roof edging, base flashing and coping shall be butted together with a ¼" (7 mm) gap to allow for expansion and contraction. Heat-weld a 6" (152 mm) wide reinforced membrane flashing strip to both sides of the joint, with approximately 1" (25.4 mm) on either side of the joint left un-welded to allow for expansion

and contraction. 2" (52 mm) wide aluminum tape can be installed over the joint as a bond-breaker, to prevent welding in this area.

3. Coated metal used for sealant pans, scupper inserts, corners of roof edging, base flashing and coping shall be overlapped or provided with separate metal pieces to create a continuous flange condition, and pop-riveted securely. Heat-weld a 6" (152 mm) wide reinforced membrane flashing strip over all seams that will not be sealed during subsequent flashing installation.

4. Provide a ½" (13 mm) hem for all exposed metal edges to provide corrosion protection and edge reinforcement for improved durability.

5. Provide a ½" (13 mm) hem for all metal flange edges whenever possible to prevent wearing of the roofing and flashing membranes at the flange edge.

6. Coated metal flashings shall be nailed to treated wood nailers or otherwise mechanically attached to the roof deck, wall or curb substrates, in accordance with construction detail requirements.

C. Reinforced Membrane Flashings

1. The thickness of the flashing membrane shall be the same as the thickness of the roofing membrane.

2. Membrane flashing may either be installed loose or fully adhered to the substrate surface in accordance with "Construction Detail Requirements".

3. Apply the adhesive only when outside temperature is above 40°F. Recommended minimum application temperature is 50°F to allow for easier adhesive application. Water-based adhesives are approved for use with smooth TPO membranes for flashings only.

4. The membrane flashing shall be carefully positioned prior to application to avoid wrinkles and buckles.

5. Please note that solvent-based adhesives must be allowed to dry until tacky to the touch before mating flashing membrane. Water-based adhesive must be allowed to flash off completely.

6. Heat-weld all laps in smooth-reinforced flashing membrane in accordance with heat-welding guidelines. All seams in fleece-back membrane and smooth field sheet must be stripped in with 8" (203 mm) flashing strip.

7. For extended length guarantees, separate counter flashing is required; exposed termination bars are not acceptable.

D. Un-reinforced Membrane Flashings

1. Un-reinforced membrane is used to field-fabricate penetration or reinforcement flashings in locations where preformed corners and pipe boots cannot be properly installed.

2. Penetration flashings constructed of un-reinforced membrane are typically installed in two sections, a horizontal piece that extends onto the roofing membrane and a vertical piece that extends up the penetration. The two pieces are overlapped and hot-air welded together.

3. Apply the adhesive only when outside temperature is above 40°F. Recommended minimum application temperature is 50°F to allow for easier adhesive application. Water-based adhesives are approved for use with smooth TPO membranes for flashings only.

4. The membrane flashing shall be carefully positioned prior to application to avoid wrinkles and buckles.

5. Please note that solvent-based adhesives must be allowed to dry until tacky to the touch before mating flashing membrane. Water-based adhesive must be allowed to flash off completely.

E. Roof Edges

1. Roof edge flashings are applicable for gravel stop and drip edge conditions as well as for exterior edges of parapet walls.

2. Flash roof edges with coated metal flanged edging with a minimum 3" (76 mm) wide flange nailed 4" (102 mm) on center to wood nailers, and heat weld 8" (203 mm) membrane strip to metal flanges.

3. When the fascia width exceeds 4" (102 mm), coated metal roof edging must be attached with a continuous cleat to secure the lower fascia edge. The cleat must be secured to the building no less than 12" (305 mm) o.c.

4. Flash roof edge scuppers with a coated metal insert that is mechanically attached to the roof edge and integrated as a part of the metal edging.

5. Alternatively, roof edges may be flashed with a 2-piece snap on fascia system, adhering the roof membrane to a metal cant and face nailing the membrane 8" (152 mm) on center prior to installing a snap-on fascia.

   a. Submit design drawings for review and approval to Architect or Specifier before fabrication.

   b. Installing contractor shall check as-built conditions and verify the manufacturer's roof edging details for accuracy to fit the wall assembly prior to fabrication. The installer shall comply

with the roof edging manufacturer's installation guide when setting edging.

F. Curbs and Ducts

1. Flash curbs and ducts with membrane adhered to the curb substrate with bonding adhesive, loose applied or with coated metal flashing nailed 4″ on center to pressure-treated wood nailers.

2. Maximum flashing height without intermediate fastening is 24" (610 mm) for loose-applied flashing and 54" (1.4 m) for adhered flashing.

3. Secure membrane flashing at the top edge with a termination bar. Exposed termination bars shall be mechanically fastened 6″ (152 mm) on center for guarantees less than 20 years and 12″ (305 mm) on center for guarantees greater than 20 years or that are counter-flashed.

4. Exposed termination bars must be sealed.

5. Roof membrane must be mechanically attached along the base of walls with screws and plates 12″ (305 mm).

6. Metal counterflashing may be optional with fully adhered flashings depending on guarantee requirements.

7. All coated metal curb flashings and loose applied membrane flashings must be provided with separate metal counterflashings, or metal copings.

G. Roof Drains

1. Roof drains must be fitted with compression type clamping rings and strainer baskets. Original-type cast iron and aluminum drains, as well as retrofit-type cast iron, aluminum or molded plastic drains are acceptable.

2. Roof drains must be provided with a minimum 36″ x 36″ (914 mm x 914 mm) sump if applicable. Slope of tapered insulation within the sump shall not exceed 4″ in 12″.

3. Extend the roofing membrane over the drain opening. Locate the drain and cut a hole in the roofing membrane directly over the drain opening. Provide a ½″ (13 mm) of membrane flap extending past the drain flange into the drain opening. Punch holes through the roofing membrane at drain bolt locations.

4. For cast iron and aluminum drains, the roofing membrane must be set in a full bed of FlexSeal™ Caulk Grade Sealant on the drain flange prior to securement with the compression clamping ring.

5. Lap seams shall not be located within the sump area. Where lap seams will be located within the sump area, a separate smooth membrane drain flashing a minimum of 12" (305 mm) larger than the sump area must be installed. The membrane flashing must be heat-welded to the roof membrane. Alternately, if the seam does not run under the clamping ring, it can be covered with a 6" (152 mm) wide reinforced-membrane strip heat-welded to the membrane.

6. Tighten the drain compression ring in place.

H. WOOD SUPPORT BLOCKING

1. Wood support blocking, typically 4" x 4" (102 mm x 102 mm), is usually installed under light-duty or temporary roof-mounted equipment, such as electrical conduit, gas lines, condensation and drain lines.

2. Install wood support blocking over a protective layer of EverGuard® TPO walkway rolls or PVC walkway pads. Place wood blocking on oversized slip sheet, fold two sides vertically, and fasten with roofing nails into the blocking.

3.10 CLEAN-UP

A. All work areas are to be kept clean, clear and free of debris at all times.

B. Do not allow trash, waste, or debris to collect on the roof. These items shall be removed from the roof on a daily basis.

C. All tools and unused materials must be collected at the end of each workday and stored properly off of the finished roof surface and protected from exposure to the elements.

D. Dispose of or recycle all trash and excess material in a manner conforming to current EPA regulations and local laws.

E. Properly clean the finished roof surface after completion, and make sure the drains and gutters are not clogged.

F. Clean and restore all damaged surfaces to their original condition.

3.11 MAINTENANCE ***WELL ROOF ADVANTAGE ONLY***

A. Inspections to the roof shall be performed annually.

END OF SECTION

SECTION 09800

PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. The work of this section includes the coating of all interior and exterior surfaces specified herein. Refer to 09911 – Architectural Painting for interior and exterior surfaces not specified herein.

1.2 REFERENCES:

A. ASTM D16 – Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.

B. ASTM D2200 – Standard Practice for Use of Pictorial Surface Preparation Standards and Guides for Painted Steel Surfaces.

C. ASTM D4417 – Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel.

D. ASTM D4263 – Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.

E. ASTM F1869 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

F. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

G. ICRI – International Concrete Repair Institute.

H. NACE (National Association of Corrosion Engineers) – Industrial Maintenance Painting.

I. NACE SP0287 – Field Measurement of Surface Profile of Abrasive Blast-Cleaned Steel Surfaces using a Replica Tape.

J. NACE SP0178 – Design, Fabrication, and Surface Finishes for Tanks and Vessels to be Lined for Immersion Service.

K. NACE SP0188 – Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.

L. NAPF – National Association of Pipe Fabricators.

M. NPCA (National Paint and Coating Association) – Guide to U.S. Government Paint Specifications.

N. SSPC (Society for Protective Coatings) – Steel Structures Painting Manual.

O. SSPC-Guide 15 – Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates.

P. SSPC-VIS 1 – Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning.

Q. SPC-PA1 – Shop, Field and Maintenance Painting of Steel.

R. SSPC-PA 2 – Measurement of Dry Film Thickness with Magnetic Gages.

S. Paint Manufacturer's printed instructions.

1.3 DEFINITIONS:

A. DFT - Dry film thickness.

B. mil(s) - a unit of measure equal to a thousandth of an inch (0.0254) mm.

C. VOC(s) - volatile organic compound(s).

1.4 INTERPRETATION:

A. The Engineer's decision shall be final in the interpretation and/or conflict between any of the referenced Specifications and Standards contained herein.

1.5 SUBMITTALS:

A. Painting schedule for the entire project. Schedule shall be organized and clear in a manner that is consistent with the organization of the Drawings. Schedule shall include each coating system(s) used for each component/area of the project.

B. Information to be provided: Provide a list of materials to be used under this Section. Submit the list before the materials are delivered to the job site. Cross reference the list to the coating systems identified. Furnish with the list, the coating Manufacturer's standard product data and color chart for each material to be used.

C. Manufacturer's color charts shall be submitted to the Engineer at least 30 days or prior to paint application. Coordinate work so as to allow sufficient time for paint to be delivered to the job site.

1.6 QUALITY ASSURANCE:

A. General: Use quality assurance procedures and practices to monitor all phases of surface preparation, application, and inspection throughout the duration of the project. Procedures or practices not specifically defined herein may be utilized provided they meet recognized and accepted professional standards.

B. Surface Preparation: Surface preparation will be based upon comparison with: SSPC-VIS 1, ASTM D2200, ASTM D4417 Method A and/or Method C, or NACE Standard SP0287. In all cases the written standard shall take precedence over the visual standard. In addition, NACE Standard SP0178,

along with the Visual Comparator, shall be used to verify the surface preparation of welds.

C. Application: No coating shall be applied: When the surrounding air temperature or the temperature of the surface to be coated or painted is below the minimum surface temperature for the products specified herein; or in rain; snow, fog, or mist; when the temperature is less than 5°F above the dew point; when the air temperature is expected to drop below 35°F within six hours after application of coating. Dew point shall be measured by use of an instrument such as a Sling Psychrometer in conjunction with U.S. Department of Commerce Weather Bureau Psychometric Tables. If the above conditions are forecast, coating or painting shall be completed in time to permit the film sufficient drying time prior to damage by atmospheric conditions.

D. Thickness: Thickness of coatings and paint shall be measured and checked according to the procedures outlined in SSPC-PA 2 with particular attention to section(s) 4.0, 7.8, 7.9, 7.11, 7.13, and 7.14, with a non-destructive, magnetic-type thickness gage that has been calibrated according to the procedures outlined in SSPC-PA 2 with particular attention to section(s) 3.0, 7.4, 7.5, and 7.15. Pass/fail criteria shall require that ninety (90) percent of the spot measurements (average of 3 gage readings within a 1.5-inch diameter area) be at or above the minimum specified dry film thickness. Of the remaining ten (10) percent of the spot measurements (average of 3 gage readings within a 1.5-inch diameter area) that are below the minimum specified dry film thickness, they shall be no less than ninety (90) percent of the minimum specified dry film thickness. Areas that fail to meet these criteria shall be corrected at no expense to the Owner. Use of an instrument such as a Tooke Gauge, precision groove grinder, etc. is permitted if a destructive test is deemed necessary by the Engineer and the total DFT is less than 50 mils.

E. Holiday (Pinhole) Testing: The integrity of interior coated surfaces shall be tested for holidays in accordance with NACE Standard SP0188. For dry films less than 20 mils, a non-destructive holiday detector shall not exceed 67.5 volts, nor shall destructive holiday detector exceed the voltage recommended by the Manufacturer of the coating system. A solution of 1-ounce, non-sudsing type wetting agent, such as Kodak Photo-Flo, and 1-gallon of tap water shall be used to perform the holiday testing. For coating thickness at 20 mils and greater, a high voltage Tinker & Rasor AP/W holiday tester shall be used. Contact coating Manufacturer for voltage recommendations and curing parameters. All pinholes and/or holidays shall be marked and repaired in accordance with the Manufacturer's printed recommendations and retested. No pinholes or other irregularities will be permitted in the final coating.

F. Inspection: Inspection shall consist of 'hold point' inspections. The Engineer or its representative shall inspect the surface prior to abrasive blasting, after abrasive blasting but prior to application of coating materials, and between subsequent coats of material. Final inspection shall take place after all coatings are applied, but prior to placing the equipment, piping, tank, etc. in service. Contractor shall insure that sufficient rigging is in place so that the Engineer or his representative shall be able to conduct the required inspections.

G. Inspection Devices: The Contractor shall furnish, until final acceptance of coating and painting, inspection devices in good working condition for detection of holidays and measurement of DFT of coating. The Contractor shall also furnish U.S. Department of Commerce; National Bureau of Standards certified thickness calibration plates to test accuracy of DFT gages and certified instrumentation to test accuracy of holiday detector. Dry film thickness gages and holiday detectors shall be made available for the Engineer's use at all times until final acceptance of application. Holiday detection devices shall be operated in the presence of the Engineer.

H. Warranty Inspection: Warranty inspection shall be conducted during the eleventh month following completion of all coating and painting work. All defective work shall be repaired in accordance with this specification and to the satisfaction of the Engineer/Owner.

1.7 QUALIFICATIONS:

A. The Contractor shall have three years practical experience and successful history in the application of specified products to surfaces in water treatment, wastewater treatment, or industrial facilities. The Contractor shall be a knowledgeable and experienced professional, fully aware of the methods and regulatory requirements of coating removal and application. Upon request, he shall substantiate this requirement by furnishing a list of references and job completions.

1.8 SAFETY AND HEALTH REQUIREMENTS:

A. General: The Contractor shall perform all work in accordance with applicable local, state, and federal laws and regulations, and material Manufacturer's instructions and recommendations pertaining to the methods, materials, or activities in the work. Some of these regulations are included in the following groups:

Occupational Safety and Health Act and derived regulations.

Clean Air Act and derived regulations, both federal and state.

The items listed below in the rest of this Paragraph are intended to call the Contractor's attention to some of the frequently necessary compliance activities. The Contractor is solely responsible for compliance with applicable regulations including, but not limited to, the areas identified in this Specification. The Contractor shall provide and require the use of personal protective equipment for persons working on or about the project.

B. Head and Face Protection and Respiratory Devices: Equipment shall include protective helmets which shall be worn by all persons while in the vicinity of the work. In addition, workers engaged in or near the work during sandblasting shall wear appropriate eye and face protection devices and air purifying, half mask or mouthpiece respirators with appropriate filters.

C. Ventilation: Where ventilation is used to control hazardous exposure, all equipment shall be explosion-proof. Ventilation shall reduce the concentration of air contaminants to the degree a hazard does not exist. Air circulation and exhausting of solvent vapors shall be continued until coatings have fully cured.

D. Sound Levels: Whenever the occupational noise exposure exceeds maximum allowable sound levels, the Contractor shall provide and require the use of approved ear protective devices.

E. Illumination: Adequate illumination shall be provided while work is in progress, including explosion-proof lights and electrical equipment. Whenever required by the Engineer, the Contractor shall provide additional illumination and necessary supports to cover all areas to be inspected. The level of illumination for inspection purposes shall be determined by the Engineer.

F. Temporary Ladders and Scaffolding: All temporary ladders and scaffolding shall conform to applicable safety requirements. They shall be erected where requested by the Engineer to facilitate inspection and be moved by the Contractor to locations requested by the Engineer.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Materials specified are those that have been evaluated for the specific service. Products are listed to establish a standard of quality. Equivalent materials of other Manufacturers may be substituted on written approval of the Engineer in accordance with Section 01600 – Material and Equipment.

Requests for substitution shall include Manufacturer's literature for each product giving name, product number, and generic type, descriptive information, solids by volume, recommended DFT and certified laboratory test reports showing results to equal the performance criteria of the products specified herein. In addition, a list of five projects shall be submitted in which each product has been used and rendered satisfactory service. The listed projects shall be in the State of Texas, Oklahoma, Louisiana, or Arkansas.

2.2 DELIVERY AND STORAGE:

A. All materials shall be brought to jobsite in original sealed containers. They shall not be used until the Engineer has inspected contents and obtained data from information on containers or label. Materials exceeding storage life recommended by the Manufacturer shall be rejected.

B. All coatings and paints shall be stored in enclosed structures to protect them from weather and excessive heat or cold. Flammable coatings or paint must be stored to conform with City, County, State, and Federal safety codes for flammable coating or paint materials. At all times coatings and paints shall be protected from freezing.

2.3 MATERIALS:

The number of coats called for in this schedule shall be considered minimum. If additional coats are required for complete coverage and uniform appearance, they shall be applied. Colors will be selected by the Owner. The system numbering may not be sequential or inclusive of all numbers from the first to last system or schedule numbers. Color coding of piping to be as noted in Section 3.5, Paragraph B.

SYSTEM NO. 1

TYPE OF SURFACE: Exterior exposed ferrous metals including handrails and walkways.

TYPE OF STRUCTURE: Structural steel, handrails, walkways, stairways, tops of digester covers, bridges, etc.

EXPOSURE CONDITION: Interior and exterior.

SURFACE PREPARATION: SSPC-SP6/NACE 3 Commercial Blast Cleaning. A 1.5 to 2.0 mil angular anchor profile as per ASTM D4417, Method C or NACE Standard SP0287. All surfaces to be clean and dry. All surfaces should be clean, dry, free of oil, rust, loose and scaling paint, and foreign material.

PAINTING SYSTEM:

First Coat:	
Tnemec Series N69 Hi-Build Epoxoline II	5.0–7.0 mils DFT
Second Coat:	
Tnemec Series 1094 Endura-Shield (Gloss)	2.0–3.0 mils DFT
Alternate Second Coat:	
Tnemec Series 1095 Endura-Shield (Semi-Gloss)	2.0–3.0 mils DFT
Total Thickness =	7.0–10.0 mils DFT min.

SYSTEM NO. 2

TYPE OF SURFACE: Ferrous metals.

TYPE OF STRUCTURE: Severe moisture and chemical contact and fumes such as: chemical tanks, feeders, rotary drums, vacuum filters, valves, conveyors, pipes, slurry tanks, and lime and ferric sulfate or chloride tanks, interior and exterior.

EXPOSURE CONDITION: Non-submerged; inside or outside.

SURFACE PREPARATION: Surface shall be sandblasted to a SSPC-SP6/NACE 3 Commercial Blast Cleaning. Anchor profile shall be angular with a 1.5 to 2.0 mil profile as per ASTM D4417, Method C or NACE Standard SP0287. All surfaces to be clean and dry.

PAINTING SYSTEM:

First Coat:	
Tnemec Series N69 Hi-Build Epoxloline II	4.0–6.0 mils DFT
Second Coat:	
Tnemec Series N69 Hi-Build Epoxloline II	5.0–7.0 mils DFT
Third Coat (Interior):	
Tnemec Series N69 Hi-Build Epoxoline II	5.0–7.0 mils DFT
Third Coat (Exterior):	
Tnemec Series 1095 (Semi-Gloss)	2.0–3.0 mils
Total Thickness (Interior) =	14.0–20.0 mils DFT min.
Total Thickness (Exterior) =	11.0–16.0 mils DFT min.

SYSTEM NO. 3

TYPE OF SURFACE: Steel.

TYPE OF STRUCTURE: Piping, fittings and valves, and exposed structural steel, metal trim, and process air lines for temperatures below 250F.

EXPOSURE CONDITION: Non-submerged.

SURFACE PREPARATION: Surface shall be sandblasted to a SSPC-SP6/NACE 3 Commercial Blast Cleaning. Anchor profile shall be angular with a 1.5 to 2.0 mil profile as per ASTM D4417, Method C or NACE Standard SP0287. All surfaces to be clean and dry.

PAINTING SYSTEM:

First Coat:	
Tnemec Series N69 Hi-Build Epoxoline II	4.0–6.0 mils DFT
Second Coat:	
Tnemec Series 1094 Endura-Shield (Gloss)	2.0–3.0 mils DFT
Alternate Second Coat:	
Tnemec Series 73 Endura-Shield (Semi-Gloss)	2.0–3.0 mils DFT
Total Thickness =	6.0–9.0 mils DFT min.

SYSTEM NO. 4

TYPE OF SURFACE: Ductile iron.

TYPE OF STRUCTURE: Piping, fittings and valves, and miscellaneous ductile iron.

EXPOSURE CONDITION: Non-submerged.

SURFACE PREPARATION: Clean all surfaces as per NAPF 500-03-01 Solvent Cleaning to remove all oil, grease, factory applied tars and/or bitumastic coatings and all other soluble contaminants. Prepare ductile iron pipe as per NAPF 500-03-04 Abrasive Blast Cleaning for Ductile Iron pipe, providing a minimum 1.5 mil angular anchor profile. Prepare ductile iron valves and fittings as per NAPF 500-03-05 Abrasive Blast Cleaning for Cast Ductile Iron Fittings. If existing ductile iron is factory coated with Tnemec Series N140, follow the recoat window listed on the current product data sheet.

PAINTING SYSTEM:

First Coat:	
Tnemec Series 133 Pro-Tuff Mastic	4.0–6.0 mils DFT
Second Coat:	
Tnemec Series 1094 Endura-Shield (Gloss)	2.0–3.0 mils DFT
Alternate Second Coat:	
Tnemec Series 1095 Endura-Shield (Semi-Gloss)	2.0–3.0 mils DFT
Total Thickness =	6.5–9.5 mils DFT min.

SYSTEM NO. 5

TYPE OF SURFACE: Factory-primed metal.

TYPE OF STRUCTURE: Piping, fittings and valves, and miscellaneous metal structures.

EXPOSURE CONDITION: Non-submerged.

SURFACE PREPARATION: All surfaces shall be dry, clean and free of all contaminants. Clean all surfaces as per SSPC-SP2 or SSPC-SP3 Hand or Power Tool Cleaning. Apply a test patch when necessary to ensure compatibility.

PAINTING SYSTEM:

First Coat:	
Tnemec Series 133 Pro-Tuff Mastic	4.0–6.0 mils DFT
Second Coat:	
Tnemec Series 1094 Endura-Shield (Gloss)	2.0–3.0 mils DFT
Alternate Second Coat:	
Tnemec Series 1095 Endura-Shield (Semi-Gloss)	2.0–3.0 mils DFT
Total Thickness =	6.0–9.0 mils DFT min.

SYSTEM NO. 6

TYPE OF LIQUID HANDLED: Non-potable water.

TYPE OF SURFACE: Steel.

TYPE OF STRUCTURE: Trickling filter arms, gates, troughs, weirs, pipes, fittings, baffles, aerators, air diffusers, pumps, flights, and skimming arms.

EXPOSURE CONDITION: Submerged or intermittently submerged.

SURFACE PREPARATION: SSPC-SP10/NACE 2 Near White Metal Blast Cleaning. Anchor profile shall be angular with a 1.5 to 2.0 mil profile as per ASTM D4417, Method C or NACE Standard SP0287. All surfaces to be clean and dry.

PAINTING SYSTEM:

First Coat:	
Tnemec Series N69-1255 Hi-Build Epoxoline II	4.0–6.0 mils DFT
Second Coat:	
Tnemec Series 21 Epoxoline	12.0–15.0 mils DFT
Total Thickness =	16.0–21.0 mils DFT min.

SYSTEM NO. 7 – REMOVED. No potable water structures.

SYSTEM NO. 8 – REMOVED. The only building is CMU.

SYSTEM NO. 9 – REMOVED. The only building is CMU.

SYSTEM NO. 10

TYPE OF SURFACE: Exterior CMU. – Plant Water/Chlorine Building.

TYPE OF STRUCTURE: Exterior building structures.

EXPOSURE CONDITION: Non-submerged.

SURFACE PREPARATION: New CMU is to be cured a minimum of 14 days and be free of all mortar splatter or other contaminants. Contractor will perform all surface preparation necessary to achieve a clean, dry surface prior to application of materials.

PAINTING SYSTEM:

Prime Coat:	
Tnemec Series 130 Envirofill	60–80 sq. ft. /gal.
First Coat:	
Tnemec Series 156 Enviro-Crete	6.0–8.0 mils DFT
Second Coat:	
Tnemec Series 156 Enviro-Crete	6.0–8.0 mils DFT
Total Thickness =	12.0–16.0 mils DFT

SYSTEM NO. 11

TYPE OF SURFACE: Interior CMU. – Plant Water/Chlorine Building.

TYPE OF STRUCTURE: Interior of building walls and ceilings, walls and ceilings in pipe galleries, pump galleries, pump and blower rooms, chlorine rooms, and control rooms.

EXPOSURE CONDITION: Non-submerged.

SURFACE PREPARATION: All loose paint, chalk, and contaminants are to be completely removed. New CMU is to be cured a minimum of 14 days and be free of all mortar splatter or other contaminants. Contractor will perform all surface preparation necessary to achieve a clean, dry surface prior to application of materials.

PAINTING SYSTEM:

Adhesion Promoter:	
Tnemec Series 130 Envirofill	60–80 sq. ft/gal.
First Coat:	
Tnemec Series N69 Hi-Build Epoxoline II	4.0–6.0 mils DFT
Second Coat:	
Tnemec Series N69 Hi-Build Epoxoline II	4.0–6.0 mils DFT
Total Thickness =	8.0–12.0 mils DFT min.

SYSTEM NO. 12

TYPE OF LIQUID HANDLED: Non-potable water.

TYPE OF SURFACE: Concrete.

TYPE OF STRUCTURE: Influent or effluent channels. Parshall flumes and tank structures, such as aerator, primary and secondary settling, trickling filters, and primary and secondary clarifiers.

EXPOSURE CONDITION: Submerged.

SURFACE PREPARATION: SSPC-SP13/NACE 6 Brush-Off Blast Cleaning. An angular anchor profile equivalent to ICRI CSP 3 Moderate Service is required. Concrete should be completely cured and free of form release compounds, laitance, loose particles and be completely dry. Pits, bugholes, or unconsolidated areas are to be repaired with Series 218 Surfacing Epoxy. Final colors shall be selected by the Owner.

PAINTING SYSTEM:

First Coat:	
Tnemec Series 21-1255 Beige Epoxoline	4.0–6.0 mils DFT
Second Coat:	
Tnemec Series 21-WH16 Off White Epoxoline	10.0–12.0 mils DFT
Total Thickness =	14.0–18.0 mils DFT min.

SYSTEM NO. 13 – REMOVED. No potable water structures.

SYSTEM NO. 14

TYPE OF SURFACE: Concrete.

TYPE OF STRUCTURE: Exterior walls of concrete structures below grade.

EXPOSURE CONDITION: Below grade.

SURFACE PREPARATION: Concrete should be completely cured and brushed free of all form release compounds, laitance, loose particles, and be completely dry. Previously coated surfaces must be cleaned of all loose paint, rust, grease, and dirt by 3,500 psi power wash with zero-degree spinner tip at a minimum flow rate of 3.5 gpm.

PAINTING SYSTEM:

First Coat:
Tnemec Series 46H-413 Hi-Build Tnemec-Tar 16.0–20.0 mils DFT

SYSTEM NO. 15 – REMOVED. Coating is not required for concrete walkways and stairs.

SYSTEM NO. 16 – REMOVED. No wood trim required.

SYSTEM NO. 17– REMOVED. No wood trim required.

SYSTEM NO. 18 – REMOVED. No wood baffles or paddles.

SYSTEM NO. 19 – REMOVED. CMU building interior does not require finished interior walls.

SYSTEM NO. 20

TYPE OF SURFACE: PVC pipe.

TYPE OF STRUCTURE: PVC conduits and pipes in building.

EXPOSURE CONDITION: Normal atmosphere.

SURFACE PREPARATION: Hand sand to roughen pipe surface.

PAINTING SYSTEM:

First Coat:
Tnemec Series N69 H.B. Epoxoline II 4.0–6.0 mils DFT

Second Coat (Interior):
Tnemec Series N69 H.B. Epoxoline II 4.0–6.0 mils DFT

Second Coat (Exterior):
Tnemec Series 1095 Endura-Shield (Semi-Gloss) 2.0–3.0 mils DFT

Total Thickness (Interior) =	8.0–12.0 mils DFT min.
Total Thickness (Exterior) =	6.0–9.0 mils DFT min.

SYSTEM NO. 21

TYPE OF SURFACE: Repair of Factory-Installed Bituminous-Coated Ductile Iron Pipe.

TYPE OF STRUCTURE: Piping.

EXPOSURE CONDITION: Buried.

PAINTING SYSTEM:

First Coat:	
Tnemec Series 46H-413 Hi-Build Tneme-Tar	8.0–10.0 mils DFT
Second Coat:	
Tnemec Series N69 Color Hi-Build Epoxoline II	8.0–10.0 mils DFT
Total Thickness =	16.0–20.0 mils DFT min.

SYSTEM NO. 22

TYPE OF SURFACE: Galvanized or non-ferrous metal.

TYPE OF STRUCTURE: Throughout plant.

EXPOSURE CONDITION: Atmospheric.

SURFACE PREPARATION: Visible deposits of oil, grease, or other contaminants shall be removed as required by SSPC-SP1. Sweep (Abrasive) Blasting per SSPC-SP16 to achieve a uniform anchor profile (1.0 to 2.0 mils). Galvanized surfaces must be clean, dry, and contaminant free prior to application of coatings.

PAINTING SYSTEM:

First Coat:	
Tnemec Series N69 Hi-Build Epoxoline II	3.0–5.0 mils DFT
Second Coat:	
Tnemec Series 1094 Endura-Shield (Gloss)	2.0–3.0 mils DFT
Total Thickness =	5.0–8.0 mils DFT min.

SYSTEM NO. 23

TYPE OF SURFACE: Galvanized or non-ferrous metal.

TYPE OF STRUCTURE: Throughout plant.

EXPOSURE CONDITION: Submerged.

SURFACE PREPARATION: Visible deposits of oil, grease, or other contaminants shall be removed as required by SSPC-SP1. Sweep (Abrasive) Blasting per SSPC-SP16 to achieve a uniform anchor profile (2.0 to 2.5 mils). Galvanized surfaces must be clean, dry, and contaminant free prior to application of coatings.

PAINTING SYSTEM:

First Coat:	
Tnemec Series 21-1255 Beige Epoxoline	5.0–6.0 mils DFT
Second Coat:	
Tnemec Series 21 WH16 Off White Epoxoline	5.0–6.0 mils DFT
Total Thickness =	10.0–15.0 mils DFT min.

SYSTEM NO. 24

TYPE OF SURFACE: Steel piping.

TYPE OF STRUCTURE: Buried.

EXPOSURE CONDITION: Below grade.

SURFACE PREPARATION: SSPC-SP10/NACE 2: Near White Metal Blast Cleaning. A 2.0 minimum surface profile is required. Surface to be clean and dry.

PAINTING SYSTEM:

First Coat:	
Tnemec Series N69 H.B. Epoxoline II	4.0–6.0 mils DFT
Second Coat:	
Tnemec Series 46H-413 Hi-Build Tnemec-Tar	16.0–20.0 mils DFT
Total Thickness =	20.0–26.0 mils DFT min.

SYSTEM NO. 25

TYPE OF SURFACE: Galvanized steel.

TYPE OF STRUCTURE: Throughout plant, galvanized steel repair.

EXPOSURE CONDITION: Atmospheric.

SURFACE PREPARATION: Visible deposits of oil, grease, or other contaminants shall be removed as required by SSPC-SP1. Sweep (Abrasive) Blasting per SSPC-SP16 to achieve a uniform anchor profile (1.0 to 2.0 mils). Surfaces must be clean, dry, and contaminant free prior to application of coatings.

PAINTING SYSTEM:

First Coat:	
Tnemec Series 66 Hi-Build Epoxoline	4.0–6.0 mils DFT

Second Coat:	
Tnemec Series 1095 Endura-Shield (Semi-Gloss)	2.0–3.0 mils DFT
Total Thickness =	6.0–9.0 mils DFT min.

SYSTEM NO. 26

TYPE OF LIQUID HANDLED: Raw sewage and sewer effluent.

TYPE OF SURFACE: Steel.

TYPE OF STRUCTURE: Underside of digester covers, odor control covers.

EXPOSURE CONDITION: Severe wastewater exposure, H_2S gas exposure.

SURFACE PREPARATION: SSPC-SP5/NACE 1 White Metal Blast Cleaning. A 3.0 mil minimum anchor profile is required. All surfaces to be clean and dry.

PAINTING SYSTEM:

Stripe Coat:	
Tnemec Series N69 Hi-Build Epoxoline II	Brushed & Scrubbed into Weld Seams
First Coat:	
Tnemec Series N69 Hi-Build Epoxoline II	5.0–7.0 mils DFT
Second Coat:	
Tnemec Series 435 Perma-Glaze	50.0–60.0 mils DFT
Total Thickness =	55.0–67.0 mils DFT min.

SYSTEM NO. 27

TYPE OF SURFACE: Steel or ductile iron.

TYPE OF STRUCTURE: Compressor, high temperature aeration piping (300 degress F. constant / 350 degrees F. intermittent), chilled or heated water lines and associated equipment.

EXPOSURE CONDITION: Atmospheric subject to high heat up to 300°F, pipe condensation, or pipe requiring insulation.

SURFACE PREPARATION:

Steel: Surface shall be sandblasted to a SSPC-SP6/NACE 3 Commercial Blast Cleaning. Anchor profile shall be angular with a 1.5 to 2.0 mil profile as per ASTM D4417, Method C or NACE Standard SP0287. All surfaces to be clean and dry.

Ductile Iron: Clean all surfaces as per NAPF 500-03-01 Solvent Cleaning to remove all oil, grease, factory applied tars and/or bitumastic coatings and all other soluble contaminants. Prepare ductile iron pipe as per NAPF 500-03-04 Abrasive Blast Cleaning for Ductile Iron pipe providing a minimum 1.5 mil angular anchor profile.

Prepare ductile iron valves and fittings as per NAPF 500-03-05 Abrasive Blast Cleaning for Cast Ductile Iron Fittings. If existing ductile iron is factory-coated with Tnemec Series N140, follow the recoat window listed on the current product data sheet.

PAINTING SYSTEM:

First Coat:	
Tnemec Series 1224 Epoxoline WB	6.0–8.0 mils DFT
Second Coat:	
Tnemec Series 971 Aerolon	50.0–60.0 mils DFT
Third Coat:	
Tnemec Series 1028T	2.0–3.0 mils DFT
Total Thickness =	58.0–71.0 mils DFT min.

SYSTEM NO. 28

TYPE OF LIQUID HANDLED: Sewage and sewer effluent.

TYPE OF SURFACE: Ductile iron.

TYPE OF STRUCTURE: Pipe.

EXPOSURE CONDITION: Submerged.

SURFACE PREPARATION: All surfaces shall be dry, clean, and free of all contaminants. All surfaces shall be inspected and pre-cleaned with suitable solvent to remove all traces of grease, oil, asphalt, and other soluble contaminants. Abrasive blast all surfaces with fine abrasive to remove all loose annealing oxides, rust, dirt, and other foreign matter. Only slight stains and tightly adhering oxides are allowed to remain on the surface. Any area where rust reappears before application shall be re-blasted. Any dust or other contaminants remaining after blasting shall be removed with dry, oil free compressed air or by vacuum cleaning. Anchor pattern shall be angular with profile of at least 3.0 mils.

PAINTING SYSTEM:

One Coat:	
Tnemec Series 431 Perma-Shield PL	40.0–50.0 mils DFT

SYSTEM NO. 29

TYPE OF LIQUID HANDLED: Sewage and sewer effluent.

TYPE OF SURFACE: Steel.

TYPE OF STRUCTURE: Pipe.

EXPOSURE CONDITION: Submerged.

SURFACE PREPARATION: All surfaces shall be dry, clean, and free of all contaminants. SSPC-SP5/NACE 1 White Metal Blast Cleaning with a minimum angular anchor profile of 3.0 mils.

PAINTING SYSTEM:

One Coat:	
Tnemec Series 431 Perma-Shield PL	30.0–40.0 mils DFT

SYSTEM NO. 30

TYPE OF SURFACE: Concrete.

TYPE OF STRUCTURE: Interior concrete walls and floors of structures subject to corrosive sewer gas including headworks, lift stations, SBR basins, Sludge Storage basins, and imhoff tanks.

EXPOSURE CONDITION: Submerged, intermittently submerged, and atmospheric.

SURFACE PREPARATION: Allow new cast-in-place concrete to cure a minimum of 28 days. Verify concrete dryness in accordance with ASTM F1869 (moisture vapor transmission should not exceed three pounds per 1,000 square feet in a 24 hour period), ASTM F2170 (relative humidity should not exceed 80%), or ASTM D4263 (no moisture present). Prepare concrete surfaces in accordance with SSPC-SP13/NACE 6 Joint Surface Preparation Standards and ICRI Technical Guidelines.

Abrasive Blast, shot-blast, water jet or mechanically abrade concrete surfaces to remove laitance, curing compounds, hardeners, sealers, and other contaminants and to provide a minimum ICRI CSP 5 surface profile. Large cracks, voids and other surface imperfections should be filled with a recommended filler or surfacer.

Primer Coat:	
Tnemec Series 218 MortarClad	25 sq. ft/gal (1/16-inch)
Liner:	
Tnemec Series 436 Perma-Shield FR	80–100 mils DFT (16 to 20 sq. ft/gal).

SYSTEM NO. 31 – REMOVED. No MBR processes on this project.

SYSTEM NO. 32 – REMOVED. No chemical containment areas.

SYSTEM NO. 33 – REMOVED. No chemical containment areas.

PART 3 EXECUTION

3.1 GENERAL:

A. All surface preparation, coating and painting shall conform to applicable standards of the Society for Protective and the Manufacturer's printed instructions. Material applied to the surface prior to the approval of the Engineer shall be removed and re-applied to the satisfaction of the Engineer at the expense of the Contractor.

B. All work shall be performed by skilled craftsmen qualified to perform the required work in a manner comparable with the best standards of practice. Continuity of personnel shall be coordinated with the Engineer.

C. The Contractor shall provide a supervisor at the work site during cleaning and application operations. The supervisor shall have the authority to sign change orders, coordinate work and make decisions pertaining to the fulfillment of the contract.

D. Dust, dirt, oil, grease, or any foreign matter that will affect the adhesion or durability of the finish must be removed by washing with clean rags dipped in an approved cleaning solvent and wiped dry with clean rags.

E. Coating and painting system include surface preparation, prime coating, and finish coatings. Unless otherwise approved by the Engineer, prime coating shall be field applied. Where prime coatings are shop applied, the Contractor shall instruct suppliers to provide the prime coat compatible with the finish coat specified. Any off-site work which does not conform to this specification or that is damaged during transportation, construction or installation shall be thoroughly cleaned and touched-up in the field as directed by the Engineer. The Contractor shall use repair procedures which insure the complete protection of all adjacent primer. The specified repair method and equipment may include wire brushing, hand or power tool cleaning, or dry-air blast cleaning. In order to prevent injury to surrounding painted areas, blast cleaning may require use of lower air pressure, smaller nozzle and abrasive particle sizes, or shorter blast nozzle distance from surface shielding and masking. If damage is too extensive or uneconomical to touch-up, then the item shall be re-cleaned and coated as directed by the Engineer.

F. The Contractor's coating and painting equipment shall be designed for application of materials specified and shall be maintained in first class working condition. Compressors shall have suitable traps and filters to remove water and oils from the air.

G. Application of the first coat shall follow immediately after surface preparation and cleaning and before rust bloom occurs. Any cleaned areas not receiving the first coat within this period shall be re-cleaned prior to application of the first coat.

H. Prior to assembly, all surfaces made inaccessible after assembly shall be prepared as specified herein and shall receive the coating or paint system specified.

3.2 SURFACE PREPARATION:

A. The latest revision of the following surface preparation specifications of the Society for Protective Coatings shall form a part of this Specification:

1. Solvent Cleaning (SSPC-SP1/NAPF 500-03-01): Removal of oil, grease, soil, and other contaminants by use of solvents, emulsions, cleaning compounds, steam cleaning or similar materials and methods which involve a solvent or cleaning action.

2. Hand Tool Cleaning (SSPC-SP2): Removal of loose rust, loose mil scale and other detrimental foreign matter to degree specified by hand chipping, scraping, sanding and wire brushing.

3. Power Tool Cleaning (SSPC-SP3): Removal of loose rust, loose mil scale and other detrimental foreign matter to degree specified by power wire brushing, power impact tools or power sanders.

4. White Metal Blast Cleaning (SSPC-SP5/NACE 1): Blast cleaning to a gray-white uniform metallic color until each element of surface area is free of all visible residues.

5. Commercial Blast Cleaning (SSPC-SP6/NACE 3): Blast cleaning until at least two-thirds of each element or surface area is free of all visible residues.

6. Brush-Off Blast Cleaning (SSPC-SP7/NACE 4): Blast cleaning to remove loose rust, loose mil scale and other detrimental foreign matter to degree specified.

7. Near White Blast Cleaning (SSPC-SP10/NACE 2): The removal of all visible oil, grease, dirt, rust, mil scale, rust, paint, oxides, corrosion products, and other foreign matter by compressed air nozzle blasting, centrifugal wheels or other specific method. Discoloration caused by certain stains shall be limited to no more than 5% of each square inch of surface area.

8. Power Tool Cleaning to Bare Metal (SSPC-SP11): The removal of all visible oil, grease, dirt, mil scale, rust, paint, oxide, corrosion products, and other foreign matter. Slight residues of rust and paint may be left in the lower portion of pits if the original surface is pitted. Differs from SSPC-SP3 in that it requires more thorough cleaning and a surface profile not less than 1 mil (25 microns). For areas where abrasive blasting is prohibited or not feasible.

9. Surface Preparation of Concrete (SSPC-SP13/NACE 6): The removal of burrs, sharp edges, fins, and concrete spatter to the degree specified.

10. Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steel, and Non-Ferrous Metals (SSPC-SP16): Blast cleaning to produce a dense and uniform anchoring profile that is suitable for the coating system to be used. For galvanized steel, the presence of "wet storage stain" and passivating treatments shall be confirmed and addressed in accordance with the surface preparation specification prior to applying the specified coating system. Removal of "wet storage stain" from galvanized steel surfaces is not permitted by blast cleaning.

11. Abrasive Blast Cleaning of Ductile Iron Pipe (NAPF 500-03-04): The removal of all visible dirt, dust, loose annealing oxide, loose rust, loose mold coating, and other foreign matter.

12. Abrasive Blast Cleaning of Cast Ductile Iron Fittings (NAPF 500-03-05): The removal of all visible dirt, dust, loose annealing oxide, loose rust, loose mold coating and other foreign matter. Differs from NAPF 500-03-04 in that it establishes varying degrees of staining, in terms of the percentage of surface area, that are permissible dependent upon the surface prior coating. For fittings previously coated with asphaltic paint, no staining shall remain on the surface after abrasive blast cleaning. Where referenced in this Section and where asphaltic paint coatings are not present, discoloration caused by stains shall be limited to not more than 5% of each square inch of surface area.

13. (ICRI CSP 2): Visual and tactile standard for field-measuring surface profile for light service.

14. (ICRI CSP 3): Visual and tactile standard for field-measuring surface profile for moderate service.

15. (ICRI CSP 5): Visual and tactile standard for field-measuring surface profile for severe service.

B. Slag and weld metal accumulation and spatters not removed by the Fabricator, Erector, or Installer shall be removed by chipping and grinding. All sharp edges shall be penned, ground, or otherwise blunted as required by the Engineer.

C. Field blast cleaning for all surfaces shall be by dry method unless otherwise directed.

D. Particle size of abrasive used in blast cleaning shall be that which will produce a 2.0–3.0 mils (37.5 microns–50.0 microns) surface profile or in accordance with recommendations of the Manufacturer of the specified coating or paint system to be applied.

E. Abrasive used in blast cleaning operations shall be new, washed, graded and free of contaminants that would interfere with adhesion of coating or paint and shall not be reused unless specifically approved by the Engineer.

F. During blast cleaning operations, caution shall be exercised to ensure that existing coatings or paint are not exposed to abrasion from blast cleaning.

G. The Contractor shall keep the area of his work and the surrounding environment in a clean condition. He shall not permit blasting materials to accumulate as to constitute a nuisance or hazard to the accomplishment of the work, the operation of the existing facilities, or nuisance to the surrounding environment.

H. Blast cleaned surfaces shall be cleaned prior to application of specified coatings or paint. No coatings or paint shall be applied over damp or moist surfaces.

I. Pit repair on steel tanks, clarifiers, etc. shall be accomplished by welding if pits are 1/8-inch deep or greater. Pits of less than 1/8-inch in depth may be repaired with Tnemec Series 215 Surfacing Epoxy.

J. Specific Surface Preparation: Surface preparation for the specific system shall be as noted in part 2.3.

K. Non-Visible Contaminants: Interior steel tank surfaces shall be checked in three locations for the presence of chlorides, iron, and sulfates. New tanks shall be tested prior to abrasive blasting, tanks being rehabilitated shall be tested prior to blasting. If blisters are present in existing tank, testing shall also be performed after abrasive blasting. These tests are an Iron Test (ferrous iron [Fe^{2+}]), Chloride Test and Sulfate Test. Testing shall be carried out as per SSPC- Guide 15. The maximum limits for these contaminants shall be:

1. The maximum level of chlorides is 30 milligrams per square meter or 3 micrograms per square centimeter.

2. The maximum level of sulfates is 100 milligrams per square meter or 10 micrograms per square centimeter.

3. The maximum level of ferrous ions (Fe^{2+}) is 50 milligrams per square meter or 5 micrograms per square centimeter.

4. Contamination levels above these limits will require washing and retesting in accordance with Item L (below) until the surface is under the allowable limits.

   If testing shows amounts present in the test solution to be greater than the limits listed herein, the Contractor shall clean the surface of the entire tank interior with a 5,000 psi water blast until the levels in the test solutions are below the maximum acceptable level. Alternate cleaning methods may be allowed with prior approval of the Engineer. Surface shall be re-blasted as specified in 2.3 at no additional cost to the Owner.

   Contractor shall provide a written statement from paint Manufacturer stating that the maximum acceptable levels are not less than those listed herein. Results of the testing shall be provided to the Owner before any coatings are applied.

   The following test kits are approved for use on this project:

   a. Chlor*Rid Test Kit.
   b. KTA SCAT Test Kit.
   c. Test kits from other vendors shall be submitted to the Engineer for prior approval before use.

3.3 APPLICATION:

A. Coating and paint application shall conform to the requirements of the revision of SSPC-PA1, the American Water Works Association, and the Manufacturer of the coating and paint materials.

B. Thinning shall be permitted only as recommended by the Manufacturer and approved by the Engineer.

C. Each application of coating or paint shall be applied evenly, free of brush marks, sags, runs, with no evidence of poor workmanship. Care shall be exercised to avoid lapping on glass or hardware. Coatings and paints shall be sharply cut to lines. Finished surfaces shall be free from defects or blemishes.

D. Protective coverings or drop cloths shall be used to protect floors, textures, and equipment. Care shall be exercised to prevent coatings or paints from being spattered onto surfaces which are not to be coated or painted. Report surfaces from which materials cannot be satisfactory removed to the Engineer.

E. When two coats of coating or paint are specified, where possible, the first coat shall contain sufficient approved color additive to act as an indicator of coverage or the two coats must be of contrasting color.

F. Film thickness per coat specified in part 2.3 are minimum required. If roller application is deemed necessary, the Contractor shall apply additional coats to achieve the specified thickness.

G. All material shall be applied as specified.

H. All welds and irregular surfaces shall receive a stripe coat by brushing and scrubbing into the weld seam of the specific product prior to application of the first complete coat.

I. All bolted connections on rake arms, rotary drums, and filter connections are to be fully coated with a flexible polysulfide coating after the coating system has been installed per part 2.3.

3.4 COATING SYSTEM APPLICATION:

A. After completion of surface preparation as specified for the specific system, materials shall be applied as noted in part 2.3.

3.5 COLOR SCHEME:

A. The Engineer shall select colors for the project. The Contractor shall submit a current chart of the Manufacturer's available colors to the Engineer thirty days prior to the start of coating and painting.

B. The identification of influent, effluent, waste backwash, and chemical feed lines shall be accomplished by use of labels or various colors of paint. Where labels are used, they shall be placed along the pipe at no greater than five foot intervals. Where colors are used they shall follow the color code prescribed below. Color coding must be by solid color or banding. If bands are used, they shall be placed along the pipe at no greater than five foot intervals. The color code is as follows:

LABELS	COLOR OF PIPE
Potable Water	Light Blue
Compressed Air	Light Green
Instrument Air	Light Green with Dark Green Bands
Chlorine (gas, liquid, or vent)	Yellow
Chlorine (solution)	Yellow with Red Bands

Liquid Alum	Yellow with Orange Bands
Alum (solution)	Yellow with Green Bands
Ammonia	Yellow with Brown Bands
Chlorine Dioxide (solution)	Yellow with Blue Bands
Ferric Chloride	Brown with Red Bands
Ferric Sulfate	Brown with Yellow Bands
Polymers	White with Green Bands
Liquid caustic	White with Red Bands
Caustic (solution)	White with Orange Bands
Fluoride	White with Yellow Bands
Ozone	Stainless Steel with White Bands
Settled Water	Green
Filter Effluent	Light Blue
Backwash Supply	Light Blue
Backwash Waste	Dark Grey
Drain	Dark Gray
Raw Water	Tan

3.6 DISINFECTION:

A. Disinfection may be required for interior surfaces of tanks or systems containing potable water. Coordinate painting with disinfection requirements per Section 02675 – Water System Disinfection.

3.7 VAPOR REMOVAL:

A. All solvent vapors shall be completely removed by suction-type exhaust fans and blowers before placing tank or system in operating service.

3.8 CLEAN UP:

A. Upon completion of the work, all staging, scaffolding and containers, waste blast abrasive, or other painting debris shall be removed from the site. Coating or paint spots or oil stains upon adjacent surfaces shall be removed and the jobsite cleaned. All damage to surfaces resulting from the work of this section shall be cleaned, repaired, or refinished to the satisfaction of the Engineer at no cost to the Owner.

END OF SECTION

SECTION 11220

SUBMERSIBLE WASTEWATER PUMPS

PART 1 GENERAL

1.1 DESCRIPTION:

A. Contractor shall furnish submersible wastewater pumps complete with motors and appurtenances required as shown and specified in the Contract Documents.

B. Section Includes:

1. Three (3) Submersible Pumps for Influent Pump Station – Triplex

C. Coordination: To ensure that all the equipment is properly coordinated and will function in accordance with the requirements of the Contract Documents, the Contractor shall obtain all the pump and motor equipment specified herein from a single pump supplier.

D. Special Considerations:

1. The manufacturer of the equipment specified herein shall review and satisfy the relevant requirements of the Contract Documents. The Contractor and component equipment manufacturer associated with this Section shall fully coordinate their equipment offering as required by the Contract Documents.

2. The Contractor shall be responsible for coordination of component equipment including pumps, motors, and controls as specified by the Contract Documents. The Contractor shall be responsible for coordinating the driven equipment to obtain successful operation throughout the intended pump range.

3. The equipment covered by this specification is intended to be standard equipment as manufactured by reputable concerns having experience in the production of such equipment. The equipment furnished shall be manufactured in accordance with the best practice and methods and shall operate satisfactorily when installed as shown and specified in the Contract Documents.

1.2 QUALITY CONTROL / QUALITY ASSURANCE (QA/QC):

A. Manufacturer's Qualifications: Manufacturer of the pumping equipment shall have experience in providing similar type equipment.

B. Reference Standards:

1. Standards of the Hydraulic Institute (HI).
2. National Electric Code (NEC).
3. Standards of National Electrical Manufacturers Association (NEMA).

4. Institute of Electrical and Electronic Engineers (IEEE).
5. American National Standards Institute (ANSI).

C. Manufacturers Quality Assurance / Quality Control Program:

1. The Pump Manufacturer shall have an ISO-9000/ISO-9001 Quality Control Program.

1.3 SUBMITTALS:

A. Shop Drawings: Submit for approval the following:

1. Performance data curves showing the following parameters as defined in the Hydraulic Institute Standards over the full operating range of the pump:

a. Total developed head in engineering units of feet.
b. Capacity in engineering units of gallons per minute.
c. Horsepower demand.
d. Pump efficiency.
e. Net positive suction head required in engineering units of feet.

2. Indicate on the performance curve(s) the point of operation of the pump. Also mark on the curve the minimum and maximum recommended operating points on the curve.

3. Electrical wiring diagrams and other data as required for complete pump installation.

4. Provide manufacturer's data and drawings describing the equipment in sufficient detail, including parts lists and materials of construction, to indicate full conformance with the detailed specifications.

5. Detailed drawings showing the dimensions and weight of the pumping unit and the motor.

B. Factory Tests Reports:

1. Testing tolerance levels shall be the latest standards per HI.

C. Installation Instructions:

1. Package Installation Instructions with the Pump.

D. Operation and Maintenance Manuals:

1. Operation and Maintenance instruction, lubrication schedules, and troubleshooting guides shall be submitted for review in accordance with the procedures and requirements set forth in Section 01300.

E. Record Drawings – (Not Used).

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Package appropriately for delivery and storage.

1.5 WARRANTY:

A. Manufacturer's standard form in which manufacturer agrees to provide 100 percent parts and labor for the repair or replace components of the submersible pump that fail(s) in materials or workmanship within specified warranty period.

B. Warranty Period: One hundred percent, non-prorated for twenty-four (24) months from date of Substantial Completion

PART 2 PRODUCTS

2.1 Process system design and performance.

A. Service Conditions:

1. Influent Pump Station – Triplex Pumps

a. Non-Clog Submersible Pumps shall be used for the transfer of raw wastewater from the new Influent Pump Station.

b. Typical operating range will be a minimum of 35-ft above the wet well floor to a maximum of 45-ft above the wet well floor.

c. Pumps shall be provided in a triplex (2 + 1) arrangement with lead/lag operation.

d. Tags:

i. P-02.0001, P-02.0002, & P-02.0003

B. Process Design Requirements:

1. Guarantee points for specific pumps are included in the equipment schedules which follow the end of this specification sheet.

2.2 EQUIPMENT DESIGN AND FABRICATION:

A. General:

1. All parts of mechanisms shall be amply proportioned for stresses that may occur during fabrication, shipping, erection, and intermittent or continuous operation.

2. The pumping units shall operate without surging, cavitation, vibration, or excessive noise.

3. Each motor shall be rated for continuous duty and sized such that it shall not be required to provide more than rated nameplate horsepower, at unity service factor, under any operating condition. Motor shall be capable of operation at any point on the operating curve.

4. The pump shall be designed to pass a minimum spherical solids of 3 inches in diameter.

5. Pump shall have an integrated base allowing it to stand on a hard bottom wet well.

6. Pump shall be capable of mounting a guide rail system so it may be removed from the wet well without disturbing the discharge piping or requiring personnel to enter the wet well.

B. Equipment Design Requirements:

1. The centrifugal pumping equipment shall be of the non-clogging submersible centrifugal type with integral close coupled drive motor for installation into a wet pit. Exposed fasteners shall be ANSI type 316 stainless steel. All metal surfaces in contact with pumped media shall be protected by a factory applied spray coating of alkyd and phenol resin primer and top coat with total thickness of 3.5-4.5 mm. Watertight seals shall be fitted with Buna-N O-rings. Sealing will not require torque to be exerted on the fasteners to seal. No secondary sealing components shall be used or required.

2. Impeller: Impeller shall be a semi-open, non-clogging, dynamically balanced, double vane, capable of passing at least 3" solids. Hard iron is acceptable material of manufacture. The backside of the impeller shall incorporate a cutting system to protect the shaft from engaging stringy or fibrous solids.

3. Volute: Volute shall be a single piece design with gray cast iron.

4. Shaft: The shaft shall be an integral part of the pump and motor assembly. The shaft shall be type 420 stainless steel. The rotating assembly (impeller, shaft, rotor) shall be dynamically balanced to reduce undesired vibrations.

5. Bearings: Pump shaft shall rotate on ball bearings. Bearings will continuously lubricate with oil from the motor housing. Bearings shall have a minimum B-10 bearing life of 50,000 hours. Upper bearings shall be a grooved ball bearing. The lower bearing shall be a heavy duty grooved ball bearing.

6. Self-Cleaning Wear Plate: Wear plate shall be designed with a wave-shaped inlet and outward spiral V-shaped groove to shred and force fibrous solids outward from the impeller to the discharge. Wear plate shall be adjustable without pump disassembly.

7. Lifting Bail: Pump shall be equipped with an open loop, stainless steel lifting bail to which a chain or other lifting device may attach. Bail shall be firmly attached to the pump and will allow the pump to be hooked from the surface in case of emergency.

8. Acceptable Manufacturer:

   a. ABS.
   b. Flygt.
   c. Gorman Rupp.
   d. KSB Amarex.
   e. Wilo.
   f. Flowserve.
   g. Or Engineering approved equal.

2.3 EQUIPMENT AND COMPONENTS:

A. Motors:

1. Watertight squirrel cage induction motor housed in an air-filled, watertight chamber with copper windings. Designed to be operated without external water required for motor cooling using an air and/or glycol chambers. Designed to handle water at a maximum temperature of 40 C. Pump shall operate at water depths up to 65-feet.

2. Motors shall have a minimum 1.15 service factor and shall be NEMA Design B, with Class H insulation to operate at full load with a Class H temperature rise per latest EEMAC standards. Motors shall be capable of at least 10 evenly spaced starts per hour.

3. Three phase motor shall be 460 V. Motor shall have a voltage tolerance of +/- 10 % from the nominal name plate rating.

4. Eyebolts or lifting lugs shall be provided on the motors and they shall be of adequate strength for lifting the motor. All metal parts shall be inherently corrosion-resistant or shall be protected with corrosion-proof coatings.

5. Each motor shall contain a bi-metallic temperature switch in the windings. The temperature switch shall be designed to open at a preset temperature.

B. Power and Signal Cable:

1. Cable shall be sized according to NEC and CSA standards.

2. The cable entry water seal design shall preclude specific torque requirements to ensure a watertight and submersible seal. The cable entry shall be sealed by epoxy potting with a rubber grommet as the secondary seal and strain relief. The cable entry sealing system shall provide strain relief for the terminal connections and allow access to

the terminal connections without adversely affecting the integrity or function of the seal system.

3. Cables shall resist oil, grease, abrasions, and meet applicable standards. The outer jacket shall be constructed of a thermoplastic elastomer.

4. Cables shall be capable of operating on 460 volt, 3-phase service and under continuous submergence without loss of watertight integrity to a depth of 65-feet.

5. Provide a cable of length 50-feet. Cable shall not require splices to reach the junction box.

C. Mechanical Seals:

1. Pump shall be equipped with a mechanical shaft seal system consisting of two independent seal assemblies with a common spring between them. Seals shall operate in an oil-filled chamber, separate from the motor chamber.

2. Rotating seal faces shall be carbon and stationary faces shall be silicon carbide. Static sealing components shall be constructed of Buna-N. Metallic components of the seal shall be constructed of 300 series stainless steel.

3. Seal system shall not rely on pumped media for lubrication nor be damaged if the pump is run dry.

4. A v-ring type lip seal shall be installed on the shaft behind the impeller to prevent pumped media solids from interfering with the primary mechanical seal.

D. Each pump and motor shall be furnished with a Type 316 stainless steel nameplate securely mounted to the body of the equipment. As a minimum, the nameplate for the pumps shall include the equipment number, manufacturer's name and model number, serial number, rated flow capacity, head, speed, impeller diameter and other pertinent data. As a minimum, nameplates for motors shall include the motor number, manufacturer's name, and model number, serial number, horsepower, speed, input voltage, amps, number of cycles, and power and service factors.

E. Floats:

1. Provide ultrasonic level transducers for operation of the pumps.

2. Back-up System: Provide 5 submersible watertight float level switches for back-up operation of the pumps. Floats shall be mounted in sumps and capable of operation in either normally open or normally closed configuration. Wire floats for fail-safe operation

a. Low level lock out

b. Pump off
c. Lead pump on
d. Lag pump on
e. High level alarm

2.4 INSTRUMENTATION AND CONTROLS:

A. The SCADA system shall control the Influent Pump Station via the Preliminary Treatment RTU panel installed near the Influent Pump Station.

B. Provide 1 panel:

1. ICP 02.0001 for Pumps P-02.0001, P-02.0002, & P-02.0003.

C. Provide sufficient I/O for operation of the triplex pump system.

D. Program the System for Operation as a lead lag system using 5 level switches.

E. Provide all Disconnects, Circuit Breakers, Transformers, Motor Starters with overload and power supplies for operation of the system. Use 24VDC as the supply voltage for operation of field devices (4 level switches) excluding the pump motor.

F. Electrical requirements for the panel shall be 480VAC 3 Phase power.

G. Indicators (Typical for Each Pump):

1. Pump 1 Run, (Green).
2. Pump 2 Run (Green).
3. Pump 3 Run (Green)
4. Hi-Hi Alarm (Red).
5. Panel Fault (Red).

H. Panel Mounted Switches:

1. Pump 1 (Local/Off/Remote).
2. Pump 2 (Local/Off/Remote).
3. Pump 3 (Local/Off/Remote).
4. Lead Selector (Pump 1/Pump 2/Pump 3).
5. Pump 1 (Start/Stop).
6. Pump 2 (Start/Stop).
7. Pump 3 (Start/Stop).

2.5 OPERATION:

A. Low-Low Level – All Pumps Off.

B. Low Level – Lead Pump On.

C. Medium Level – Lead Lag Pump On.

D. High Level – Lag Lag Pump On.

E. High-High Level – Alarm.

2.6 SPARE PARTS:

A. Package and deliver specified spare parts to the Owner.

1. Two (2) spare mechanical seals.

2.7 SHOP PAINTING:

A. All interior and exterior non-stainless steel ferrous surfaces of the pump unit, including motor, motor stand, frames, baseplates and appurtenances shall be shop primed and painted in accordance with manufacturer's specification for submerged service.

2.8 SPECIAL TOOLS:

A. The Contractor shall furnish a complete set of special tools as required for operation, maintenance, dismantling, and assembly of the pumps.

2.9 LUBRICANTS:

Not used.

PART 3 EXECUTION

3.1 DELIVERY AND INSTALLATION:

A. The Contractor shall inspect all equipment upon delivery to site. If damaged, notify Engineer.

B. The Contractor shall not install damaged equipment until repairs are made in accordance with manufacturer's written instructions and approved by the Engineer. Only minor repair work shall be permitted in the field. All other damaged items shall be sent to factory for repair or replacement.

C. The Contractor shall complete the installation in accordance with pump manufacturer's instructions and recommendations.

D. Contractor shall provide miscellaneous valves, pressure indicators, check valves and other appurtenances to complete the installation.

3.2 COMMISSIONING:

A. Contractor shall inspect and verify that structures, pipes and equipment are compatible. The Contractor shall make any adjustments required to place system in proper operating condition.

3.3 OPERATOR TRAINING:

A. Manufacturer of the pump shall provide instructions to the Operations and Maintenance Personnel in accordance with Division 1.

B. The Manufacturer shall demonstrate the mechanical seal replacement procedures.

3.4 ACCEPTANCE TESTING:

A. The Engineer shall witness the test of the installed pump to determine conformance to the design criteria.

B. Testing and Startup Responsibilities.

1. Perform all Work for equipment function and performance tests specified herein.

2. Furnish qualified manufacturer's representatives when required to assist in testing.

3. Utilize an approved Manufacturer's Certificate of Proper Installation Form, supplemented as necessary, to document all functional and performance procedures, results, problems, and conclusions.

4. Schedule and attend pretest (functional and performance) meetings related to test schedule, plan of test, materials, chemicals, and liquids required, facilities' operations interface or involvement.

3.5 FIELD QUALITY CONTROL:

A. Retain a qualified representative of the manufacturer to perform the following services:

1. Oversee installation of the equipment specified herein.

2. Inspect the completed installation and note deficiencies.

3. Be present and assist the CONTRACTOR during start-up, adjusting, and site testing of completed installation.

4. Furnish test forms and procedures for field testing.

5. Instruct OWNER's personnel in the operations and maintenance of the equipment with minimum services as follows.

a. Installation assistance: As required.
b. Owner personnel instruction, classroom, and jobsite: 4 hrs.
c. Plant startup: 8 hrs.
d. Coordinate training and start-up with Owner’s personnel.
e. Owner may videotape training.
f. Manufacturer shall make four additional trips to the job site, at 3 months, 6 months, 12 months and 24 months to inspect and provide troubleshooting support of the equipment.

6. Prepare manufacturer's installation report and submit within 30 days after completion of field testing. Include the following information:

a. Field testing results.

b. Descriptions of installation deficiencies not resolved to the manufacturer's satisfaction.

c. Description of problems or potential problems.

d. Names of OWNER personnel who attended operations and maintenance training sessions.

e. Record copy of materials used for training session including outlined summary of course.

B. Field representatives shall have a minimum of five (5) years of experience with the operation of and training on this type of equipment.

1. Factory personnel will be required to perform this service. Sales representatives will only be considered acceptable service technicians if they have three (3) years of experience with the operation of and training on this type of equipment from the manufacturer being supplied and have started up 10 units of a similar size and type from the manufacturer.

C. Field Testing:

1. Testing and startup schedule shall be submitted to ENGINEER for approval.

2. Test Procedure: Verify proper operation.

11220 - SUBMERSIBLE PUMP

Service Conditions	Influent Pump Station Temperature -40°F to 90°F
Equipment Name	Influent Pump Station Pumps
Equipment Tag	P-02.0001, P-02.0002, P-02.0003
Material	Gray Iron

Quantity	3 (2+1)
Pump Size, HP	14 (maximum)
Suction Size, inches	4
Discharge Size, inches	4
Design Capacity per Pump, gpm	425
Design TDH (1 pump operating), feet	37
Design Capacity (2 pumps operating), gpm	850
Design TDH (2 pumps operating), gpm	46
Minimum pump efficiency at design capacity (%)	70
Minimum Pump Shutoff head, ft	70
Seal Failure Sensor	Yes
Moisture Sensor	Yes
Balance Pump Design	Yes
Pump Case Vibration Sensor Transmitter	No
Pump Bearing Temperature Transmitter	Yes

* Maximize Impeller for specified motor size without overloading.
* Point must be at or near the best efficiency point.

Motor Information

Maximum motor speed, rpm	1750
Motor Drive	VFD
Motor Size rated, HP	14
Motor Enclosure Type	Waterproof Submersible
Service Factor	1.15
Motor Voltage	460
Phase	3
Temperature Protection	Yes
Motor Vibration Transmitter	No

END OF SECTION

SECTION 11260

CHLORINATION EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. This Section specifies gas chlorination equipment for applying chlorine to water and process fluids. including cylinder scales, vacuum regulators, automatic switchovers, manual and automatic chlorinators/rate valves, eductors, gas detectors, self-contained breathing apparatus (SCBA), and incidental tubing and pipe.

1.2 DEFINITIONS:

A. Eductor, also ejector or injector: an apparatus using a venturi to create a vacuum to draw and combine gas and water into solution.

1.3 SYSTEM DESCRIPTION:

A. The equipment specified in this Section will have one supplier, supplying a fully coordinated system in accordance with this Section.

B. The chlorination equipment has one function:

1. Disinfect the wastewater treatment plant flow by supplying chlorine solution.

1.4 SUBMITTALS:

A. Submit under provisions of Section 01300.

B. Product Data:

1. Submit product data for approval. As a minimum, include the following:

a. Materials of Construction.
b. Rated capacity and performance ranges.

C. Shop Drawings:

1. Submit shop drawings in accordance with the requirements of Section 01300. As a minimum, include the following:

a. Overall dimensions and piping connection sizes for all units.
b. Total weight for each unit.
c. Wiring diagrams and electrical requirements as appropriate.

D. Submit complete manufacturer's installation operation and maintenance instructions for each component and the system. Instructions shall include illustrative figures to adequately illustrate the procedures.

1.5 WARRANTY:

A. The supplier/manufacturer shall provide a warranty on equipment against manufacturer's defects for twenty-four (24) months, commencing on the date of Owner-accepted substantial completion of the project. If the equipment should fail during the warranty period due to a defective part, it shall be replaced and the unit restored at no cost to the owner, including both service and parts.

PART 2 PRODUCTS:

2.1 MANUFACTURERS:

A. 150-lb Cylinder Systems (alphabetical order):

1. Archer Instruments.
2. Environmental Improvements, Inc. (EI2) – Southlake, Texas
3. Hydro Instruments.
4. JCS.
5. Superior.
6. Or Engineer-approved equivalent.

2.2 MATERIALS:

A. Polyethylene tubing meeting, ASTM D-1693 with a 0.375 inch outside diameter. Manufacturer to review pressure drop in polyethylene tubing for chlorine under vacuum. Supply larger tubing at no extra cost to Owner if required.

B. PVC Schedule 80, Type I, piping various sizes.

C. Plastic conduit, Type II, Schedule 40 PVC with 1-1/2-inch nominal inside diameter.

D. All chlorination equipment will be comprised of materials suitable for handling chlorine gas and solution.

2.3 EQUIPMENT:

A. Scale:

1. Supply each scale capable of accepting two standard 150-pound chlorine cylinders.

2. The scale shall be of the electronic strain gauge, load-cell type equipped with two separate weighing platforms and built-in stops to prevent overload damage.

3. Each platform shall have a gross weight capacity of 0-350 pounds and a tare weight capacity of 0-180 pounds.

4. Each display shall provide 3-1/2 digit, LCD characters. Electronics shall be housed in a NEMA 4X enclosure.

5. Provide a 4-20 mAdc output signal.

SCHEDULE OF DUAL PLATFORM – 150-LB CYLINDER SCALES	
Quantity	Location
1	Chlorine Room

B. Chlorinators:

1. Provide 1 manual chlorinator and one automatic compound loop chlorinator rated at 150 pounds per day (ppd) each with all components housed in a self-contained wall-mountable unit.

2. Mount the gas flow indicator and manual rate adjustment device into a single panel.

3. Chlorine is to be conveyed and metered under vacuum created by the eductor.

4. The automatic gas flow controller shall contain a V-notch variable orifice to maintain the set feed rate within 4 percent of the indicated flow which will range from 0-150 ppd.

5. Each manual flow meter assembly shall contain a manually operated valve for controlling the chlorine feed rate from 0 to 100 percent of scale.

   a. Provide vertical manifold mounted to each vacuum regulator. Manifold capacity shall be 4 cylinders.

   b. Provide automatic switchover unit connected to vacuum regulators.

   c. Provide 2 chlorine flow rate indicators with manual adjusting valves to split pre- and post-chlorine flows.

6. Automatic chlorinators (automatic rate valves):

   a. Feed rate shall be flow-paced as indicated in P&ID.

   b. Each rotameter assembly shall contain an automatic valve positioner/control valve for controlling the chlorine feed rate from 0 to 100 percent of scale.

7. Manual chlorinators (manually adjusted rotameters):

   a. Each manual rotameter assembly shall contain a manually operated valve for controlling the chlorine feed rate from 0 to 100 percent of scale.

8. Chlorinator Schedule:

SCHEDULE OF CHLORINATORS			
Location	Tag Number	Type	Capacity (ppd)
Chlorine Room	FCV-04.0001	Manual (redundant)	150
	FCV-04.0002	Automatic (duty)	150
		Spare Rotameter for Manual Chlorinator	150

C. Residual Analyzer:

1. Provide one residual analyzer housed in a NEMA-4 enclosure that will continuously analyze a liquid sample in an amperometric-type cell and produce a current proportional to the free chlorine residual.

2. Supply wall-mounted unit with fixed gold and copper electrodes with fixed output contacts containing a continuously cleaning apparatus.

3. The isolated output signal of 4-20 mAdc will be continuously maintained.

4. A gravity regulator will maintain a constant sample flow allowing automatic temperature compensation.

5. Maintain a constant pH in the measuring cell using a pH buffer solution feed system, including a reagent storage bottle which will gravity-feed through a rotary valve.

6. The reagent storage will consist of a bottle with a capacity of at least 7 days.

7. Provide a residual analyzer range of 0-10 mg/L displayable to a resolution of 0.01 mg/L.

8. The response of the residual analyzer to the sample entry will be within 4 seconds with an accuracy of $\pm$0.002 mg/L.

9. Provide a circular chart recorder for permanent record of residual.

10. Provide high and low residual level alarm contacts.

D. Eductors:

1. Provide anti-siphon-type eductors as shown in the schedule below and on the Drawings.

2. Components of the eductor shall include a spring diaphragm-type check valve, a ball-type check valve, and a variable diameter throat to produce a vacuum on the gas supply.

3. Provide wall-mounted units suitable for continuous service with chlorine gas and water at the pressures shown in the schedule below.

4. Construct the eductor of Schedule 80 PVC with all fasteners made of 316 Stainless Steel.

5. Provide a low-flow nozzle if required based on the available flow rate of solution water shown in the schedule below.

SCHEDULE OF EDUCTORS					
Location	Quantity	Capacity, Each (ppd)	Max. Eductor Back Pressure (psig)	Available Motive Water Supply	
				(gpm)	(psig)
Chlorine Room	2 (Duty + Standby)	150	10	18	70

E. Water Supply Accessories

1. The chlorination equipment shall be suitable for the available educator water supply:

   a. Potable water.
   b. Available pressure: 60 to 80 psi.

2. Manufacturer shall provide any recommended accessories such as a strainer of appropriate mesh size, a pressure regulating valve, etc. if recommended.

F. Chlorine Gas Detector:

1. Provide a wall-mounted chlorine gas detector housed in a NEMA-4 enclosure suitable for monitoring the air in a chlorine area.

2. Include in the chlorine gas detector a self-contained sample blower for positive air sampling to avoid chlorine build-up in stagnant areas, and an easy-to-read flowmeter to indicate the sample is reaching the measuring cell.

3. Provide in the unit a glycerin-based electrolyte which will last at least one year under normal operating conditions.

4. Supply the detector with the necessary electronic circuits to trigger an alarm condition when the chlorine concentration in the sample exceeds 1 ppm.

5. Fix an alarm level by design to avoid unauthorized adjustments which may be harmful to personnel above the current OSHA limit.

6. Provide the alarm with a flashing light on the front of the unit and a change in state of the relay contacts for actuation of remove devices.

7. Include a plug-in type relay with a 120 VAC DPDT contacts rated at 10 amperes.

8. Provide with the detector unit a chlorine gas detected warning alarm reset switch for alarm acknowledgment and a test switch to permit simple checking of the circuits.

9. Include in the detector electrical connections to a high-level switch, a remote alarm and a remote warning light.

G. Self-Contained Breathing Apparatus:

1. Provide one (1) complete 30-minute supply self-contained breathing apparatus as shown in the schedule below.

2. Breathing apparatus shall be 800 series as manufactured by North or equivalent meeting NIOSH certification TC-13F-146.

3. Provide indoor/outdoor wall case for each self-contained breathing apparatus. Case shall be yellow ABS plastic with markings indicating breathing apparatus inside.

SCHEDULE OF SCBs	
Quantity	Location
1	Chlorine Room Exterior

PART 3 EXECUTION

3.1 INSTALLATION:

A. Install the chlorination equipment as indicated on the drawings and in accordance with the manufacturer's written instructions.

3.2 FIELD QUALITY CONTROL:

A. Tests:

1. Test all vacuum piping at 23 inches Hg vacuum for 4 hours.

2. Test all solution piping with water at a minimum of 100 psi maintained for 4 hours.

3. Subject the entire chlorination system to field operational test after installation.

4. System operation will be satisfactory for a minimum of 48 consecutive hours.

3.3 FIELD SERVICE:

A. Provide a factory-trained representative to inspect, review, and start up the equipment provided.

B. Representative shall present a minimum 4-hour training session for the Owner’s personnel. Representative shall prepare in advance for training session with prepared instruction outline and hand out materials. Owner may

videotape training.

C. Training shall not be done until all equipment is operational.

D. Training timing shall be devoted only to training and instruction of Owner's personnel. Troubleshooting, check-out, and/or adjustment of system shall not be done during the training period.

3.4 SPARE PARTS:

A. Supply a 2-year supply of pre-mixed electrolyte.

B. Supply 50 extra feet of 3/8-inch inside diameter polyethylene tubing.

END OF SECTION

SECTION 11317

PLANT WATER PUMP STATION EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Plant water pump station equipment including hydropneumatic tank, plant water pumps, pressure relief valves, air compressor, and other work and materials required for a complete and operable system.

B. General Contractor shall install plant water pump station equipment in accordance with manufacturer's instructions and supply interconnecting piping, wiring, and valves not supplied by the manufacturer such as gate valves and check valves. Contractor shall coordinate scope of supply with manufacturer.

1.2 SYSTEM DESCRIPTION:

A. The plant water pump station shall supply non-potable WWTP effluent water to the plant water system. The WWTP effluent is treated with an SBR system and chlorination. Water is withdrawn from the chlorine structure.

B. The plant water pump station equipment shall be installed in a new plant water building. Refer to P&ID and Site Plan drawings for piping.

C. Provide plant water pumps (duplex configuration). Pump runtime shall be based on the level transducer monitoring the water level in the hydro-pneumatic tank.

D. Operations:

1. The plant water pumps (PWP-06.0001 and PWP-06.0002) will operate based on level in the hydropneumatic tank via the level indicator located in the tank. Tank shall be maintained at a minimum of 1ft below half full and a maximum of 1ft above half full.

2. Only one pump will operate at a time and the pumps will alternate between run times. Pump status, HOA status, and alarms will be transmitted to the OIC. The plant OIC will insure no simultaneous motor start with other plant equipment. Pump control panel will be powered from "PB-BB" located in the process blower building. Pumps will be powered from NPW pump control panel.

3. HOA switches for each pump will be located on the NPW pump control panel located in the plant water covered area. In HAND each pump shall run until shut off. In AUTO each pump shall be controlled by the plant OIC. Pumps shall alternate between run times.

4. Each plant water pump shall shut down due to low level in the chlorine contact basin as reported by LIT/LE-04.0001 and LIT/LE-04.0002. These LITs shall be located locally and report to the plant OIC.

5. Plant water pump discharge flow will be monitored via FE/FIT-06.0003. FIT-06.0003 shall be located in the plant water area. Instantaneous flow (GPM) and totalized flow (pal x 1000) will be sent to the plant OIC.

6. The discharge pressure in the water distribution line will be maintained via the air compressor. Compressed air in the hydropneumatic tank will be maintained at 80psi via manual pressure regulator. A Pressure relief valve shall be installed.

7. System pressure shall be transmitted to the plant OIC via the system pressure indicator.

1.3 SUBMITTALS:

A. Product Data: Manufacturer's product data sheets. Include product data on individual system components. Include pump curve on 8-1/2-inch by 11-inch format.

B. Submit under provisions of Section 01300.

1.4 QUALITY ASSURANCE:

A. All equipment discussed herein shall be provided by the contractor. The contractor shall be responsible for the successful integration of all components into a unified system. This includes but is not limited to supplying field supervision/consulting services, testing and plant trials, and coordination of all components associated with the system.

B. The system manufacturer/suppliers shall have at least five years of experience in manufacturing/supplying equipment of similar capacity and service capability to the equipment described herein.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Store the equipment and accessories in accordance with manufacturer’s written instructions. Protect the equipment from damage.

1.6 WARRANTY:

A. The manufacturer shall provide a warranty on equipment against manufacturer’s defects for twenty-four (24) months, commencing on the date of Owner-accepted substantial completion of the project. If the equipment should fail during the warranty period due to a defective part, it shall be replaced and the unit restored at no cost to the owner, including both service and parts.

PART 2 PRODUCTS

2.1 ACCEPTABLE SUPPLIERS:

A. A+ Water Works.

B. Motor Controls, Inc.

C. Smith Pump.

D. Tiger Flow.

E. Or Engineer-approved equivalent.

2.2 PLANT WATER PUMPS:

A. Plant water pumps shall be Gorman Rupp 82H2-B or Engineer-approved equal.

B. Provide a total of two (2) identical large pumps.

SCHEDULE OF PLANT WATER PUMPS	
Equipment Identification:	PWP-06.0001 PWP-06.0002
Number of pumps:	2
Maximum horsepower:	15
Voltage/phase/Hertz:	480/3/60
Capacity, gallons per minute	105
Total dynamic head at capacity above, feet (psi):	150 (65)
Minimum pump efficiency, percent:	45%
Nominal suction size*, inches:	2" Flanged
Nominal discharge size*, inches:	2" Flanged

* Note: Other suction and discharge connection diameters and types are acceptable. General contractor shall provide appropriate reducers and adapters.

2.3 HYDROPNEUMATIC TANK:

A. Tank shall meet the requirements of Section 11330.

B. Capacity: 1,500 gallons minimum.

2.4 PRESSURE ELEMENTS/SWITCHES:

A. Two on-off pressure switches shall be utilized for control of the pumps. The pressure switches shall be Allen Bradley or Engineer-approved equal.

B. The on-off pressure switches shall be capable of starting the corresponding pump motor at a predetermined low pressure and shall stop the pump motor at predetermined higher pressure.

C. Pressure switches shall be installed in a NEMA 4 enclosure with a pressure gauge plumbed into the inlet of the pressure switches below and outside of the enclosure.

D. A copper or polyethylene tube shall be installed at the inlet of the pressure switches and gauge and shall be attached at the other end to a tee connection at the inlet of the pressure tank.

2.5 PRESSURE RELIEF VALVE:

A. Pressure relief valve shall be Cla-Val 2" model 50-01 or Engineer-approved equal.

2.6 PRESSURE CONTROL REGULATOR:

A. One pressure control regulator shall be utilized between the air compressor and the hydropneumatic tank.

2.7 ELECTRICAL:

A. The plant water system shall be have with all electrical and controls required to maintain the specified pressure in the system.

B. The power supply shall be 480 volts, 3 phase, 60 Hertz.

C. The pumps shall be provided with a motor starter. All motor starters and control equipment required for the proper operation of the pump station shall be furnished.

a. Magnetic Starter (Full Voltage): Starters shall be individual units, combination starter/molded case circuit breaker units.

b. Units shall be of Allen-Bradley, Square D, General Electric, or approved equal.

c. Provide pushbutton stations, pilot lights and HAND-OFF-AUTOMATIC switches as required. Provide auxiliary contacts on starters to accomplish interlocks and control as specified.

d. Provide all three phase starters with solid state, three phase overload elements. Overloads shall be sized in accordance with the National Electrical Code.

e. Equip each starter unit with a control power transformer, with 120 volt secondary, a secondary fuse in one leg and the other secondary leg grounded.

f. Provide adjustable 1-60 second "on" time delay relay set for 15 seconds.

g. Include phase-loss, unbalance (voltage & current), reversal and over/under-voltage protection assembly with adjustable nominal voltage setting shall be provided for three (3) phase motor. This device shall drop-out pumps if all phases drop below 90% or if one phase drops below 80-83% nominal voltage. This device shall have a nominal ½ second dropout delay and adjustable automatic restoration time delay of up to five minutes.

h. Dry run protection: Provide a mechanism to detect when a pump is running dry (due to loss of prime from failure of the suction line foot valve, for example) and stop the pump to prevent damage. Provide

Cycle Stop CS3PH1-500HP or Engineer-approved equivalent for each pump.

D. WIRING. All wiring shall have not less than 600 volt insulation and all power wiring and bus shall be in complete conformity with the National Electric Code and state and local and NEMA Electrical Standards. Control wiring shall be color-coded. All job connections required to conveniently replace control components shall be made at approved type terminal blocks with engraved bakelite marker strips or similar approved means. All wiring shall be routed in conduit.

E. Starters and control equipment shall be located on a swing out panel or shall be positioned such that the location conforms to the front access requirements of the National Electrical Code.

F. All equipment shall be Underwriter's Laboratories, Inc. listed, with the exception of the Cycle Sensor.

G. Alarms: Provide a dry contact output for a general alarm to SCADA. The alarm shall be activated by:

1. Low pressure.
2. Pump failure.

H. Provide following SCADA inputs from Pump control panel.

1. Pump #1 running
2. Pump #1 fault
3. Pump #2 running
4. Pump #2 fault

I. Provide following SCADA control of plant water system.

1. START/STOP of pumps.

PART 3 EXECUTION

3.1 INSTALLATION:

A. Install in accordance with manufacturer's written instructions.

3.2 TESTING:

A. Test valve by adjusting flow rates and observing operation.

B. At end of testing, set control valve to a pressure of 70 psi or as directed by Engineer.

3.3 START-UP AND OPERATOR TRAINING:

A. Provide the services of a factory trained representative for start-up and operator training. Minimum one (1) day on-site.

B. Use approved O&M Literature for training.

C. Provide field report certifying the equipment is properly installed, fully functional and ready for use.

END OF SECTION

SECTION 13125

METAL BUILDING SYSTEMS

PART 1 GENERAL

1.1 SECTION REQUIREMENTS

A. Metal Building System Description: Rigid clear span with nonexpandable endwalls and primary frame.

1. Eave Height: Manufacturer's standard height, as indicated by nominal height on Drawings.
2. Dimensions and Bay Spacings: As indicated on Drawings.
3. Roof Slope: 2-inch per 12-inch (2:12).
4. Colors: Provide up to 3 colors for wall and trim (Matching existing facilities)

B. Structural Performance: Provide metal building systems capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Engineer metal building systems according to procedures in MBMA's "Metal Building Systems Manual."

2. Design Loads: As required by MBMA's "Metal Building Systems Manual."

3. Where doors and windows prevent cable “x” bracing from being installed structurally sound, the use of wind bents should be utilized. Coordinate with Engineer.

C. Submittals: Product Data, Color Samples, Shop Drawings with structural analysis data signed and sealed by a qualified professional engineer registered in the state of Texas.

1. Submit letter of design certification, signed and sealed by a qualified professional engineer. Indicate name and location of Project, name of manufacturer, order number, name of contractor, governing building code and standards including year of edition, design loads and load combinations, building use category, and load importance factors.

D. Comply with AISC's "Specification for Structural Steel Buildings - Allowable Stress Design, Plastic Design," or AISC's "Load and Resistance Factor Design Specification for Structural Steel Buildings"; and AISI's "Specification for the Design of Cold-Formed Steel Structural Members," or AISI's "Load and Resistance Factor Design Specification for Steel Structural Members."

PART 2 PRODUCTS

2.1 METAL BUILDINGS

A. Manufacturers:

1. Horizon Structural Systems – New Braunsfel, TX
2. Mueller, Inc. – New Braunsfel, TX
3. Monitor, Inc. – Sherman, TX
4. Other, submit company information

B. Structural-Framing Materials:

1. W-Shapes: ASTM A 992; ASTM A 572, Grade 50 or 55; or ASTM A 529, Grade 50 or 55.

2. Channels, Angles, M-Shapes, and S-Shapes: ASTM A 36; ASTM A 572, Grade 50 or 55; or ASTM A 529, Grade 50 or 55.

3. Plate and Bar: ASTM A 36; ASTM A 572, Grade 50 or 55; or ASTM A 529, Grade 50 or 55.

4. Steel Pipe: ASTM A 53, Type E or S, Grade B.

5. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B or C, structural tubing.

6. Structural-Steel Sheet: Hot-rolled, ASTM A 1011, Structural Steel (SS), or High-Strength Low Alloy Steel (HSLAS); or cold-rolled, ASTM A 1008, Structural Steel (SS), or High-Strength Low Alloy Steel (HSLAS).

7. Metallic-Coated Steel Sheet: ASTM A 653, Structural Steel (SS) or High-Strength Low Alloy Steel (HSLAS); with G60 coating designation; mill phosphatized.

8. Steel Joists and Joist Girders: Comply with SJI's "Standard Specifications, Load Tables, and Weight Tables for Steel Joists and Joist Girders," with steel-angle top and bottom chord members.

C. Roof Panels:

1. Manufacturer’s standard specifications unless more restrictive requirements are presented herein.

2. Provide 1-inch thick, extruded-polystyrene thermal spacer blocks at roof.

3. Provide 1/8-inch thick by 2-inch wide thermal foam tape at wall girts, continuous.

D. Flashing and Trim: Form from 24 ga. - 0.0239-inch thick, zinc-coated (galvanized) steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Finish flashing and trim same as adjacent roof or wall panels.

E. Gutters and Downspouts: Manufacturer’s standard specifications unless more restrictive requirements are presented herein.

F. Accessories: as required to complete the install for an enclosed thermally and moisture protected enclosure.

G. Miscellaneous Materials:

1. Primer: SSPC-Paint 15, Type I, red oxide. Gray is acceptable.

2. Grout: ASTM C 1107, factory-packaged, nonmetallic grout, noncorrosive, and nonstaining.

3. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; of manufacturer's standard size.

4. Joint Sealant: ASTM C 920; one-part elastomeric polyurethane, polysulfide, or silicone-rubber sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended by metal building system manufacturer.

5. Thermal Foam Tape: 1/8" thick thermal break tape, 2-inch width. Install along length of wall purlins before applying wall sheets.

PART 3 EXECUTION

3.1 ERECTION

A. Setting Base and Bearing Plates: Clean concrete and masonry of bond-reducing materials and roughen surfaces before setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts.

2. Tighten anchor rods after supported members have been positioned and plumbed.

3. Pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure.

B. Erect framing true to line, level, plumb, rigid, and secure. Comply with AISC specifications referenced in this Section.

1. Make field connections for primary framing using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts," snug tightened or pretensioned.

2. Fasten secondary framing to primary framing using clips and non-high-strength bolts. Hold rigidly to a straight line by sag rods.

3. Install frames, purlins and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Standard Specifications, Load Tables, and Weight Tables for Steel

Joists and Joist Girders."

4. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.

5. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.

C. Roof Panel Installation: See Section Metal Roof Panels, 07411.

1. Install screws with power tools having controlled torque to compress neoprene washer without damage to washer, screw threads, or panels. Install screws in predrilled holes.

2. Use stainless-steel fasteners for exterior and interior.

3. Locate panel splices over, but not attached to, structural supports; stagger panel splices.

4. Standing-Seam Roof Panels: Fasten to purlins with concealed clips at each standing-seam joint. Install clips over top of insulation. Provide thermal spacers between roof and metal purlins. Crimp standing seams with manufacturer-approved motorized seamer tool. Rigidly fasten eave end of metal roof panels and allow ridge end free movement due to thermal expansion and contraction.

D. Gutters, Downspouts, Flashing, and Trim Installation: Comply with SMACNA's "Architectural Sheet Metal Manual." Provide for thermal expansion; conceal fasteners where possible, and set units true to line and level. Install work with laps and seams that will be permanently watertight.

END OF SECTION

SECTION 13440

INSTRUMENTATION FOR PROCESS CONTROL: BASIC REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY:

A. Section Includes:

1. Basic requirements for complete instrumentation and process control system.

2. The following SCADA system integrators (SSI, or instrumentation and controls subcontractor) are acceptable as SSIs, subject to compliance with the Contract Documents (in alphabetical order):

a. Inframark A&I.
b. Kimark Control Solutions.
c. Prime Controls.
d. PSI Process.
e. TraC-n-trol.
f. Walker Industrial.
g. Wallace Controls & Electric, Inc.

1.2 QUALITY ASSURANCE:

A. Referenced Standards:

1. The Instrumentation, Systems, and Automation Society (ISA):

a. 5.1 – Instrumentation Symbols and Identification.

b. 5.2 – Binary Logic Diagrams for Process Operations.

c. 5.3 – Graphic Symbols for Distributed Control/Shared Display Instrumentation, Logic, and Computer Systems.

d. 5.4 – Standard Instrument Loop Diagrams.

e. 20 – Specification Forms for Process Measurement and Control Instruments, Primary Elements, and Control Valves.

2. National Electrical Manufacturers Association (NEMA):

a. 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).

3. National Fire Protection Association (NFPA):

a. 70 – National Electrical Code (NEC).

4. National Institute of Standards and Technology (NIST).

5. 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. SCADA System Integrator (SSI):

1. Qualifications of SSI:

    a. Experience:

        i. Have satisfactorily provided a control system for a minimum of five (5) projects of similar magnitude and function.

        ii. Have satisfactorily provided a control system for at least one advanced wastewater treatment plant project (requires experience in working with automated system PLCs, such as for an MBR or SBR plant secondary process).

2. A single SSI shall furnish and coordinate instrumentation and control systems.

    a. The SSI shall be responsible for functional operations of all systems, performance of control system engineering, supervision of installation, final connections, calibrations, preparation of Drawings and Operation and Maintenance Manuals, start-up, training, demonstration of substantial completion and all other aspects of the control system.

3. 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.

4. Prior to Shop Drawing preparation, the SSI shall inspect the Owner's existing equipment and as-constructed electrical documentation 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, furnishand install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, complete and compatible installation.

1.3 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.

1.4 SYSTEM DESCRIPTION:

A. Control System Requirements:

1. This Specification Section provides the general requirements for the instrument and control system.

2. 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. Unless otherwise required for instrument compatibility, electric control signals shall be 4-20 mA, 24V DC and pneumatic signals shall be 5 to 15 psi.

C. All signals shall be directly linearly proportional to measured variable unless specifically noted otherwise.

D. Comply with electrical classifications and NEMA enclosure types shown on Drawings.

1.5 SUBMITTALS:

A. Shop Drawings:

1. See Specification Section 01300 – Submittals for requirements for the mechanics and administration of the submittal process.

2. 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.

b. Do not provide any submittals for Specification Section 13440.

3. Product technical data including:

a. Acknowledgement that products submitted meet requirements of standards referenced.
b. Equipment catalog cut sheets.
c. Instrument data sheets:

i. ISA S20 or approved equal.
ii. Separate data sheet for each instrument.

d. Materials of construction.
e. Minimum and maximum flow ranges.
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.

4. PLC panel drawings including loop diagrams of each instrument to be wired to the PLC.

5. Comprehensive set of point-to-point wiring diagrams showing all interconnections between packaged systems or equipment control panels, motor control centers, instrumentation and all other electrical equipment as required to depict a complete and functional plant-wide electrical control system as specified in Specification Section 13448 – Control Panels and Enclosures and below:

a. Instrumentation wiring already shown on loop diagrams need not be included on point-to-point wiring diagrams.

b. Diagrams shall provide the following minimum information:

i. Terminal block identification (includes terminals on remote equipment furnished by Others).
ii. Wire size.
iii. Wire type.
iv. Wire color.
v. Wire shielding and insulation type.
vi. Conductor quantities and associated conduit size.
vii. Ground points.
viii. Interconnection requirements to existing systems or equipment furnished by Others.

c. Diagrams shall be provided on Drawings of sufficient size to minimize the number of drawings.

i. Maximum drawing size: 24 x 36 IN.
ii. Minimum drawing size: 11 x 17 IN.

6. Panel fabrication drawings as specified in Specification Section 13448 – Control Panels and Enclosures.

7. PLC/DCS equipment drawings.

8. HMI graphics.

9. Nameplate layout drawings.

10. 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.

11. All Shop Drawings shall be modified with as-built information/corrections.

12. Provide a parameter setting summary sheet for each field configurable device.

13. 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.

i. Certification documentation is required for all equipment for which the specifications require independent agency approval.

14. Testing reports: Source quality control reports.

B. Operation and Maintenance Manuals:

1. See Specification Section 01300 for requirements for:

a. The mechanics and administration of the submittal process.
b. The content of Operation and Maintenance Manuals.

2. Warranties: Provide copies of warranties and list of factory authorized service agents.

1.6 WARRANTY:

A. The SSI shall furnish a "no exception - no exclusion," two-year warranty for all parts and labor on all new equipment provided by the SSI.

B. Warranty shall begin when all equipment and systems are installed, functionally checked, and accepted by the Owner.

C. The warranty period is beyond any "limited" warranty extended by manufacturers or suppliers on their packages or products.

1.7 DELIVERY, STORAGE, AND HANDLING:

A. 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.

1.8 SITE CONDITIONS:

A. Unless designated otherwise on the Drawings, area designations are as follows:

1. Outdoor area:

a. Wet.

b. Corrosive and/or hazardous when specifically designated on the Drawings or in the Specifications.

c. Below grade vaults and manholes:

i. 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.

PART 2 PRODUCTS

2.1 NEMA TYPE REQUIREMENTS:

A. Provide enclosures/housing for control system components in accordance with the following:

1. Areas designated as wet: NEMA Type 4.

2. Areas designated as wet and/or corrosive: NEMA Type 4X.

a. Unless otherwise shown, enclosures located in process/equipment areas shall be NEMA Type 4X, 316SS.

b. Unless otherwise shown, enclosures located outdoors shall be NEMA Type 4X, 316SS.

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.

i. Utilize intrinsically safe circuits to the maximum extent practical and as depicted in the Contract Documents.

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.

i. Utilize intrinsically safe circuits to the maximum extent practical and as depicted in the Contract Documents.

5. Either architecturally or non-architecturally finished areas designated as dry, noncorrosive, and nonhazardous (such as Electrical rooms): NEMA Type 12.

6. Areas designated to be subject to temporary submersion: NEMA 6P.

2.2 PERFORMANCE AND DESIGN REQUIREMENTS:

A. System Operating Criteria:

1. Stability: After controls have taken corrective action, as result of a change in the controlled variable or a change in setpoint, oscillation of

final control element shall not exceed two (2) cycles per minute or a magnitude of movement of 0.5 percent full travel.

2. Response: Any change in setpoint or change in controlled variable shall produce a corresponding corrective change in position of final control element and become stabilized within 30 seconds.

3. Agreement: Setpoint indication of controlled variable and measured indication of controlled variable shall agree within 3 percent of full scale over a 6:1 operating range.

4. 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 percent of full travel regardless of force required to position final element.

5. Sensitivity: Controls shall respond to setpoint deviations and measured variable deviations within 1.0 percent of full scale.

6. Performance: All instruments and control devices shall perform in accordance with manufacturer's specifications.

2.3 ACCESSORIES:

A. Provide identification devices for instrumentation system components including:

1. Manufacturer’s model number.
2. Manufacturer’s serial number.
3. Range:

a. Utilize the same units of measurement as are utilized in the Contract Documents.

4. Power supply requirement.

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 such as Clarifiers, Digesters, Reservoirs, etc.

PART 3 EXECUTION

3.1 INSTALLATION:

A. Wherever feasible, use bottom entry for all conduit entry to instruments and junction boxes.

B. Install electrical components per Division 16.

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.

3.2 FIELD QUALITY CONTROL:

A. See Specification Section 01600 – Material and Equipment.

B. The SSI shall maintain accurate daily log of all instrumentation and control startup activities, calibration functions, and final setpoint adjustments.

1. Documentation requirements include the utilization of the forms located at the end of this Specification Section.

a. Loop Check-out Sheet.
b. Instrument Certification Sheet.
c. Final Control Element Certification Sheet.

C. 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.

D. 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 feet 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.

E. Instrumentation Calibration by SSI:

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 gauges, 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 gauges.

    a. Field mount gauge within seven (7) days of calibration.

5. Check the calibration of each transmitter and gauge across its specified range at 0, 25, 50, 75, and 100 percent.

    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.

F. Loop check-out requirements (by SSI) 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.

        i. Verify that readings at all loop components are in agreement.
        ii. Make corrections as required.

            - 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.

G. Provide verification of system assembly, power, ground, and I/O tests.

H. Verify existence and measure adequacy of all grounds required for instrumentation and controls.

I. Manufacturers of equipment provided by SSI shall provide Manufacturer's Field Services as defined in Section 01600 to provide the following services:

1. Assistance during installation to include observation, guidance, instruction of General Contractor's assembly, erection, installation or application procedures.

2. Inspection, checking, and adjustment as required for equipment to function as warranted by manufacturer and necessary to provide written approval of installation.

3. Revisiting the site as required to correct problems and until installation and operation are acceptable to OWNER.

4. Resolution of assembly or installation problems attributable to, or associated with, respective manufacturer's products and systems.

5. Assistance during Demonstration Period functional and performance testing, and until product acceptance by the OWNER.

6. Training of OWNER'S personnel in the operation and maintenance of respective product as required herein.

   a. 16 hours of Pre-Demonstration training.
   b. 40 hours of Post-Demonstration training.
   c. Training may be specified as either during the Pre-Demonstration Period or Post Demonstration.

7. Completion of Manufacturer's Certificate of Proper Installation as included in Section 01600 with applicable certificates for proper installation and initial, interim, and final test service.

8. Complete Certificate of Successful Start-up as defined in Section 01600.

END OF SECTION

SECTION 15104

BALL VALVES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ball valves.

1.2 QUALITY ASSURANCE

A. Referenced Standards:

1. ASTM International (ASTM):

a. A48, Standard Specification for Gray Iron Castings.

b. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

c. D1784, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.

2. American Water Works Association (AWWA):

a. C507, Standard for Ball Valves, 6 IN through 48 IN.

3. Manufacturers Standardization Society of the Valve and Fittings Industry Inc. (MSS):

a. SP-72, Ball Valves with Flanged or Butt-Welding Ends for General Service.

b. SP-110, Ball Valves; Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.3 DEFINITIONS

A. PVDF: Polyvinylidene fluoride.

1.4 SUBMITTALS

A. Shop Drawings:

1. See Division 01 for requirements for the mechanics and administration of the submittal process.

2. See Specification Section 15100 – *Valves – Basic Requirements*.

3. Test results for AWWA valves.

B. Operation and Maintenance Manuals:

1. See Division 01 for requirements for:

a. The mechanics and administration of the submittal process.
b. The content of Operation and Maintenance Manuals.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the manufacturers listed in the applicable Articles below are acceptable.

B. Submit request for substitution in accordance with Division 01.

2.2 METALLIC BALL VALVES 1/4 TO 3 IN DIA

A. Acceptable Manufacturers:

1. Apollo.
2. Jamesbury.
3. Watts.
4. Stockham.
5. Nibco.
6. Engineering Approved Equal.

B. Materials:

1. Body: Stainless Steel.
2. Stem, stem gland nut: Stainless Steel.
3. Ball: Brass, chrome plated.
4. Seats, stuffing box ring, and thrust washer: Reinforced Teflon.
5. Handle: Vinyl coated or zinc- or cadmium-plated steel.

C. Design Requirements:

1. Rated for 400 psi and 250 Deg F, WOG for threaded end applications and 285 psi WOG and 150 psi saturated steam service for flanged end applications.

2. Handles showing direction of opening.

3. Stuffing boxes capable of being repacked under pressure and adjustable for wear.

4. Stem with reinforced Teflon stuffing box ring and blowout-proof design.

5. Renewable reinforced Teflon seats.

6. Ball design which does not allow media contact with stem.

7. Balancing stop for all applications.

8. Bodies with mounting pad for applications requiring actuators.

2.3 PLASTIC BALL VALVES: 1/2 IN TO 4 IN DIA

A. Acceptable Manufacturers:

1. Chemtrol.
2. Spears.
3. ASAHI/America.

B. Materials:

1. Body, stem, ball, handle, end connectors:

   a. PVC ASTM D1784-12454B
   b. CPVC ASTM D1784-23477-B

2. Ball Seat: Teflon.
3. O-rings:

   a. General: Viton or PTFE encapsulated fluorocarbon.
   b. NaOH or LAS Service: EPDM.

C. Design Requirements:

1. Rated at 150 psi at 75 Deg F.
2. Double or "true union" design.
3. Blocks both directions, upstream and downstream.
4. Union nut capable of compensating for seat wear.
5. Body with mounting pad for actuators where required.
6. Capable of being disconnected at downstream end under full line pressure.

2.4 AWWA C507 BALL VALVES: 6 IN TO 48 IN DIA {PRATT (P), WILLAMETTE (W)}

A. Comply with AWWA C507.

B. Acceptable Manufacturers:

1. Willamette.
2. Pratt.
3. Val Matic.
4. Engineering Approved Equal.

C. Materials:

1. Body:

   a. Cast iron ASTM A126, Class B (P).

b. Cast iron ASTM A48, Class 35 (W).

2. Ball:

a. Cast iron ASTM A48, Class 40 (P).
b. Cast iron ASTM A48, Class 35 (W).

3. Shaft:

a. Stainless steel 18-8 Type 304 (P)
b. Forged steel, chrome plated at seal tensile yield 82,000 psi (W).

4. Bearings, sleeve type, non-metallic:

a. Teflon lined (P).
b. Sleeve type (W).

5. Ball seat: Stainless steel Type 304 (P and W).

6. Body seat:

a. Buna-N (P).
b. Monel (W).

D. Design Requirements:

1. Design pressure: 150 psi.
2. Flanges: Class 125.
3. Ball shall provide one (1) direction seal or closure.
4. Provide pipe tap for body drain and air vent and legs or base for support.
5. Ball and body seats: Field adjustable and replaceable.

2.5 ACCESSORIES

A. Refer to Drawings and valve schedule for type of actuators.

1. Furnish actuator integral with valve.

B. Refer to Section 15100 for actuator requirements.

2.6 SOURCE QUALITY CONTROL

A. Shop test AWWA C507 ball valves in accordance with AWWA C507.

B. Furnish record of test.

PART 3 EXECUTION

3.1 INSTALLATION

A. See Section 15100.

3.2 FIELD QUALITY CONTROL

A. For AWWA C507 ball valves, and in accordance with Division 01 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.

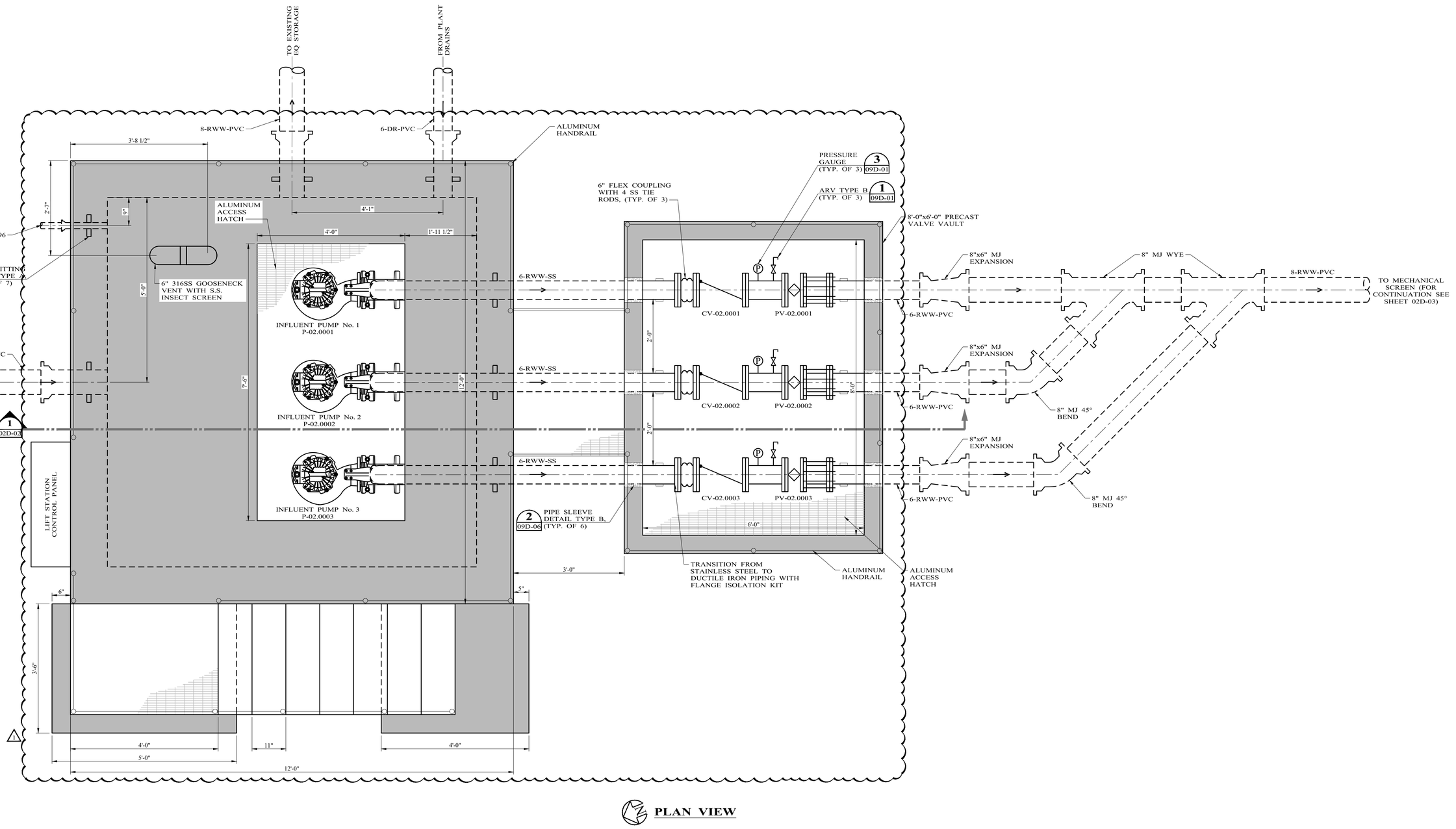
3. Provide test equipment, tools, and instruments necessary to accomplish equipment testing.

4. Conduct startup of equipment and perform operational checks.

5. Provide Owner with a written statement that manufacturer's equipment has been installed properly, has been started up, and is ready for operation by Owner's personnel.

END OF SECTION

DRAWINGS



PLAN VIEW

GENERAL NOTES:

1. REFER TO SPECIFICATION 11220 FOR ADDITIONAL DETAIL ON THE SUBMERSIBLE PUMP EQUIPMENT REQUIREMENTS.

NO.	REVISION	DATE
0	ISSUED FOR ADVERTISEMENT	08/27/2024
1	ADDENDUM No. 2	09/24/2024

09/24/2024

Brittany D. White

BRITTANY D. WHITE 128714 LICENSED PROFESSIONAL ENGINEER

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402 Cedar Street • Abilene, Texas 79601 • T: (325) 698-5560 • F: (325) 690-3240 • www.e-ht.com
PE Firm Registration No. 1151 • PG Firm Registration No. 50103 • RPLS Firm Registration No. 10011900

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BAR IS ONE INCH ON ORIGINAL DRAWING (0 — 1)

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DESIGNED BY	B.WHITE
DRAWN BY	J.CASSIDY
CHECKED BY	C.RICH
SCALE	3/4" = 1'-0"
DATE	09/24/2024

CITY OF TOLAR
WASTEWATER TREATMENT PLANT IMPROVEMENTS

INFLUENT LIFT STATION PLAN

PROJECT NO.:	8434
SEQUENCE No.	26 OF 123
SHEET No.	02D-01

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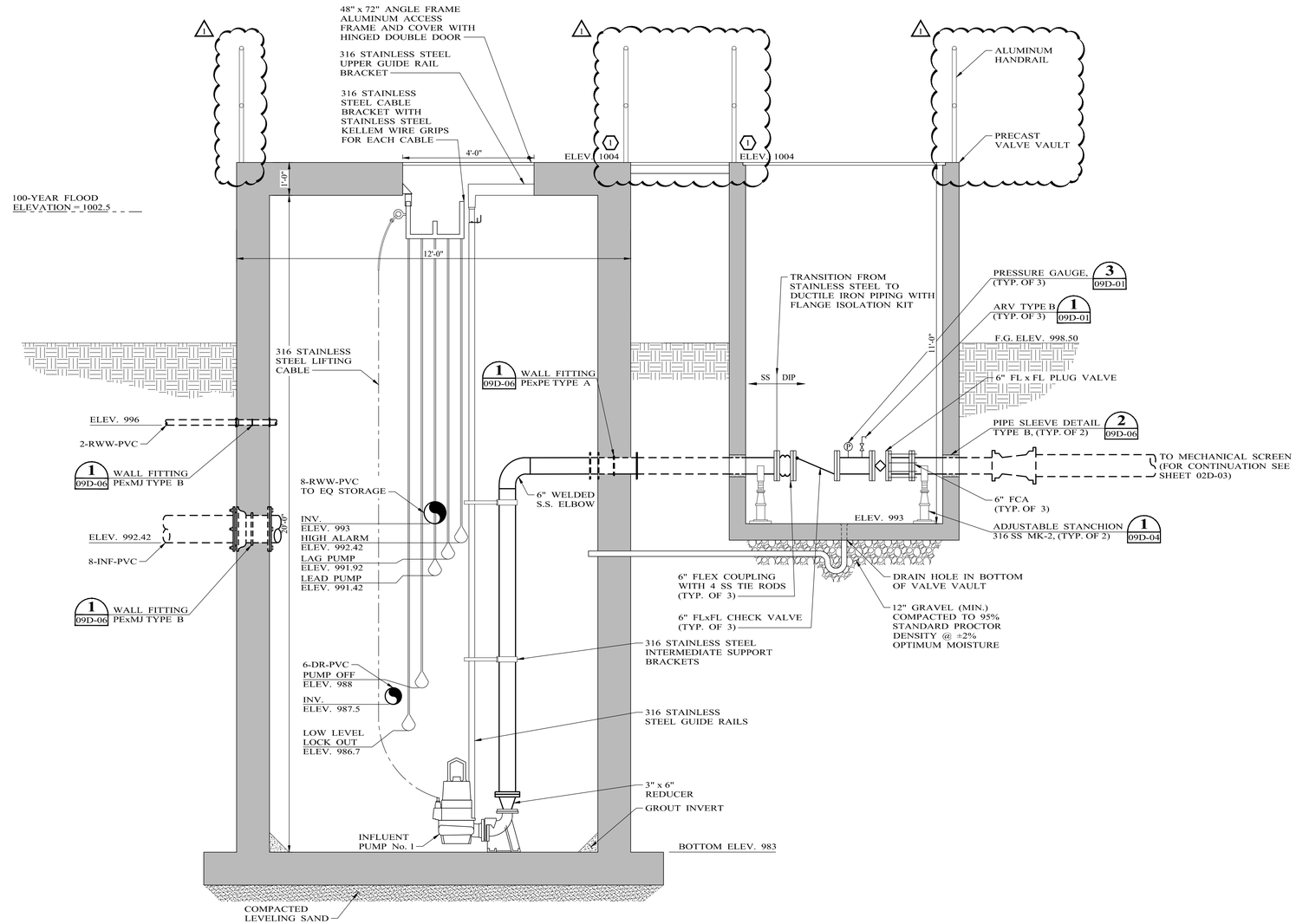

1 02D-01 **SECTION**

NOTES INDICATED ON DRAWING BY (1):

1. TOP OF STRUCTURE NEEDS TO BE A MINIMUM OF 1 FOOT ABOVE THE 100 YEAR FLOOD ELEVATION.

GENERAL NOTES:

1. WETWELL INLET AND DISCHARGE PIPING SHOWN IN SECTION FOR CLARITY. ACTUAL ORIENTATION AND PLACEMENT AS PER SITE PLAN. REFER TO PLAN VIEW FOR LOCATION. COORDINATE LOCATION WITH ON-SITE REPRESENTATIVES.
2. LIFT STATION MANUFACTURER TO CALCULATE THE REQUIRED WETWELL FOUNDATION DESIGN TO OVERCOME THE BUOYANCY FORCE.

NO.	REVISION	DATE
0	ISSUED FOR ADVERTISEMENT	08/27/2024
1	ADDENDUM No. 2	09/24/2024

09/24/2024

Brittany D. White

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0 1
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DESIGNED BY	B.WHITE
DRAWN BY	J.CASSIDY
CHECKED BY	C.RICH
SCALE	1/2" = 1'-0"
DATE	09/24/2024

CITY OF TOLAR
WASTEWATER TREATMENT PLANT IMPROVEMENTS

INFLUENT LIFT STATION SECTION

PROJECT NO.: 8434
SEQUENCE No. 27 OF 123
SHEET No. 02D-02

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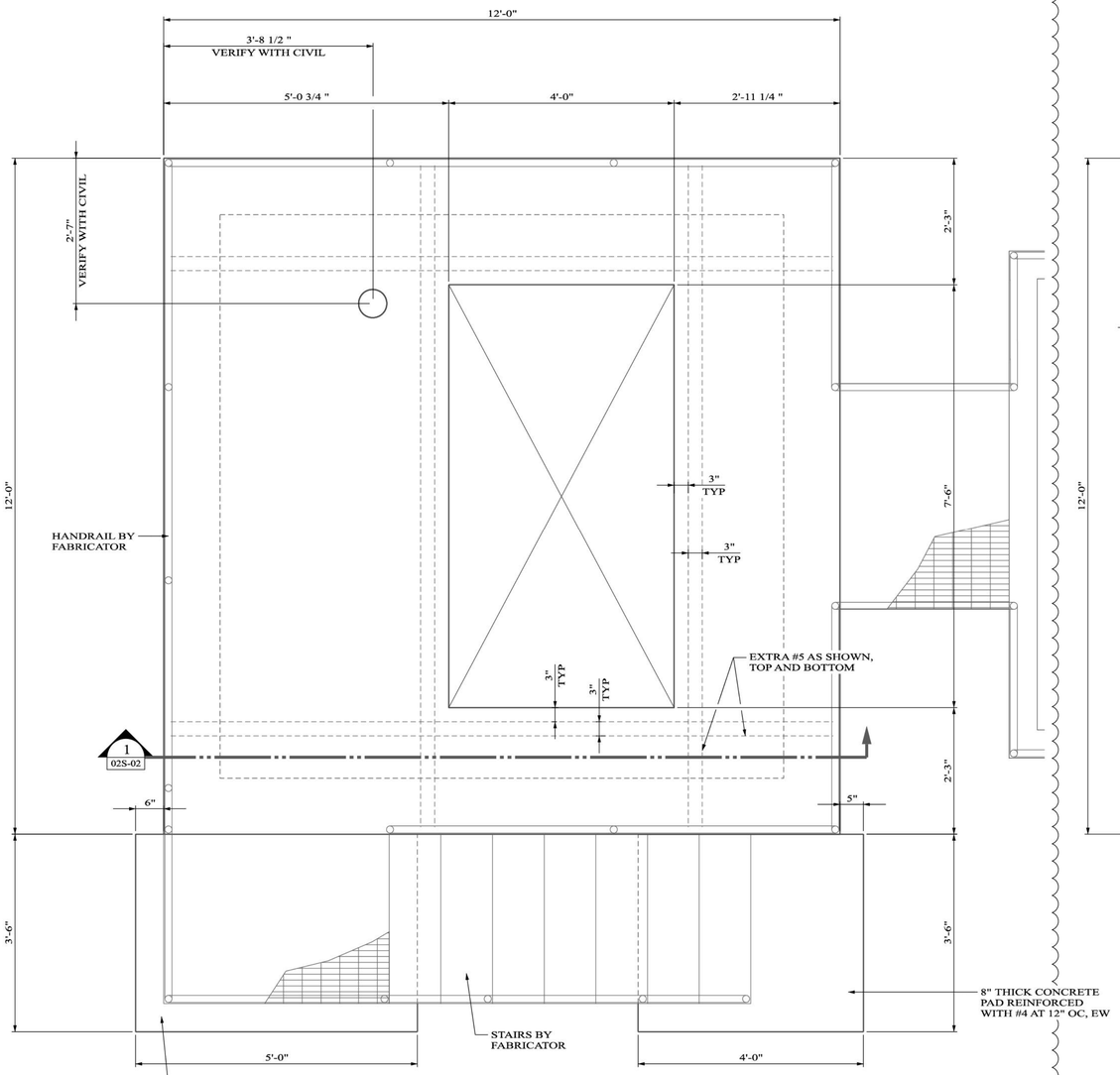
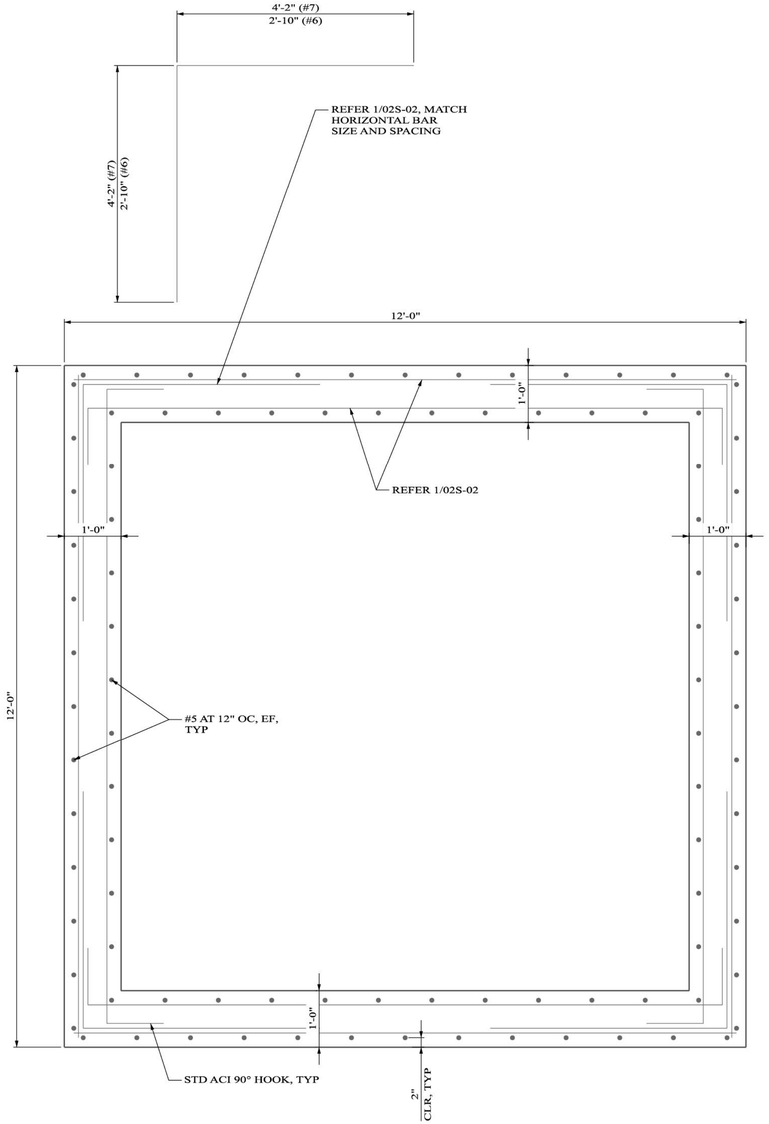
NOTES:

1. GRATING SHALL BE DESIGNED FOR A LIVE LOAD OF 100 PSF.
2. HANDRAILS SHALL BE DESIGNED BY FABRICATOR FOR A CONCENTRATED LOAD OF 200 LB APPLIED IN ANY DIRECTION.
3. REFER STRUCTURAL NOTES FOR EARTHWORK, CONCRETE, AND OTHER REQUIREMENTS.
4. REFER CIVIL DRAWINGS FOR LOCATIONS AND ELEVATIONS.
5. FIELD VERIFY DIMENSIONS WITH ALL EXISTING CONDITIONS.
6. VERIFY DIMENSIONS WITH EQUIPMENT FABRICATOR'S DETAILS AND REQUIREMENTS. NOTIFY ENGINEER IN CASE OF DISCREPANCY.
7. ALL STEEL SHALL BE HOT DIP GALVANIZED.
8. ALUMINUM SHALL BE 6061-T6 PER ASTM B308.
9. INCOMPATIBLE METALS SUCH AS STEEL AND ALUMINUM SHALL NOT BE FABRICATED TO BE IN CONTACT.
10. CONTRACTOR SHALL SUBMIT COMPLETE FABRICATION DRAWINGS FOR STAIRS, HANDRAILS, GRATING, BEAMS, AND CONNECTIONS.
11. PROVIDE PVC WATERSTOP AT ALL JOINTS, UNO.



1 8" THICK CONCRETE PAD REINFORCED WITH #4 AT 12" OC, EW

1 - STRUCTURAL PLAN
SCALE: 3/4" = 1'-0"



2 - HORIZONTAL SECTION
SCALE: 3/4" = 1'-0"

PIERCE ENGINEERING IS RESPONSIBLE FOR THE CONTENTS OF THIS SHEET.
TX PE FIRM NO. 9186
PHONE: 940-937-8600

NO.	REVISION	DATE
0	ISSUED FOR ADVERTISEMENT	08/27/2024
1	ADDENDUM NO. 2	09/24/2024

STATE OF TEXAS · BRIAN C. PIERCE · 94837 · LICENSED PROFESSIONAL ENGINEER · 09/24/2024

Celebrating 35 years

Enprotec | Hibbs & Todd
402 Cedar Street • Abilene, Texas 79601 • T: (325) 698-5560 • F: (325) 690-3240 • www.e-ht.com
PE Firm Registration No. 1151 • PG Firm Registration No. 50103 • RPLS Firm Registration No. 10011900

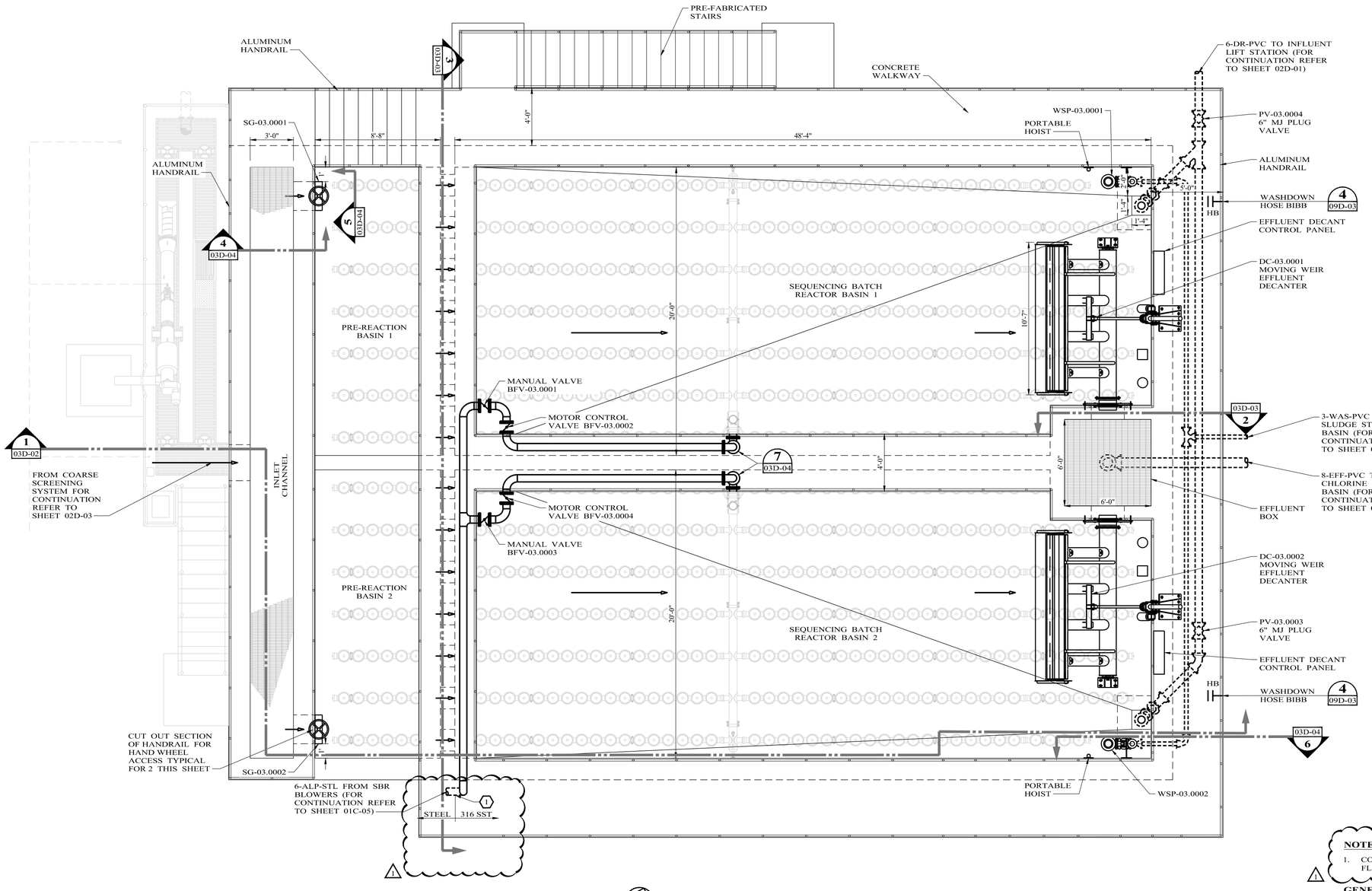
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DESIGNED BY	BGP
DRAWN BY	BGP
CHECKED BY	BGP
SCALE	AS NOTED
DATE	08/27/2024

CITY OF TOLAR
WASTE WATER TREATMENT PLANT IMPROVEMENTS

INFLUENT LIFT STATION STRUCTURAL PLAN AND SECTION

PROJECT NO.:	8434
SEQUENCE No.	32 OF 123
SHEET No.	02S-01



PLAN

NOTES INDICATED ON DRAWING BY (#):

1. CONTRACTOR TO INSTALL DIELECTRIC FLANGE KIT AS SPECIFIED.

GENERAL NOTES:

1. CONTRACTOR TO FIELD VERIFY ALL EXISTING PIPING, STRUCTURES, AND UTILITIES PRIOR TO CONSTRUCTION. CONTRACTOR TO NOTIFY ENGINEER IMMEDIATELY OF ANY DEVIATIONS.
2. INSTALL SURFACE MIXER PER MANUFACTURER'S WRITTEN INSTRUCTIONS.
3. HANDRAILS SHALL BE TOP MOUNTED AND INSTALLED AS PER LAYOUT SHOWN ON THIS SHEET.

NO.	REVISION	DATE
0	ISSUED FOR ADVERTISEMENT	08/27/2024
1	ADDENDUM No. 2	09/24/2024

09/24/2024

Brittany D. White

STATE OF TEXAS — BRITTANY D. WHITE — 128714 — LICENSED PROFESSIONAL ENGINEER

Celebrating 35 years

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BAR IS ONE INCH ON ORIGINAL DRAWING (0 — 1)

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DESIGNED BY	B.WHITE
DRAWN BY	J.CASSIDY
CHECKED BY	C.RICH
SCALE	1/4" = 1'-0"
DATE	09/24/2024

CITY OF TOLAR
WASTEWATER TREATMENT PLANT IMPROVEMENTS

SBR BASIN - OVERALL PLAN

PROJECT NO.: 8434

SEQUENCE No.: 37 OF 123

SHEET No.: 03D-01

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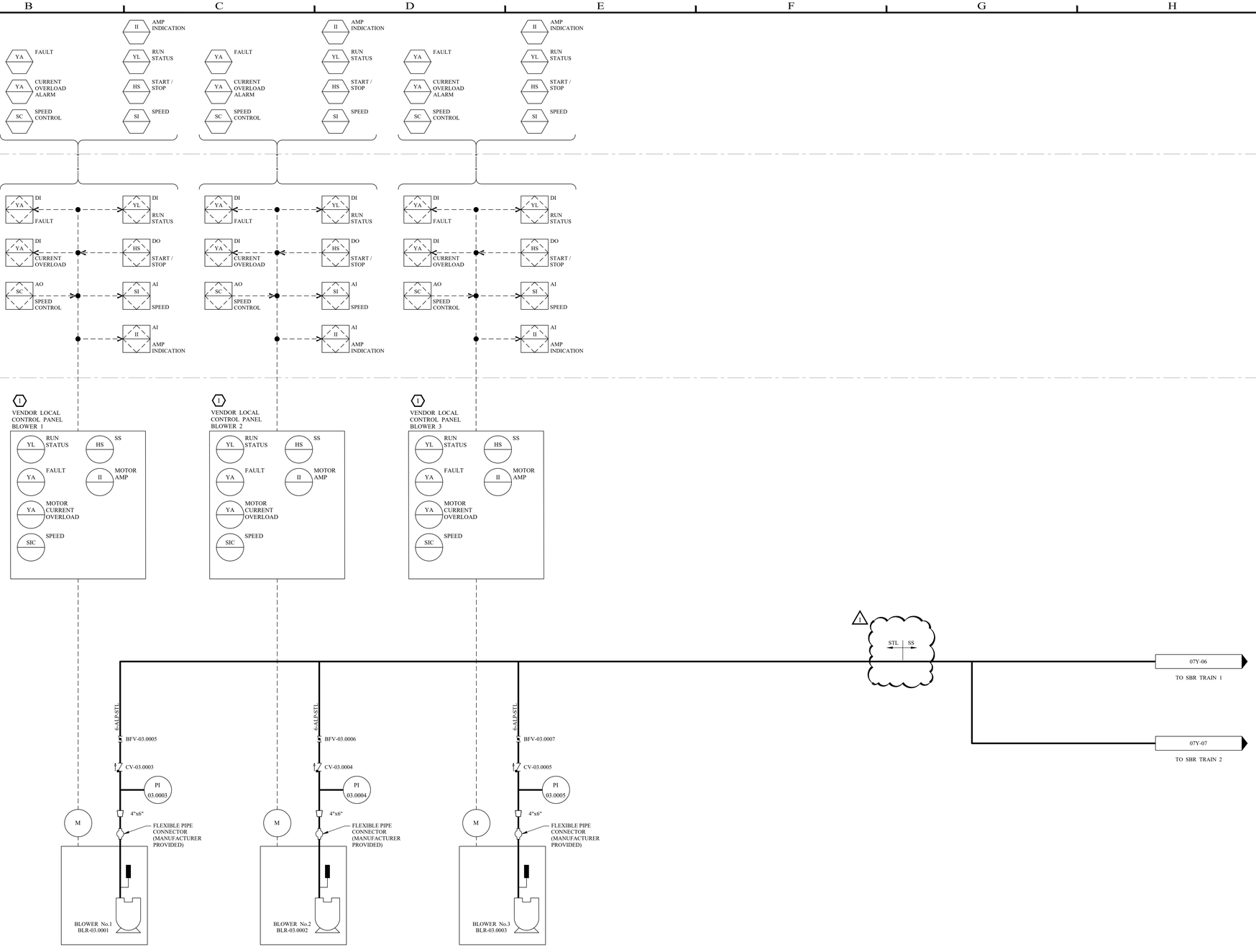

NOTES INDICATED ON DRAWING BY (1):

1. BLOWER CONTROLS TO BE LOCATED INSIDE OF THE SBR CONTROL PANEL, LOCATED ON BLOWER PAD.

NO.	REVISION	DATE
0	ISSUED FOR ADVERTISEMENT	08/27/2024
1	ADDENDUM No. 2	09/24/2024

09/24/2024

Brittany D. White

BRITTANY D. WHITE 128714 LICENSED PROFESSIONAL ENGINEER

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BAR IS ONE INCH ON ORIGINAL DRAWING
0 1
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DESIGNED BY B.WHITE
DRAWN BY J.CASSIDY
CHECKED BY C.RICH
SCALE NO SCALE
DATE 09/24/2024

CITY OF TOLAR
WASTEWATER TREATMENT PLANT IMPROVEMENTS

P&ID - PROCESS AERATION SYSTEM

PROJECT NO.: 8434
SEQUENCE No. 80 OF 123
SHEET No. 07Y-08

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