

Volume 1

CONTRACT DOCUMENT SPECIFICATIONS

for the construction of the

**Quinns Junction Water Treatment Plant
2019 Upgrades**

CONSTRUCTION DOCUMENTS

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SECTION 00 01 07
SEALS PAGE

TECHNICAL SPECIFICATIONS

DIVISION 26 – ELECTRICAL

Manika Gupta, P.E.

TECHNICAL SPECIFICATIONS

DIVISION 33 – UTILITIES

DIVISION 44 – POLLUTION CONTROL EQUIPMENT

Joseph Zalla, P.E.

END OF SECTION

TABLE OF CONTENTS

Pages

TECHNICAL SPECIFICATIONS

DIVISION 1 THROUGH 25 (NOT USED)

DIVISION 26—ELECTRICAL

26 20 00 Low-Voltage AC Induction Motors..... 1- 12

DIVISION 27 THROUGH 32 (NOT USED)

DIVISION 33—UTILITIES

33 12 17.01 Surge Control System Engineer Designed..... 1- 6

Supplements:

Hydropneumatic Tank Data Sheets:

TNK-742, Raw Water Surge Tank

TNK-743, Finished Water Surge Tank

Tank Data Sheets:

TNK-742, Raw Water Surge Tank

TNK-743, Finished Water Surge Tank

33 16 13.13 Welded Steel Tank..... 1- 11

Supplements:

Carbon Steel Tank Schedule

Sulfuric Acid Tank Data Sheet

DIVISION 34 THROUGH 43 (NOT USED)

DIVISION 44—POLLUTION CONTROL EQUIPMENT

44 42 56.04 Submersible Pumps..... 1- 6

DIVISION 45 THROUGH 49 (NOT USED)

DRAWINGS (BOUND SEPARATELY)

END OF SECTION

SECTION 26 20 00
LOW-VOLTAGE AC INDUCTION MOTORS

PART 1 GENERAL

1.01 RELATED SECTIONS

- A. This section applies to low-voltage AC induction motors, whether or not referenced by a motor-driven equipment specification. If equipment specification section deviates from this section in requirements such as, application, horsepower, enclosure type, mounting, shaft type, or synchronous speed, then those listed requirements shall take precedence over this section.

1.02 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Bearing Manufacturers Association (ABMA):
 - a. 9, Load Ratings and Fatigue Life for Ball Bearings.
 - b. 11, Load Ratings and Fatigue Life for Roller Bearings.
 2. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
 - a. 112, Standard Test Procedure for Polyphase Induction Motors and Generators.
 - b. 620, Guide for the Presentation of Thermal Limit Curves for Squirrel Cage Induction Machines.
 - c. 841, Standard for Petroleum and Chemical Industry—Premium Efficiency Severe Duty Totally Enclosed Fan-Cooled (TEFC) Squirrel Cage Induction Motors—Up to and Including 370 kW (500 hp).
 3. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
 - b. C50.41, Polyphase Induction Motors for Power Generating Stations.
 - c. MG 1, Motors and Generators.
 4. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
 5. UL:
 - a. 83, Standard for Safety for Thermoplastic-Insulated Wire and Cables.
 - b. 674, Standard for Safety for Electric Motors and Generators for Use in Division 1 Hazardous (Classified) Locations.
 - c. 2111, Standard for Safety for Overheating Protection for Motors.

1.03 DEFINITIONS

- A. CISD-TEFC: Chemical industry, severe-duty enclosure.
- B. DIP: Dust-ignition-proof enclosure.
- C. EXP: Explosion-proof enclosure.
- D. Inverter Duty Motor: Motor meeting applicable requirements of NEMA MG 1, Section IV, Parts 30 and 31.
- E. Inverter Ready Motor: Motor meeting applicable requirements of NEMA MG 1, Section IV, Part 31.4.4.2.
- F. Motor Nameplate Horsepower: That rating after any derating required to allow for extra heating caused by the harmonic content in the voltage applied to the motor by its controller.
- G. ODP: Open drip-proof enclosure.
- H. TEFC: Totally enclosed, fan-cooled enclosure.
- I. TENV: Totally enclosed, nonventilated enclosure.
- J. VPI: Vacuum pressure impregnated.
- K. WPI: Open weather protected enclosure, Type I.
- L. WPPI: Open weather protected enclosure, Type II.

1.04 SUBMITTALS

- A. Action Submittals:
 - 1. Descriptive information.
 - 2. Nameplate data in accordance with NEMA MG 1.
 - 3. Additional Rating Information:
 - a. Service factor.
 - b. Locked rotor current.
 - c. No load current.
 - d. Safe stall time for motors 100 hp and larger.
 - e. Multispeed load classification (for example, variable torque).
 - f. Variable frequency drive motor load classification (for example, variable torque) and minimum allowable motor speed for that load classification.
 - g. Guaranteed minimum full load efficiency and power factor.
 - 4. Enclosure type and mounting (such as, horizontal, vertical).

5. Dimensions and total weight.
6. Conduit box dimensions and usable volume as defined in NEMA MG 1 and NFPA 70.
7. Bearing type.
8. Bearing lubrication.
9. Bearing life.
10. Space heater voltage and watts.
11. Description, ratings, and wiring diagram of motor thermal protection.
12. Motor sound power level in accordance with NEMA MG 1.
13. Maximum brake horsepower required by the equipment driven by the motor.
14. Description and rating of submersible motor moisture sensing system.
15. Anchorage and bracing data sheets and drawings as required by Bid Package 1 - Section 01 88 15, Anchorage and Bracing.

B. Informational Submittals:

1. Operation and Maintenance Data: As specified in Bid Package 1 - Section 01 78 23, Operation and Maintenance Data.
2. Manufacturer's Certificate of Proper Installation, in accordance with Bid Package 1 - Section 01 43 33, Manufacturers' Field Services for motors 100 hp and larger.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Materials, equipment, and accessories specified in this section shall be products of:

1. General Electric.
2. Siemens Energy and Automation, Inc., Motors and Drives Division.
3. Baldor (ABB).
4. U.S. Electrical Motors.
5. TECO-Westinghouse Motor Co.
6. Toshiba International Corp., Industrial Division.
7. WEG Electric Motors Corp.
8. SEW Eurodrive (for valve and gate actuators only).
9. FLYGT Submersible Pumps.

2.02 GENERAL

- A. For multiple units of the same type of equipment, furnish identical motors and accessories of a single manufacturer.

- B. In order to obtain single source responsibility, use a single supplier to provide drive motor, its driven equipment, and specified motor accessories.
- C. Meet requirements of NEMA MG 1.
- D. Provide motors specifically designed for the use and conditions intended, with a NEMA design letter classification to fit the application.
- E. Lifting lugs on motors weighing 100 pounds or more.
- F. Operating Conditions:
 - 1. Maximum ambient temperature as per Bid Package 1 - Section 01 61 00, Common Product Requirements.
 - 2. Altitude: as per Bid Package 1 - Section 01 61 00, Common Product Requirements.
 - 3. Provide motors suitable for operating conditions without reduction in nameplate rated horsepower or exceeding rated temperature rise.
 - 4. Overspeed in either direction in accordance with NEMA MG 1.

2.03 HORSEPOWER RATING

- A. As designated in motor-driven equipment specification.
- B. Constant Speed Applications: Brake horsepower of driven equipment at any operating condition not to exceed motor nameplate horsepower rating, excluding service factor.
- C. Adjustable Frequency and Adjustable Speed Applications (Inverter Duty Motor, Inverter Ready Motor): Driven equipment brake horsepower at any operating condition not to exceed motor nameplate horsepower rating, excluding service factor.

2.04 SERVICE FACTOR

- A. Inverter-Duty Motors: 1.0 at rated ambient temperature, unless otherwise noted.
- B. Other Motors: 1.15 minimum at rated ambient temperature, unless otherwise noted.

2.05 VOLTAGE AND FREQUENCY RATING

- A. System Frequency: 60 Hz.
- B. Voltage Rating: Unless otherwise indicated in motor-driven equipment specification:

Voltage Rating		
Size	Voltage	Phase
1/2 hp and smaller	115	1
3/4 hp through 400 hp	460	3

- C. Suitable for full voltage starting.
- D. 60 hp and larger also suitable for reduced voltage starting with 65 percent or 80 percent voltage tap settings on reduced inrush motor starters.
- E. Suitable for accelerating the connected load with supply voltage at motor starter supply terminals dipping to 90 percent of motor rated voltage.

2.06 EFFICIENCY AND POWER FACTOR

- A. For all motors except single-phase, under 1 hp, multispeed, short-time rated and submersible motors, or motors driving gates, valves, elevators, cranes, trolleys, and hoists:
 - 1. Efficiency:
 - a. Tested in accordance with NEMA MG 1, Paragraph 12.59.
 - b. Guaranteed minimum at full load in accordance with NEMA MG 1 Table 12-12, Full-load Efficiencies for NEMA Premium Efficiency Electric Motors Rated 600 Volts or Less (Random Wound), or as indicated in motor-driven equipment specification.
 - 2. Power Factor: Guaranteed minimum at full load shall be manufacturer’s standard or as indicated in motor-driven equipment specification.

2.07 LOCKED ROTOR RATINGS

- A. Locked rotor kVA Code G or lower, if motor horsepower not covered by NEMA MG 1 tables.
- B. Safe Stall Time: 12 seconds or greater.

2.08 INSULATION SYSTEMS

- A. Single-Phase, Fractional Horsepower Motors: Manufacturer’s standard winding insulation system.
- B. Three-phase and Integral Horsepower Motors: Unless otherwise indicated in motor-driven equipment specification, Class B or Class F at nameplate horsepower and designated operating conditions.

2.09 ENCLOSURES

- A. Conform to NEMA MG 1.
- B. TEFC and TENV: Furnish with drain hole with porous drain/weather plug.
- C. Submersible: In accordance with Article Special Motors.
- D. Chemical Industry, Severe-Duty (CISD-TEFC): In accordance with Article Special Motors.

2.10 TERMINAL (CONDUIT) BOXES

- A. Oversize main terminal boxes for motors.
- B. Diagonally split, rotatable to each of four 90-degree positions. Threaded hubs for conduit attachment.
- C. Except ODP, furnish gaskets between box halves and between box and motor frame.
- D. Minimum usable volume in percentage of that specified in NEMA MG 1, Section 1, Paragraph 4.19 and NFPA 70, Article 430:

Terminal Box Usable Values		
Voltage	Horsepower	Percentage
Below 600	15 through 125	500
Below 600	150 through 300	275
Below 600	350 through 600	225

- E. Terminal for connection of equipment grounding wire in each terminal box.
- F. Coordinate motor terminal box conduit entries versus size and quantity of conduits shown on Drawings.

2.11 BEARINGS AND LUBRICATION

- A. Horizontal Motors:
 - 1. 3/4 hp and Smaller: Permanently lubricated and sealed ball bearings, or regreasable ball bearings in labyrinth sealed end bells with removable grease relief plugs.
 - 2. 1 hp through 400 hp: Regreasable ball bearings in labyrinth sealed end bells with removable grease relief plugs.

3. For Direct Drive Equipment: Minimum 100,000 hours L-10 bearing life for ball and roller bearings as defined in ABMA 9 and ABMA 11.
4. For Belt Driven Equipment: Minimum 30,000 hours L-10 bearing life for ball and roller bearings as defined in ABMA 9 and ABMA 11.

B. Vertical Motors:

1. Thrust Bearings:
 - a. Antifriction bearing.
 - b. Manufacturer's standard lubrication 100 hp and smaller.
 - c. Oil lubricated 125 hp and larger.
 - d. Minimum 50,000 hours L-10 bearing life.
2. Guide Bearings:
 - a. Manufacturer's standard bearing type.
 - b. Manufacturer's standard lubrication 200 hp and smaller.
 - c. Oil lubricated 250 hp and larger.
 - d. Minimum 100,000 hours L-10 bearing life.

C. Regreasable Antifriction Bearings:

1. Readily accessible, grease injection fittings.
2. Readily accessible, removable grease relief plugs.

D. Oil Lubrication Systems:

1. Oil reservoirs with sight level gauge.
2. Oil fill and drain openings with opening plugs.
3. Provisions for necessary oil circulation and cooling.

2.12 NOISE

- A. Measured in accordance with NEMA MG 1.
- B. Maximum Sound Level for Motors Controlled by Adjustable Frequency Drive Systems: 3 dBA higher than NEMA MG 1.

2.13 BALANCE AND VIBRATION CONTROL

- A. In accordance with NEMA MG 1, Part 7.

2.14 EQUIPMENT FINISH

- A. External Finish: Prime and finish coat manufacturer's standard. Finish color manufacturer's standard.
- B. Internal Finish: Bore and end turns coated with clear polyester or epoxy varnish.

2.15 SPECIAL FEATURES AND ACCESSORIES

- A. Screen Over Air Openings: Stainless steel on motors with ODP, WPI, and WPPI enclosures meeting requirements for guarded machine in NEMA MG 1, and attached with stainless steel screws.
- B. Winding Thermal Protection:
 - 1. Thermostats:
 - a. Motors for constant speed application 40 hp and larger. Motors for adjustable speed application 25 hp and larger.
 - b. Bi-metal disk or rod type thermostats embedded in stator windings.
 - c. Automatic reset contacts rated 120 volts ac, 5 amps minimum, opening on excessive temperature. (Provide manual reset at motor controller.)
 - d. Leads extending to separate terminal box for motors 100 hp and larger.
- C. Nameplates:
 - 1. Raised or stamped letters on stainless steel or aluminum.
 - 2. Display motor data required by NEMA MG 1, Paragraph 10.39 and Paragraph 10.40 in addition to bearing numbers for both bearings.
 - 3. Premium efficiency motor nameplates to display NEMA nominal efficiency, guaranteed minimum efficiency, full load power factor, and maximum allowable kVAR for power factor correction capacitors.
- D. Anchor Bolts: Provide meeting manufacturer's recommendations and of sufficient size and number for specified seismic condition.

2.16 SPECIAL MOTORS

- A. Requirements in this article take precedence over conflicting features specified elsewhere in this section.
- B. Chemical Industry, Severe-Duty (CISD-TEFC):
 - 1. In accordance with IEEE 841.
 - 2. TEFC in accordance with NEMA MG 1.
 - 3. Suitable for indoor or outdoor installation in severe-duty applications including high humidity, chemical (corrosive), dirty, or salty atmospheres.
 - 4. Motor Frame, End Shields, Terminal Box, and Fan Cover: Cast iron.
 - 5. Ventilating Fan: Corrosion-resistant, nonsparking, external.
 - 6. Drain and Breather Fittings: Stainless steel.

7. Nameplate: Stainless steel.
 8. Gaskets between terminal box halves and terminal box and motor frame.
 9. Extra slinger on rotor shaft to prevent moisture seepage along shaft into motor.
 10. Double shielded bearings.
 11. 125,000 hours minimum L-10 bearing life for direct-connected loads.
 12. External Finish: Double-coated epoxy enamel.
 13. Coated rotor and stator air gap surfaces.
 14. Insulation System, Windings, and Connections:
 - a. Class F insulation, Class B rise or better at 1.0 service factor.
 - b. Multiple dips and bakes of non-hygroscopic polyester varnish.
 15. Service Factor:
 - a. At 40 Degrees C Ambient: 1.15.
 - b. At 65 Degrees C Ambient: 1.00.
 16. Safe Stall Time Without Injurious Heating: 20 seconds minimum.
- C. Multispeed: Meet requirements for speeds, number of windings, and load torque classification indicated in motor-driven equipment specification.
- D. Inverter Duty Motor:
1. Motor Supplied Power by variable voltage and variable frequency drives: Inverter duty rated in accordance with NEMA Parts 30 and 31.
 2. Provide winding insulation rated 1,600 peak volts, minimum.
 3. Meet or exceed NEMA MG 1 corona inception voltage rating.
 4. Provide one insulated bearing at non-driven end for motors 40 hp and larger.
 5. Suitable for operation over entire speed range indicated.
 6. Provide forced ventilation where speed ratio is greater than published range for motor provided.
 7. Shaft Grounding Device, Motors Larger than 20 hp: Furnish with conductive micro fiber shaft grounding ring solidly bonded to grounded motor frame in accordance with manufacturer's recommendations.
 - a. Manufacturers: Grounding Ring: EST-Aegis.
- E. Submersible Pump Motor:
1. Manufacturers:
 - a. Xylem Flygt Corp.
 - b. Or Approved 'Equal'.
 2. At 100 Percent Load:
 - a. Motors with Speeds Less than 1,200 rpm: Manufacturer's standard.

b. Motors with Speeds 1,200 rpm and Greater:

Submersible Pump Motors		
Horsepower	Guaranteed Minimum Efficiency	Guaranteed Minimum Power Factor
5 through 10	80	82
10.1 through 50	80	82
50.1 through 100	87	82
Over 100	89	82

3. Insulation System: Manufacturer’s standard Class B or Class F.
4. Motor capable of running dry continuously.
5. Enclosure:
 - a. Hermetically sealed, watertight, for continuous submergence up to 65-foot depth.
 - b. Seals: Tandem mechanical.
6. Bearing and Lubrication:
 - a. Permanently sealed and lubricated, replaceable antifriction guide and thrust bearings.
 - b. Minimum 15,000 hours L-10 bearing life.
7. Inrush kVA/horsepower no greater than NEMA MG 1 and NFPA 70, Code F.
8. Winding Thermal Protection:
 - a. Thermal sensor and switch assembly, one each phase, embedded in stator windings and wired in series.
 - b. Switches normally closed, open upon excessive winding temperature, and automatically reclose when temperature has cooled to safe operating level.
 - c. Switch contacts rated at 5 amps, 120V ac.
9. Motor Seal Failure Moisture Detection:
 - a. Probes or sensors to detect moisture beyond seals.
 - b. Probe or sensor monitoring module for mounting in motor controller, suitable for operation from 120V ac supply.
 - c. Monitoring module with control power transformer, probe test switch and test light, and two independent 120V ac contacts, one opening and one closing when flux of moisture is detected.
10. Winding thermal protection, moisture detection, and bearing overtemperature specified above may be monitored by single device providing two independent 120V ac contacts.

11. Connecting Cables:
 - a. Combined or separate cables containing power and grounding and control and grounding conductors.
 - b. Each cable suitable for hard service, submersible duty with watertight seal where cable enters motor.
 - c. Length: as defined in equipment specifications.
 - d. UL 83 listed and sized in accordance with NFPA 70.

2.17 FACTORY TESTING

A. Tests:

1. In accordance with IEEE 112 for polyphase motors.
2. Routine (production) tests in accordance with NEMA MG 1. Test multispeed motors at all speeds.
3. For energy efficient and premium efficiency motors, test efficiency and power factor at 50 percent, 75 percent, and 100 percent of rated horsepower:
 - a. In accordance with IEEE 112, Test Method B, and NEMA MG 1, Paragraph 12.59. and Paragraph 12.60.
4. Vibration (balance) for inverter duty motors 100 hp and larger. Provide test reports for 100 hp and larger.

B. Test Report Forms:

1. Routine Tests: IEEE 112, Form A-1.
2. Efficiency and power factor by Test Method B, IEEE 112, Form A-2, and NEMA MG 1, Table 12-11 or Table 12-12.

PART 3 EXECUTION

3.01 INSTALLATION

- A. In accordance with manufacturer's instructions and recommendations.
- B. Align motor carefully and properly with driven equipment.
- C. Secure equipment to mounting surface with anchor bolts.

3.02 MANUFACTURER'S SERVICES

- A. Furnish manufacturer's representative at Site in accordance with Bid Package 1 - Section 01 43 33, Manufacturers' Field Services, for installation assistance, inspection, equipment testing, and startup assistance for motors larger than 50 hp.
- B. Manufacturer's Certificate of Proper Installation for motors larger than 50 hp.

END OF SECTION

SECTION 33 12 17.01
SURGE CONTROL SYSTEM ENGINEER DESIGNED

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Society of Mechanical Engineers (ASME):
 - a. B16.5, Pipe Flanges and Flanged Fittings.
 - b. B16.11, Forged Steel Fittings, Socket-Welding and Threaded.
 2. National Electrical Manufacturers Association (NEMA): ICS 1, General Standards for Industrial Control and Systems.
 3. Steel Structures Painting Council (SSPC):
 - a. SP 6, Commercial Blast Cleaning.
 - b. SP 10, Near-White Blast Cleaning.

1.02 SUBMITTALS

- A. Action Submittals: Shop Drawings:
1. Complete dimensional fabrication drawings of surge tank, surge tank control panel, equipment, accessories, supports, connections, outlets, and all related piping.
 2. Complete electrical elementary diagrams and electrical interconnection diagrams for bladder integrity monitoring system. Diagrams in accordance with NEMA ICS 1.
- B. Informational Submittals:
1. Manufacturer's Certificate of Compliance, in accordance with Bid Package 1 - Section 01 61 00, Common Product Requirements, that tank is certified and stamped in accordance with ASME Section VIII, Division 1.
 2. Seismic anchorage and bracing calculations as required by Bid Package 1 - Section 01 88 15, Anchorage and Bracing.
 3. Manufacturer's Certificate of Proper Installation, in accordance with Bid Package 1 - Section 01 43 33, Manufacturers' Field Services.
 4. Tank manufacturer's written instructions.

5. Test Reports:
 - a. Date and time of testing.
 - b. Description of method of testing, including pumping combinations and pressure records.
 - c. Description of observed leaks and method and date of repair.
 - d. Description of catastrophic failures.
6. Operation and Maintenance Manual and Maintenance Summary:
Provide an Operation and Maintenance Manual and Maintenance Summary in conformance with the requirements of Bid Package 1 - Section 01 78 23, Operation and Maintenance Data.

1.03 QUALIFICATIONS

- A. Statement of Qualification: Tank welders must be ASME certified.

PART 2 PRODUCTS

2.01 SURGE TANK

- A. Materials for tank, design, shop fabrication and inspection shall comply with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1. Provide ASME code stamp, National Board Registration number and pressure rating on tank.
- B. Physical Data:
 1. Vertical, inverted bladder-type vessel suitable for use with raw water, for Surge Tank TNK-742.
 2. Vertical, inverted bladder-type vessel suitable for use with potable water, for Surge Tank TNK-743.
 3. Surge tank bladder and manufacturing facility shall be NSF-61 approved for potable water and listed with NSF.
 4. Minimum volume, diameter and height required as specified in the Tank Data sheets at the end of this section.
 5. Minimum design pressure as specified in the Tank Data sheets at the end of this section.
 6. As specified in the Tank Data Sheets at the end of this section.
- C. Structural Design and Supports shall include the tank, supports, and anchor bolts shall be designed based upon local building codes in addition to the following criteria:

1. Design for hydrostatic operating pressure and test pressure with no reactive load permitted through the inlet/outlet piping as specified in the Tank Data Sheets at the end of this section.
 2. Seismic Design Parameters to conform to the current IBC
- D. Attachments:
1. Manways:
 - a. One minimum, design and fabricate in accordance with ASME Boiler and Pressure Vessel Code, Section VIII, Article D10.
 - b. Minimum Diameter: 16 inches
 - c. Removeable top or end to allow for inspection and maintenance of the bladder.
Include davit arm to support manway lid when unbolted from surge tank.
 2. Nozzles:
 - a. As shown and in accordance with ASME Code, Section VIII, Article D6.
 - b. As specified in the Tank Data Sheets at the end of this section.
- E. Lifting Lugs: Provide suitably attached for equipment assemblies and components weighing over 100 pounds.
- F. Equipment Identification Plates: An engraved Gravoply laminated identification plate shall be securely mounted on the equipment in a readily visible location. The plate shall bear the 1/4-inch minimum identification number indicated on Drawings.
- G. Anchor Bolts: Type 316 stainless steel, sized by equipment manufacturer, 1/2-inch minimum diameter, and as specified in Bid Package 1 - Section 05 50 00, Metal Fabrications. Coat in accordance with Bid Package 1 - Section 09 97 13, Steel Tank Coatings.

2.02 FABRICATION

- A. Fabricate tank in accordance with ASME Boiler and Pressure Vessel Code, Section VIII. Stamp and certify tank in accordance with ASME Code Section VIII, Division 1.
- B. Construct tank shell of deep drawn carbon steel sub-arc welded domes and side shells with double welded seams. Tank/Vessels shall be fabricated by listed manufacturer.

- C. Weld the support legs to the tank. Secure tank by attaching support legs (four minimum) to a concrete floor or slab. Material of construction shall comply with ASTM A 36 or ASTM A 285, Grade C.
- D. Bladder tank shall be National Board approved with Liquid Relief Valve set at tank design pressure. Bladders and replacement bladders shall be manufactured in the tank manufacturers' plant. Bladder shall be sized to conform to the inner shape of the vessel. Bladder tank, fabricated with a food grade, heavy duty butyl rubber bladder, shall be of vertical configuration.
- E. Precharge pressure will be located between the shell and the bladder. Provide a 1/2-inch threaded connection at the top of the tank to contain a gas charging valve and pressure gauge.
- F. Valves: Tank shall be designed to function properly with the specific valves, including but not limited to plug valves and check valves, submitted by the Contractor. Acceptance of these valves shall be clearly stated in the surge tank submittal.
- G. Plate Thicknesses: Determine in accordance with allowable stresses listed in the Code for material, pressure, and temperature specified.
- H. Heads: As specified in ASME Code, Section VIII, Division 1.
- I. Shell and Head Thicknesses: Include minimum corrosion allowance of 0.125 inch.
- J. Painting and Coating: All painting and coating shall be completed at the factory. Field painting and coating will not be accepted.
 - 1. Interior (submerged) Surface Treatment: Tank interior shall be painted with an NSF 61 epoxy paint with a uniform layer thickness of no less than 6 mils. Clean and paint in accordance with Bid Package 1 - Section 09 90 00, Painting and Coating.
 - 2. Exterior Surface Treatment: Tank exterior shall be painted with an anti-corrosion polyurethane and shall have a uniform layer with a minimum thickness of 10 mils. Clean and paint in accordance with Bid Package 1 - Section 09 90 00, Painting and Coating

2.03 SOURCE QUALITY CONTROL

- A. Perform hydrostatic testing in shop. Test pressure shall be 150 percent of the design pressure of the tank for at least 24 hours.
- B. Repair leaks found during testing prior to painting.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install tank in accordance with manufacturer's written instructions.
- B. The surge tank manufacturer shall verify the performance of the surge protection equipment provided, by recording surge pressures following membrane rack transitions for TNK-742 and pump trips for TNK-743, and summarize the results in a written document.
- C. The surge tank vendor shall provide all equipment needed to record the field data during field testing. The pressure shall be recorded with a pressure transducer capable of recording the surge pressures at a sample rate of 1,000 recordings per second. Transducers and measurement software are not permanently installed and are to be provided by the manufacturer for testing only.
- D. Level tank and grout support legs as specified in Bid Package 1 - Section 03 62 00, Nonshrink Grouting, before anchoring.
- E. Assemble Accessories: Make process, control, and electrical connections.
- F. Make piping connections such that misalignment stresses are not induced in tank nozzles.

3.02 FIELD QUALITY CONTROL

- A. Field Hydrostatic Test:
 - 1. Hydrostatically test installed surge tank for 4 hours minimum at 1.3 times design pressure, before dynamic testing.
 - 2. Repair any leaks detected during testing. Retest until no leakage is detected.
- B. Test Preparation:
 - 1. Perform test preparation and inspections prior to functional and performance testing.
 - 2. Inspect existing and new piping, branches, connections, nipples, valves, tapping bosses, associated instruments, and all other components for deficiency, damage and inadequate rated pressure.
 - 3. If any component is damaged, rated less than tank design pressure, or not restrained, notify Engineer and do not perform functional test.

C. Functional and Performance Testing:

1. Contractor shall submit test schedule a minimum of 4 weeks prior to commencement. Tests shall not commence on weekends or holidays.
2. Inspect and test all components for alignment, connection, operation, and performance.
3. System Supplier shall test level control system for all functions.
4. At least 30 minutes shall be allowed between each pump start to prevent overheating of the pump motor.
5. Dynamic Test: Perform in response to flow startup and stoppage.
6. Testing with Multiple Pumps: Increase number of pumps, one at a time.
7. Record steady state flow prior to flow stoppage.
8. Record dynamic pressures and surge tank level for each test.
9. System Supplier shall provide suitable test equipment to electronically log surge tank pressure in 0.5-second increments (maximum) for the duration of each dynamic test. Pressure transducers shall have calibration certificates dated no earlier than 30 days prior to test date, and be accurate to within 0.5 percent.
10. Functional Test Report:
 - a. Contractor shall submit complete written report and electronic data file of all tests performed within 10 days after test completion. Reports shall include:
 - 1) Date and time of all testing.
 - 2) Description of method of testing including pumping combinations, pressure records, etc.
 - 3) Description of any failures or repairs.
 - 4) Signature of System Supplier, Contractor, and test equipment operator.
 - 5) Electronic file on compact disc (CD) media containing pressure versus time data of all tests. Data file shall be in Microsoft Excel format, or approved equivalent.

3.03 SUPPLEMENTS

- A. The supplements listed below, following “End of Section” are a part of this specification.
1. Hydropneumatic Tank Data Sheets:
 - a. TNK-742, Raw Water Surge Tank.
 - b. TNK-743, Finished Water Surge Tank.
 2. Tank Data Sheets:
 - a. TNK-742, Raw Water Surge Tank.
 - b. TNK-743, Finished Water Surge Tank.

END OF SECTION

HYDROPNEUMATIC TANK DATA SHEET, 01Tag Number: TNK-742Tank Name: Raw Water Surge TankManufacturers and Product: (1) Charlatte America(2) Pulsco(3) Wessels Co.

Physical Data:

Type: Pre-charged BladderNet Volume: Not less than 1,200 gallonsConfiguration: Vertical cylindrical shape with elliptical headsDiameter: Approx. 4 feet-11 inchesSidewall Length: 7 feet 6 inchesDesign Pressure: Rated for 60 psig minimumDesign Temperature: 60 degrees F

Nozzles:

Sizes 2-1/2 Inches and Larger: 350 psi flanged, ASME B31.3, match existing pipe material and flange typeSizes 2 Inches and Smaller: 350 psi screwed, ASME B31.3, match existing pipe material and flange type

Number and Type:

One 10-inch inlet/outlet nozzle

One 0.5-inch pressure relief nozzle

Two level gauge nozzles

One 0.5-inch differential pressure instrument

One 0.5-inch level element

One pressure sustaining valve per manufacturer recommended size

Pressure Relief (Safety) Valve:

In accordance with Boiler and Pressure Vessel Code, Section VIII, General Requirements, UG-125 and 126.

Set as recommended by Surge Tank Supplier

Tank Support Legs: Four minimum sized to set inlet/outlet flange approximately 2 feet below bottom of tank

Level Gauges: One

HYDROPNEUMATIC TANK DATA SHEET, 02Tag Number: TNK-743Tank Name: Finished Water Surge TankManufacturers and Product: (1) Charlatte America(2) Pulsco(3) Wessels Co.

Physical Data:

Type: Pre-charged BladderNet Volume: Not less than 250 gallonsConfiguration: Vertical cylindrical shape with elliptical headsDiameter: Approx. 2 feet-9 inchesSidewall Length: 4 feet 11 inchesDesign Pressure: Rated for 200 psigDesign Temperature: 60 degrees F

Nozzles:

Sizes 2-1/2 Inches and Larger: 350 psi flanged, ASME B31.3, match existing pipe material and flange typeSizes 2 Inches and Smaller: 350 psi screwed, ASME B31.3, match existing pipe material and flange type

Number and Type:

One 10-inch inlet/outlet nozzle

One 0.5-inch pressure relief nozzle

Two level gauge nozzles

One 0.5-inch differential pressure instrument

One 0.5-inch level element

One pressure sustaining valve per manufacturer recommended size

Pressure Relief (Safety) Valve:

In accordance with Boiler and Pressure Vessel Code, Section VIII, General Requirements, UG-125 and 126

Set as recommended by Surge Tank Supplier

Tank Support Legs: Four minimum sized to set inlet/outlet flange approximately 2 feet below bottom of tank.

Level Gauges: One

TANK DATA SHEET

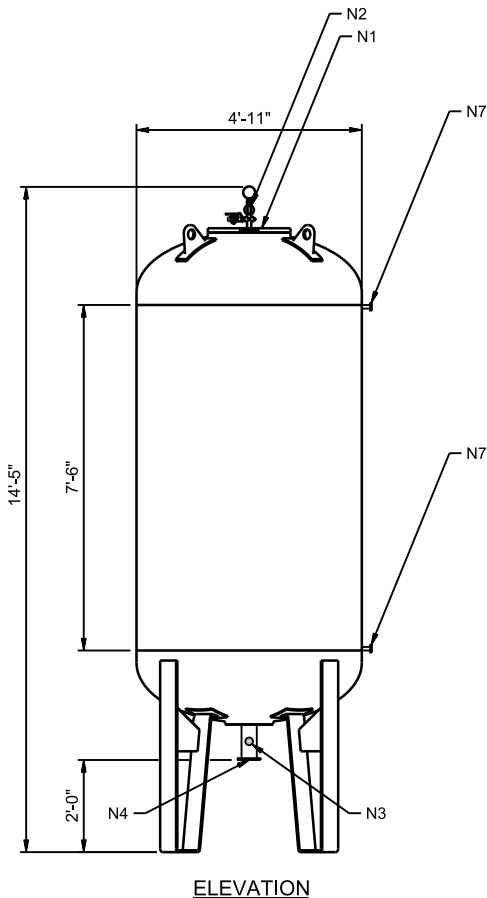
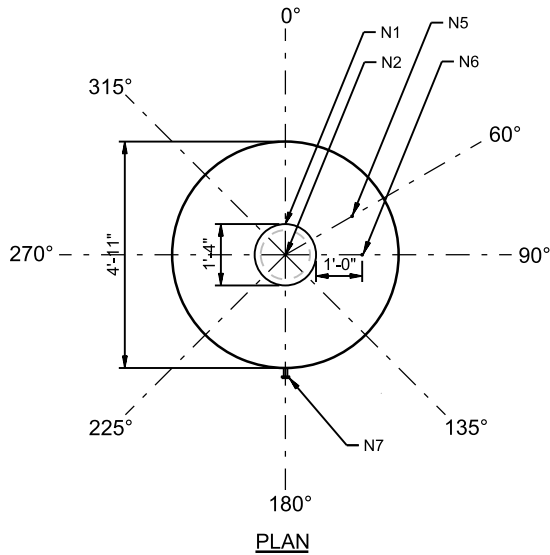
APPLICABLE TO:

- PROPOSAL
- PURCHASE
- RECORD

Information not specified to be supplied by vender as applicable

Item No. TNK-742
QUINNS JUNCTION 2019 UPGRADES
RAW WATER SURGE TANK

plot time: 10:34:06 AM
plot date: 9/11/2019



GENERAL INFORMATION

Service RAW WATER SURGE TANK		
Working Capacity	1,200 (MIN) GAL	Thickness
Design Code	ASTM / ASME	Roof DOMED
Material	CARBON STEEL	Shell VERTICAL CYLINDER
		Bottom CONICAL

COATING	EXTERNAL	INTERNAL
Surface Prep	SEE 09 90 00	SEE 09 90 00
Primer	SEE 09 90 00	SEE 09 90 00
Finish Coat	SEE 09 90 00	SEE 09 90 00
Insulation Thk		
Material		
Cladding		

NOZZLE SCHEDULE

MK	Size/Type	Service	Projection	Radial CL
N1	16" FLG	MANWAY, NOTE 2		CENTER
N2	0.5" NPT	GAS CHARGE VALVE WITH GAUGE		CENTER
N3	2" FLG	DRAIN WITH BALL VALVE		CENTER
N4	6" FLG	OUTLET 6" ANSI CLASS 150		CENTER
N5	0.5" NPT	DIFF. PRESSURE INSTRUMENT		2'-4"
N6	0.5" NPT	LEVEL ELEMENT		2'-4"
N7	NOTE 4	LEVEL GAUGE NOZZLE		SIDE

ACCESSORIES

Level Indicator	<input checked="" type="checkbox"/>	
Ladder	<input type="checkbox"/> Int <input type="checkbox"/> Ext	
Stairs		
Walkway		
Platform Clips	<input type="checkbox"/>	
Anchor Lugs	<input checked="" type="checkbox"/>	
Syphon Drain		
Sump		
Vortex Breaker		
Inlet Baffle		
Lifting Lugs	<input checked="" type="checkbox"/>	
Thief Hatch		
Access Manway, NOTE 2	<input checked="" type="checkbox"/>	
Down Comer	<input type="checkbox"/> Int <input type="checkbox"/> Ext	
Heat Trace		
Insulate		

NOTES

1. PROVIDE TANK LEGS PER DIMENSIONS SHOWN.
2. ACCESS MANWAY SHALL HAVE DAVIT ARM TO SUPPORT MANWAY AFTER REMOVAL.
3. VALVE PROJECTION AS RECOMMENDED BY SURGE TANK SUPPLIER.
4. LEVEL GAUGE NOZZLE SIZE PER MANUFACTURER RECOMMENDATION.

BP4-N-Tank-742_667681.dgn

TANK DATA SHEET

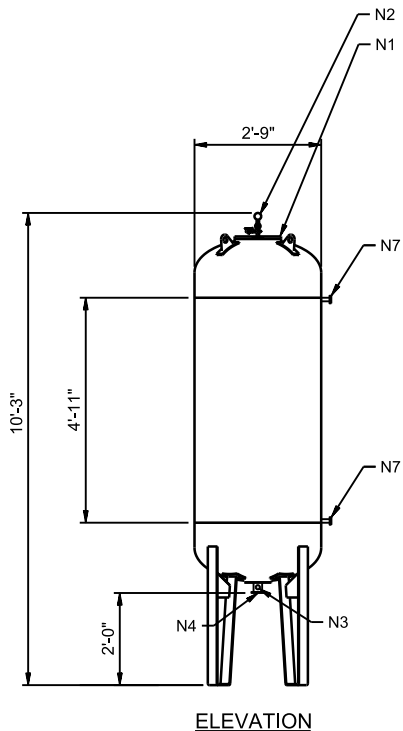
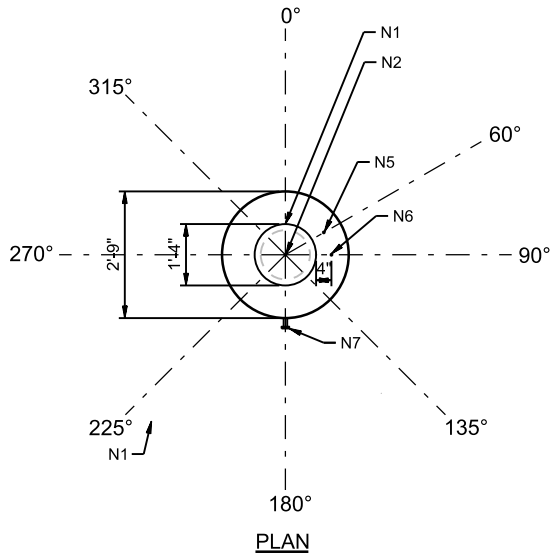
APPLICABLE TO:

- PROPOSAL
- PURCHASE
- RECORD

Information not specified to be supplied by vender as applicable

Item No. TNK-743
QUINNS JUNCTION 2019 UPGRADES
FINISHED WATER SURGE TANK

plot time: 10:30:28 AM
plot date: 9/11/2019



GENERAL INFORMATION

Service FINISHED WATER SURGE TANK	
Working Capacity 250 (MIN) GAL	Thickness
Design Code ASTM / ASME	Roof DOMED
Material CARBON STEEL	Shell VERTICAL CYLINDER
	Bottom CONICAL

COATING	EXTERNAL	INTERNAL
Surface Prep	SEE 09 90 00	SEE 09 90 00
Primer	SEE 09 90 00	SEE 09 90 00
Finish Coat	SEE 09 90 00	SEE 09 90 00
Insulation Thk		
Material		
Cladding		

NOZZLE SCHEDULE

MK	Size/Type	Service	Projection	Radial CL
N1	16" FLG	MANWAY, NOTE 2		CENTER
N2	0.5" NPT	GAS CHARGE VALVE WITH GAUGE		CENTER
N3	2" FLG	DRAIN WITH BALL VALVE		CENTER
N4	10" FLG	OUTLET 10" ANSI CLASS 150		CENTER
N5	0.5" NPT	DIFF. PRESSURE INSTRUMENT		2'-0"
N6	0.5" NPT	LEVEL ELEMENT		2'-0"
N7	NOTE 4	LEVEL GAUGE NOZZLE		SIDE

ACCESSORIES

Level Indicator	<input checked="" type="checkbox"/>	
Ladder <input type="checkbox"/> Int <input type="checkbox"/> Ext		
Stairs		
Walkway		
Platform Clips <input type="checkbox"/>		
Anchor Lugs	<input checked="" type="checkbox"/>	
Syphon Drain		
Sump		
Vortex Breaker		
Inlet Baffle		
Lifting Lugs	<input checked="" type="checkbox"/>	
Thief Hatch		
Access Manway, NOTE 2	<input checked="" type="checkbox"/>	
Down Comer <input type="checkbox"/> Int <input type="checkbox"/> Ext		
Heat Trace		
Insulate		

NOTES

1. PROVIDE TANK LEGS PER DIMENSIONS SHOWN.
2. ACCESS MANWAY SHALL HAVE DAVIT ARM TO SUPPORT MANWAY AFTER REMOVAL.
3. VALVE PROJECTION AS RECOMMENDED BY SURGE TANK SUPPLIER.
4. LEVEL GAUGE NOZZLE SIZE PER MANUFACTURER RECOMMENDATION.

BP4-N-Tank-743_667681.dgn

**SECTION 33 16 13.13
WELDED STEEL TANK**

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American Petroleum Institute (API): STD 650, Welded Steel Tanks for Oil Storage.
 2. American Society of Mechanical Engineers (ASME):
 - a. B16.11, Forged Fittings, Socket-Welding and Threaded.
 - b. B31.3, Process Piping.
 - c. BPVC SEC VIII, Division 1, Rules for Construction of Pressure Vessels.
 - d. BPVC SEC IX, Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators.
 3. American Society of Civil Engineers (ASCE): ASCE 7, Minimum Design Loads for Buildings and Other Structures.
 4. American Society of Nondestructive Testing (ASNT): SNT-TC-1A, Personnel Qualification and Certification in Non-Destructive Testing.
 5. American Society of Safety Engineers (ASSE): Z359.1, Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components.
 6. ASTM International (ASTM):
 - a. A36, Standard Specification for Carbon Structural Steel.
 - b. A181/A181M, Standard Specification for Carbon Steel Forgings, for General-Purpose Piping.
 - c. A193/A193M, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications.
 - d. A194/A194M, Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both.
 - e. A234/A234M, Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
 - f. A240, Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.
 - g. A516/A516M, Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service.

- h. F1554, Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
- 7. American Water Works Association (AWWA):
 - a. C207, Steel Pipe Flanges for Waterworks Service—Sizes 4 Inch through 144 Inch (100 mm through 3,600 mm).
 - b. C228, Stainless-Steel Pipe Flanges for Water Service—Sizes 2 In. through 72 In. (50 mm through 1,800 mm).
 - c. D100, Welded Steel Tanks for Water Storage.
- 8. American Welding Society (AWS):
 - a. A2.4, Standard Symbols for Welding, Brazing, and Nondestructive Examination.
 - b. A3.0, Standard Welding Terms and Definitions; Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting, and Thermal Spraying.
 - c. D1.1/D1.1M, Structural Welding Code - Steel.
 - d. QC 1, Standard for AWS Certification of Welding Inspectors.
- 9. International Building Code (IBC).
- 10. National Association of Corrosion Engineers (NACE):
 - a. NACE Standard RP-0391, Materials for the Handling and Storage of Commercial Concentrated (90 percent to 100 percent) Sulfuric Acid at Ambient Temperatures.
 - b. NACE SP-0178, Design, Fabrication and, Surface Finish Practices for Tanks and Vessels to be Lined for Immersion Service.
 - c. NACE SP-0294, Design, Fabrication, and Inspection of Storage Tank Systems for Concentrated Fresh and Process Sulfuric Acid and Oleum at Ambient Temperatures.
- 11. National Electrical Manufacturers Association (NEMA): 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
- 12. NSF International (NSF):
 - a. NSF/ANSI 61, Drinking Water System Components - Health Effects.
 - b. NSF/ANSI 372, Drinking Water System Components - Lead Content.
- 13. Occupational Safety and Health Act (OSHA): 29 CFR 1910, Code of Federal Regulations.
- 14. The Society for Protective Coatings (SSPC):
 - a. SSPC-SP5, White Metal Blast Cleaning.
 - b. SSPC-SP6, Commercial Blast Cleaning.

1.02 DEFINITIONS

- A. CWI: Certified Welding Inspector.
- B. NDT: Nondestructive Testing.
- C. PQR: Procedure Qualification Record.
- D. RT: Radiographic Testing.
- E. UT: Ultrasonic Testing.
- F. VT: Visual Testing.
- G. WPQ: Welder Performance Qualification.
- H. WPS: Welding Procedure Specification.

1.03 SYSTEM DESCRIPTION

- A. Steel Tank System:
 - 1. Welded carbon steel tank and all appurtenant work, as specified herein.
 - 2. Baked phenolic lining and external coating system.

1.04 SUBMITTALS

- A. Action Submittals:
 - 1. Tank construction drawings and calculations of steel tank system and accessories. Calculations shall be signed and sealed by Contractor's tank designer. All details shall satisfy the minimum requirements, sizes, factors herein specified or shown on Drawings.
 - 2. Shop Fabrication Drawings.
 - 3. Shop Drawings in accordance with Bid Package 1 - Section 05 05 23, Welding.
 - 4. Complete specifications, dimensional drawings, and descriptive literature on the tanks and their accessories to be furnished, including:
 - a. Materials of construction.
 - b. Shell height and plate thickness.
 - c. Type and thickness of roof.
 - d. Type and thickness of the bottom plates.
 - e. Dimension, location, and details of all nozzles, and accessories such as manways. Identify all tank nozzles with the identification mark shown on the Tank Data Sheets.
 - f. Tank data indicating equipment number, pressure rating, and details of nozzle designs.

5. Welding Information: Submit information regarding location, type, size, and extent of all welds with reference called out for Welding Procedure Specifications numbers shown on Drawings. Shop Drawings shall indicate by welding symbols or sketches the details of the welded joints, and the preparation of parent metal required to make them.
6. Manufacturer's literature and catalog data of components.
7. Tank designer's detailed requirements for tank anchorage.

B. Informational Submittals:

1. Manufacturer's instructions for coating systems.
2. Manufacturer's Certificate of Compliance, in accordance with Bid Package 1 - Section 01 61 00, Common Product Requirements.
3. Manufacturer's Certificate of Proper Installation, in accordance with Bid Package 1 - Section 01 43 33, Manufacturers' Field Services.
4. Welding Documentation:
 - a. Shop and field WPSs and supporting PQRs.
 - b. NDT procedure specifications.
 - c. Shop and field CWI reports.
 - d. Shop and field NDT reports.
5. Field Test Results:
 - a. Hydrostatic test report.
6. Operation and Maintenance Manual and Maintenance Summary: Provide an Operation and Maintenance Manual and Maintenance Summary in conformance with the requirements of Bid Package 1 - Section 01 78 23, Operation and Maintenance Data.

1.05 QUALITY ASSURANCE

A. Qualifications:

1. Tank Designer: Registered professional engineer licensed to perform specified Work in the state of Utah.
2. Tank Installer: Certified by Tank Manufacturer as qualified to perform specified Work.
3. Experience requirements for Tank Manufacturer, Tank Designer, and Tank Installer shall include five or more similar previous projects to specified Work, all in satisfactory operation for minimum of 5 years.
4. Welder/Welding Operator: Qualified by Tank Manufacturer or Contractor in accordance with referenced welding codes.
5. Provide phenolic liner applicator's qualifications and experience include a list a at least five similar previous projects. Include names, addresses and phone numbers of customer contacts for each project.
6. Provide third party inspector's qualifications and experience including training and certifications.

7. CWI: Certified in accordance with AWS QC 1, and having prior inspection experience with specified welding codes.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. In accordance with Bid Package 1 - Section 01 61 00, Common Product Requirements. In addition, prepare and protect tank for shipment as follows:
 1. Mount tank on padded cradles if shipped horizontally or on a suitable skid if shipped vertically.
 2. Do not ship components or other pieces loose inside tank.
 3. Load tank with at least 2 inches of clearance between tank (including fittings) and bulkheads, or bed of vehicle.
 4. Regardless of mode of transportation, firmly fasten and pad components to prevent shifting of load or flexing of components while in transit.

1.07 SEQUENCING AND SCHEDULING

- A. Do not ship tank from factory until Engineer's review of Certification of Factory Testing is completed.

PART 2 PRODUCTS

2.01 GENERAL

- A. Components and Materials in Contact with Water for Human Consumption: Comply with the requirements of the Safe Drinking Water Act and other applicable federal, state, and local requirements. Provide certification by manufacturer or an accredited certification organization recognized by the Authority Having Jurisdiction that components and materials comply with the maximum lead content standard in accordance with NSF/ANSI 61 and NSF/ANSI 372.
 1. Use or reuse of components and materials without a traceable certification is prohibited.

2.02 MANUFACTURERS

- A. Qualifications:
 1. Tank Designer: Registered professional engineer licensed to perform Work in the State of Utah.
 2. Tank Manufacturer Experience: 10 years' minimum experience in manufacturing welded steel tanks for corrosive chemical service in municipal/industrial applications with similar tank sizes, usage, and chemicals.

3. Lining Applicator Experience: 10 years' minimum experience in application of tank linings and 5 years minimum experience in application of phenolic tank lining per NACE SP-0178.
 4. Third Party Inspector Experience:
 - a. 10 years' minimum experience in the inspection of API 650 steel tanks of similar design and size.
 - b. 5 years' minimum experience in the inspection of steel tanks fabricated to NACE SP-0294 with at least five projects of similar design and size.
 - c. 5 years' minimum experience in the inspection of tank lining per NACE SP-0178 with at least five projects involving phenolic lining of concentrated sulfuric acid storage tanks.
- B. Materials, equipment, components and accessories specified in this section shall be products of:
1. Springs Fabrication, LLC. Colorado Springs, CO.
 2. Paso Robles Tank, Inc. Paso Robles, CA.
 3. "Or-equal."

2.03 DESIGN CONDITIONS

- A. Sulfuric Acid Tanks:
1. Liquid: 93 percent sulfuric acid.
 2. Specific Gravity: 1.84 at 60 degrees F, 1.86 at 10 degrees F.
 3. Design Pressure: 0.50 psig positive pressure and 0.25 psig vacuum.
 4. Maximum Pressure: 5 psig positive pressure and 2.5 psig vacuum.
- B. Design Temperature: In accordance with Bid Package 1 – Section 01 61 00, Common Product Requirements.
- C. Location: Indoors.
- D. Design for seismic according to the latest edition of the International Building Code (IBC) by the International Code Council. Refer to Bid Package 1 - Section 01 88 15, Anchorage and Bracing.

2.04 GENERAL REQUIREMENTS FOR SULFURIC ACID TANKS

- A. See Bid Package 1 - Section 01 61 00, Common Product Requirements, for specific requirements related to the equipment specified herein.

B. Materials:

1. Tank Plates: Conforming to ASTM SA516-70, carbon steel.
2. Bolts, Anchor Bolts, and Hex Nuts: Type 316 stainless steel.
3. Minimum Thickness of Plate for Floor and Shell: 3/8 inch.
4. Roof: 1/4-inch.
5. Wallplates: Shaped and bent in the shop to exact radius required.
6. Metal Design and Fabrication: In accordance with applicable AISC codes of standard practice. Plates and shapes shall be sheared, sawn, or machined true to dimensions shown. Joining of parts shall be by welding. Grind exposed and rough edges to a smooth, uniform radius.
7. Lining: Baked phenolic lining.

C. Design:

1. Tanks: Designed, fabricated, and inspected in accordance with current API 650, except as modified by NACE RP-0391, SP-0178, SP-0294, and these Specifications. Tank roofs shall be designed and fabricated with a frangible joint design at the roof-to-shell junction.
2. Special attention shall be paid to the requirements of NACE SP-0178 to ensure successful application of the tank lining. All welds shall be ground and finished to a NACE Designation A.
3. Constructed with full penetration continuous butt welding inside and out. The vessel shall be completely shop welded with no field weld permitted. The tank shall be fabricated from a minimum number of pieces. All longitudinal shell seams shall be staggered. Welding seams shall be located to clear all nozzle openings.
4. Dimensions, capacities, nozzle locations, and design information for the tank to be provided are described on the attached Tank Data Sheets.
5. The Contractor shall be responsible for the design of the welded steel tanks, based on these Specifications, the associated Tank Data Sheets, and Bid Package 1 - Section 01 61 00, Common Product Requirements.
6. Welded joints shall be inspected by radiographic testing wherever possible. Joints which cannot be radiographed shall be inspected by ultrasonic testing.
7. Welded joints shall be inspected by radiographic testing wherever possible. Joints which cannot be radiographed shall be inspected by ultrasonic testing.

D. Nozzles:

1. Unless specified otherwise, shell side nozzle centerlines shall intersect and be perpendicular to the tank axial centerline. Centerlines of nozzles in ends of tanks shall be parallel to the tank axial centerline.

2. Nozzle flanges shall be ANSI B16.5 Class 150, raised-face, weld neck style unless noted otherwise. Where specified, slip-on type flanges with a full fillet weld at the junction of the flange face and the edge of the nipple may be used. Grind smooth to a 1/8-inch minimum radius.
3. Unless specified otherwise, flanged nozzle projection shall be 6 inches (nozzle face to nearest outside tank surface). Flange bolt holes shall symmetrically straddle the tank centerlines.
4. Gasket surfaces shall be flat and parallel within 1/16-inch from the tank centerline over the flange width.
5. Dip Pipes:
 - a. Provide inside and outside surfaces of dip-pipes with corrosion barrier.
 - b. Tank fill nozzles shall utilize a 2-inch dip tube. Dip tube shall terminate no more than 3 feet to 0 inches above tank invert and have a 1/2-inch diameter hole drilled in the tube located above the tank overflow nozzle with hole facing center of tank.

2.05 ACCESSORIES

A. Top Access Manways:

1. As shown on the attached Tank Data Sheets. Minimum clear opening of 18 inches, unless otherwise noted. Flanged and bolted type cover with confined gasket. Hinge cover to tank shell. Grind welds and sheared edges smooth. Type 316 stainless steel bolts and nuts.

B. Sight Gauge:

1. Tubular magnetic-type visual level indicator with 2-inch flanged connection.
2. Furnish with valves, drain cock, and stainless steel guard rods.
3. Parts coming in contact with liquid chemical shall be compatible with that chemical.
4. Manufacturer and Product: Magetrol, AtlasTM; "Or Equal."

C. Gaskets: Two sets (one spare) of 1/8-inch thick full-face gaskets for all flanged nozzles and manways. Gasket material shall be Viton.

D. Equipment Identification Plates:

1. 16-gauge Type 316 stainless steel identification plates shall be securely mounted on each tank in a readily visible location with stainless steel screws or drive pins. Nameplates shall contain the manufacturer's name, model, serial number, size, and characteristics. Tank nameplates shall include the information required by API 650, including, but not limited to:

- a. Equipment tag number.
 - b. Name of tank manufacturer.
 - c. Tank capacity.
 - d. Material specification.
 - e. Date of manufacture.
- E. Lifting Lugs: Provide for all tanks. Quantity and location as recommended by tank manufacturer.
- F. Tank Supports:
1. Provide steel tank legs welded to steel tank to support tank from the floor. Support legs shall include a base plate designed to be anchored to the concrete floor.
 2. Quantity, location, and type as recommended by tank manufacturer for loads specified in supplemental Tank Schedule and Tank Data Sheet.
 3. Height of tank supports as shown in the Tank Data Sheet.
- G. Platform:
1. ASTM A240, Type 316L stainless steel with FRP grating. Top of grating to be 8 inches above the top of the tank.
 2. OSHA compliant handrails around the top perimeter of the tanks with OSHA approved safety gate and toe boards.
 3. OSHA compliant ladder extending to the bottom of the tank and tank supports as shown in the Tank Data Sheet.

2.06 COATING

- A. See Bid Package 1 - Section 09 97 13, Steel Tank Coating, for exterior tank coating requirements.

2.07 MARKING AND LABELING

- A. Identify each tank with fabricator's name, capacity in gallons, maximum temperature, design pressure/vacuum, specific gravity, pH, minimum metal thickness, tank number, tank name, and date of manufacture.
- B. Equipment Identification Plates: An engraved Gravoply laminated identification plate shall be securely mounted on the tank in a readily visible location. The plate shall bear the 1/4-inch minimum equipment tag number, tank name, and chemical name with concentration.
- C. Provide engraved Gravoply laminated plate securely mounted on the tank above discharge nozzle. The plate shall bear "EMERGENCY SHUTOFF VALVE" with 1-inch minimum lettering.

- D. Provide pre-fabricated, permanent NFPA 704 diamond on side of tank..

2.08 TESTING

- A. After fabrication, hydrostatic pressure test the tank with water containing 1 ppm of free chlorine (to prevent microbial induced corrosion).
- B. Fill tank with water and pressurize to 0.2 psig for the sulfuric acid tanks. Pressure shall be held for 1 hour without loss of pressure or sign of leaks.

2.09 SOURCE QUALITY CONTROL

- A. Shop Welds: Perform visual inspection. Acceptance standards in accordance with ANSI/AWS D1.1, Paragraph 8.15.1 and additional nondestructive testing requirements as specified herein and Bid Package 1 - Section 05 05 23, Welding.

PART 3 EXECUTION

3.01 INSTALLATION

- A. In accordance with manufacturer's written instructions.
- B. Anchor Bolts: Accurately place using templates furnished by manufacturer and as specified in Bid Package 1 - Section 05 50 00, Metal Fabrications.

3.02 MANUFACTURER'S FIELD SERVICES

- A. Provide manufacturer's representative at site for 1 person-day in accordance with Bid Package 1 - Section 01 43 33, Manufacturers' Field Services, and Bid Package 1 - Section 01 91 14, Equipment Testing and Project Startup, for installation assistance, inspection, testing, and certification of proper installation.
- B. Field Tests: In accordance with AWWA D100, Section 11:
 - 1. Hydrostatic test tank after painting is complete.

3.03 SUPPLEMENTS

- A. The supplements listed below, following "End of Section" are a part of this specification.
 - 1. Carbon Steel Tank Schedule.
 - 2. Sulfuric Acid Tank Data Sheet.

END OF SECTION

Carbon Steel Tank Schedule	
Name of Tank*	Sulfuric Acid Storage Tank 1
Equipment Numbers	TNK-741
Lining	Baked phenolic lining
Maximum Capacity Measured to High Solution Level (gallons)	976
Installation (Vertical/Horizontal)	Vertical
Diameter (feet)	4'-8"
Straight Shell Height (feet)	5'-10"
Support (saddles, flat pad, legs)	Legs
Type of Bottom Head	Domed
Type of Top Head	Domed
Ladder Required (Yes/No)	Ladder and Platform Required
Tank Location (indoor/outdoor)	Indoor
Ambient Temperature Range (degrees F)	55 – 85
Exterior Loading (psf):	
Personnel Roof Loads	20 psf
Platforms	5 psf (plus live loads)
Pipe Supports and Miscellaneous	5 psf
Operating Contents:	Sulfuric Acid
Chemical Composition	H ₂ SO ₄
Specific Gravity	1.80 – 1.86
Concentration	93%
pH Range	0.3 – 2.1
Magnetic Sight Gauge (Y/N)	Y
Magnetic Sight Gauge Tube Length	As required by tank manufacturer
Insulation/Heat Tracing (Yes/No)	No

TANK DATA SHEET

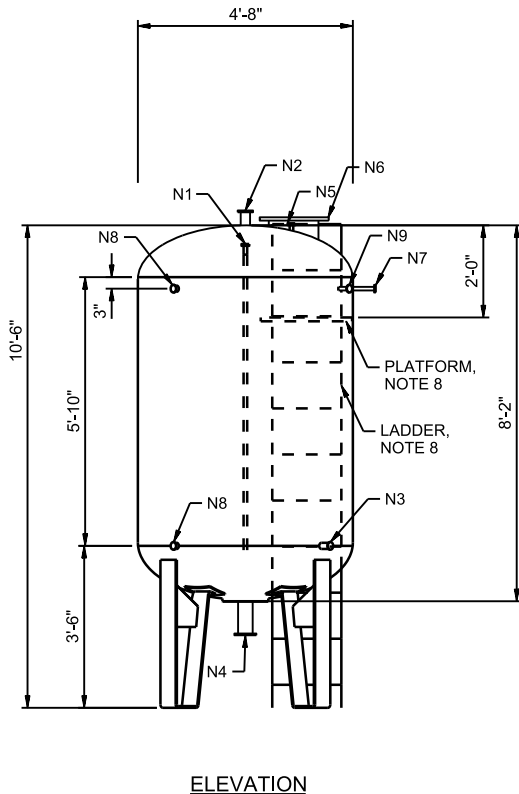
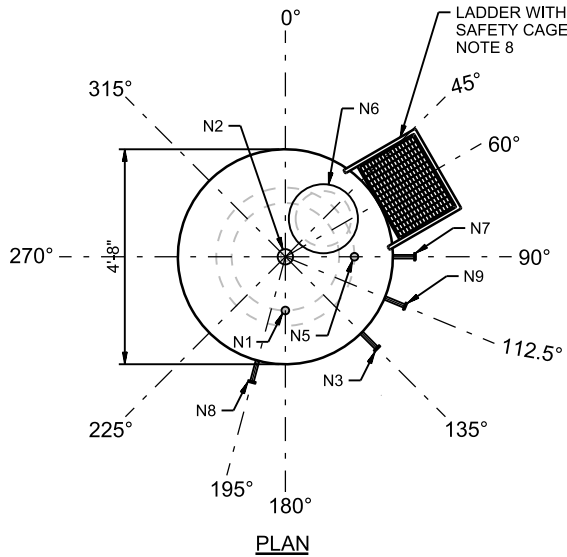
APPLICABLE TO:

- PROPOSAL
- PURCHASE
- RECORD

Information not specified to be supplied by vender as applicable

Item No. TNK-741
QUINNS JUNCTION 2019 UPGRADES
SULFURIC ACID STORAGE TANK

plot date: 9/11/2019 plot time: 10:30:28 AM



GENERAL INFORMATION

SERVICE SULFURIC ACID (93%, 15.0 LB / GAL)			
WORKING CAPACITY	750 GAL	THICKNESS	3/8" MINIMUM
DESIGN CODE	API 650	ROOF	DOMED
MATERIAL	CARBON STEEL	SHELL	VERTICAL CYLINDER
TEMPERATURE	30 - 120° F	BOTTOM	DOMED
LINING BAKED PHENOLIC LINING			

NOZZLE SCHEDULE

MK	Size/Type	Service	Projection	Radial CL
N1	2" FLG	FILL, NOTE 2	6"	1'-2"
N2	4" FLG	VENT	6"	CENTER
N3	2" FLG	OUTLET	6"	SIDE
N4	2" FLG	DRAIN, NOTE 3	6"	CENTER / BOTTOM
N5	2" FLG	LEVEL TRANSMITTER	6"	1'-6"
N6	18" FLG	ACCESS MANWAY	6"	1'-2"
N7	2" FLG	OVERFLOW	6"	SIDE
N8	2" FLG	SIGHT LEVEL INDICATOR	6"	SIDE
N9	2" FLG	LEVEL SWITCH	6"	SIDE

ACCESSORIES

Level Indicator	<input checked="" type="checkbox"/>	X	
Ladder <input type="checkbox"/> Int <input checked="" type="checkbox"/> Ext		X	
Stairs			
Walkway			
Platform Clips <input type="checkbox"/>		X	
Anchor Lugs		X	
Syphon Drain			
Sump			
Vortex Breaker			
Inlet Baffle			
Lifting Lugs		X	
Thief Hatch			
Access Manway		X	
Down Comer <input checked="" type="checkbox"/> Int <input type="checkbox"/> Ext		X	
Heat Trace			
Insulate			

NOTES

1. SEE SPECIFICATIONS FOR ADDITIONAL INFORMATION.
2. EXTEND FILL LINE (N1) TO 12" FROM TANK BOTTOM. PROVIDE LATERAL SUPPORTS. PROVIDE 1/4" PERFORATIONS EVERY 6" ALONG LENGTH OF FILL LINE TO PREVENT BACK SIPHON.
3. DRAIN (N4) SHALL BE LOCATED AT INVERT OF TANK BOTTOM.
4. TANK SHELL THICKNESS SHALL 1/8" CORROSION MINIMUM.
5. ACTUAL NUMBER AND LOCATION OF ANCHOR LUGS TO BE DETERMINED BY MANUFACTURER.
6. TANK SHALL BE SUPPORTED BY STEEL SUPPORTS.
7. TANK NOZZLES SHALL BE ANSI B16.5 CLASS 15, RAISED-FACE, WELD NECK STYLE.
8. PROVIDE A STAINLESS STEEL LADDER ALONG THE HEIGHT OF THE TANK AS SHOWN AND PROVIDE A 2'-0" LONG AND 1'-6" WIDE FRP PLATFORM AT THE INDICATED LOCATION. PROVIDE HANDRAIL AROUND PLATFORM.

BP4-N-Tank-741_667681.dgn

**SECTION 44 42 56.04
SUBMERSIBLE PUMPS**

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards that may be referenced in this section:
1. American Bearing Manufacturers Association (ABMA):
 - a. 9, Load Ratings and Fatigue Life for Ball Bearings.
 - b. 11, Load Rating and Fatigue Life for Roller Bearings.
 2. American Society of Mechanical Engineers (ASME): B16.1, Gray Iron Pipe Flanges and Flanged Fittings, Class 25, 125, and 150.
 3. ASTM International (ASTM):
 - a. A48, Standard Specification for Gray Iron Castings.
 - b. A576, Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.
 4. Hydraulic Institute Standards (HIS):
 - a. 11.6, Submersible Pump Test.
 - b. 14.6, Rotodynamic Pumps for Hydraulic Performance Acceptance Tests.
 5. National Electrical Manufacturers Association (NEMA).
 6. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code.
 - b. 497, Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas.
 7. Underwriters Laboratories Inc. (UL).

1.02 DEFINITIONS

- A. Terminology pertaining to pumping unit performance and construction shall conform to ratings and nomenclature of Hydraulic Institute Standards.

1.03 SUBMITTALS

- A. Action Submittals:
1. Make, model, weight, and horsepower of each equipment assembly.
 2. Complete catalog information, descriptive literature, specifications, and identification of materials of construction, including cable seal details.
 3. Performance data curves showing head, capacity, horsepower demand, and pump efficiency over entire operating range of pump, from shutoff

to maximum capacity. Indicate separately head, capacity, horsepower demand, overall efficiency, and minimum submergence required at guarantee point.

4. For variable speed motors, provide variable speed curves for at a minimum every 50 rpm.
5. Power and control wiring diagrams, including terminals and numbers.
6. Motor data, in accordance with the requirements of Section 26 20 00, Low-Voltage AC Induction Motors.
7. Adjustable frequency drive data, in accordance with the requirements of Bid Package 1 - Section 26 29 23, Low-Voltage Adjustable Frequency Drive System.
8. Factory-finish system.
9. L-10 bearing life calculations per ABMA.
10. If required, wiring for motor protection module.
11. Seismic anchorage and bracing drawings and cut sheets, in accordance with the requirements of Bid Package 1 - Section 01 88 15, Seismic Anchorage and Bracing.

B. Informational Submittals:

1. Seismic anchorage and bracing calculations in accordance with the requirements of Bid Package 1 - Section 01 88 15, Seismic Anchorage and Bracing.
2. Special shipping, storage and protection, and handling instructions.
3. Manufacturer's printed installation instructions.
4. Manufacturer's Certificate of Compliance, in accordance with the requirements of Bid Package 1 - Section 01 61 00, Common Product Requirements, that factory finish system meets requirements specified herein.
5. Suggested spare parts list to maintain equipment in service for period of 1 year and 5 years. Include list of special tools required for checking, testing, parts replacement, and maintenance with current price information.
6. List special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.
7. Operation and Maintenance Manual and Maintenance Summary: Provide an Operation and Maintenance Manual and Maintenance Summary in conformance with the requirements of Bid Package 1 - Section 01 78 23, Operation and Maintenance Data.
8. Manufacturer's Certificate of Proper Installation, in accordance with Bid Package 1 - Section 01 43 33, Manufacturers' Field Services.

1.04 EXTRA MATERIALS

- A. Furnish for this set of pumps:
 - 1. One set mechanical seals.
 - 2. One complete set of special tools required to dismantle pump.

PART 2 PRODUCTS**2.01 GENERAL**

- A. Submersible, vertical shaft, centrifugal type, for pumping membrane backwash waste water. Fine solids may be present, TSS \leq 1000 mg/L.
- B. Designed for continuous operation under submerged or partially submerged conditions.
- C. Pump and Electrical Driver: Meet requirements for class, group, and division location in accordance with NFPA 70.
- D. Where adjustable speed drives are required, furnish a coordinated operating system complete with pump, drive, and speed controller.
- E. Pumps furnished under this section to be provided by a single manufacturer.

2.02 SUPPLEMENTS

- A. Specific requirements are attached to this section as supplements.

2.03 COMPONENTS

- A. Equipment consists of pump complete with motor, control system, guide rail, anchoring brackets, base elbow, power cable, and pump lifting cable. Refer to Contract Document Drawings for pump orientation and basin dimensions.
- B. Characteristics:
 - 1. Motor and rotating parts shall be removable from motor end of pump.
 - 2. Mating surfaces to be watertight and fitted with nitrile O-rings.
 - 3. Pumps fitted with dynamically balanced impellers.

- C. Lifting Arrangement:
1. Stainless steel chain, 2 feet minimum, and one “grip-eye.”
 2. Attach chain permanently to pump and access opening with stainless steel wire rope.
 3. “Grip-eye” capable of being threaded over and engaging links of stainless steel chain so pump and motor may be lifted with “grip-eye” and independent hoist.
- D. Sliding Guide Bracket:
1. Integral part of pump unit.
 2. Pump unit to be guided by no less than two guide bars, or equivalent cable system, and pressed tightly against discharge connection elbow with metal-to-metal contact or through use of profile-type gasket, provided gasket is attached to pump’s flange and can be easily accessed for inspection when pump is lifted out of wetwell.
- E. Oil chamber between seals shall be equipped with drain and inspection plug. Plug shall have positive antileak seal and shall be easily accessible from outside.
- F. Motor nameplate horsepower not to be exceeded at head-capacity point on pump curve.
- G. Pump motor and sensor cables shall be suitable for submersible pump application and cable sizing shall conform to NFPA 70 specifications for pump motors. Cables shall be of sufficient length to reach junction boxes without strain or splicing.
- H. Motor Protection Module: If required, provide pump with a motor protection module for remote mounting. Contract Drawings are based on first named submersible pump manufacturer and motor protection module. If pump and motor protection module other than first named manufacturer is provided, provide revised wiring for the motor protection module.
- I. Cable Entry System:
1. Junction chamber and motor separated by stator lead sealing gland or terminal board that prevents foreign material entering through pump top.
 2. Utilize cable with factory-installed sealing gland with nonshrink epoxy seal system.
 3. O-ring compression seal between sealing gland and cable entry point shall also be acceptable.

2.04 ACCESSORIES

- A. Equipment Identification Plate: 16-gauge stainless steel with 1/4-inch die-stamped equipment tag number securely mounted to pump.
- B. Anchor Bolts: Type 316 stainless steel, sized by equipment manufacturer, and as specified in Bid Package 1 - Section 05 50 00, Metal Fabrications. Coat in accordance with Bid Package 1 - Section 09 90 00, Painting and Coating.

2.05 FACTORY FINISHING

- A. Manufacturer's standard epoxy system for continuous submergence in corrosive water.

2.06 SOURCE QUALITY CONTROL

- A. Pump:
 - 1. Factory Performance Test:
 - a. In accordance with HIS 11.6, Level B for submersible pump tests.
 - b. Include curve test results and performance test logs.
 - 2. Conduct on each pump.
 - 3. Perform under actual or approved simulated operating conditions.
 - a. Throttle discharge valve to obtain pump data points on curve at 2/3, 1/3, and shutoff conditions.
- B. Submersible Motor Functional Test: In accordance with HIS 11.6.

PART 3 EXECUTION**3.01 INSTALLATION**

- A. Install in accordance with manufacturer's printed instructions.
- B. Mount the discharge elbow to the floor of the wetwell floor with stainless steel bolts as shown on the Drawings.
- C. Connect piping without imposing strain to flanges.
- D. No portion of pump shall bear directly on floor of sump.

3.02 FIELD FINISHING

- A. Equipment as specified in Bid Package 1 - Section 09 90 00, Painting and Coating.

3.03 FIELD QUALITY CONTROL

- A. Functional Test: Conduct on each pump.
 - 1. Alignment: Test complete assemblies for correct rotation, proper alignment and connection, and quiet operation.
 - 2. Flow Output: Measured by plant instrumentation and storage volumes.
 - 3. Operating Temperatures: Monitor bearing areas on pump and motor for abnormally high temperatures.
 - 4. Test for continuous 3-hour period.
 - 5. Test Report Requirements: In accordance with Hydraulic Institute Standards for submersible pump tests HIS 14.6 and 11.6.

- B. Manufacturer's Representative: Present at Site or classroom designated by Owner, for minimum person-days listed below, travel time excluded:
 - 1. 1 person-day for functional testing, completion of Manufacturer's Certificate of Proper Installation.
 - 2. 1 person-day facility startup and post-startup training of Owner's personnel.

- C. See Bid Package 1 - Section 01 43 33, Manufacturers' Field Services.

3.04 SUPPLEMENTS

- A. The supplements listed below, following "End of Section," are part of this Specification.
 - 1. 01, Plate Settler Feed Pumps 1, 2, and 3 Pump Data Sheet.

END OF SECTION

SUBMERSIBLE PUMP DATA SHEET, 01Tag Numbers: PMP-40431 , PMP-40432 , PMP-40433Pump Name: Plate Settler Feed Pumps 1, 2, and 3Manufacturer and Model Number: (1) Flygt(2) Grundfos(3) KSB**SERVICE CONDITIONS**Liquid Pumped (Material and Percent Solids): Membrane Backwash Waste, fine solids may be presentPumping Temperature (Fahrenheit): Normal: 60 Max 77 Min 41Specific Gravity at 60 Degrees F: 1.0pH: 7.0-8.0Abrasive (Y/N) N Possible Scale Buildup (Y/N): NTotal suspended solids (mg/L): 1,000Minimum diameter solid pump can pass (inches): 1**PERFORMANCE REQUIREMENTS**Capacity (US gpm): Rated: 300 Secondary: 80Total Dynamic Head (Ft): Rated: 50 Secondary: 39Min. Rated Pump Hydraulic Efficiency at Rated Capacity (%): 70.0Max. Pump Speed at Rated Capacity (rpm): 1,800Constant (Y/N): N Adjustable (Y/N): Y**DESIGN AND MATERIALS**Pump Type: Submersible non-clogVolute Material: Cast Iron ASTM A48, or equal, subject to engineer approval

Pump Casing Material: Cast Iron ASTM A48, or equal, subject to engineer approval

Motor Housing Material: Cast Iron ASTM A48, or equal, subject to engineer approval

Wear Rings Case (Y/N): Y Material: 316L SST per ASTM A276

Wear Ring Impeller (Y/N): Y Material: 316L SST per ASTM A276

Elastomers: Nitrile Rubber

Fasteners: 316 Stainless Steel per ASTM A193

Impeller: Type: Self-cleaning semi open-open channel or approved equal (Y/N): Y

Other: _____

Material: Cast Iron ASTM A48

Shaft Material: Carbon Steel, ASTM A576 with stainless steel sleeve or all stainless steel

Base Elbow: Cast Iron ASTM A48

Coating System: See Section 2.05 Factory Finishing.

Double Mechanical Seal (Y/N): Y Bearing Life (Hrs): 100,000

DRIVE MOTOR (See Section 26 20 00, Low-Voltage AC Induction Motors.)

Horsepower: 10 Voltage: 460 Phase: 3 Synchronous Speed (rpm): 1800

Enclosure: See Section 26 20 00, Low-Voltage AC Induction Motors.

Adjustable Speed Drive Range: 40 Hz min to 60 Hz max, See Bid Package 1 - Section 26 29 23, Low-Voltage Adjustable Frequency Drive System.

Other Features: _____

Moisture Detection Switches (Y/N): Y

Thermal Protection Embedded in Windings (Y/N): Y

REMARKS: _____
