

**SECTION 13 60 00
EMERGENCY WASTEWATER STORAGE TANK**

PART 1 - GENERAL**1.1 DESCRIPTION:**

- A. Aboveground, glass-fused-to-steel, emergency wastewater storage tank, complete and ready for operation, including piping, penetrations, tank overflow, overflow weir box, manway, ladder, safety cage, platform, ladder door, vent, access hatch, doomed roof, roof penetrations, roof walkway, roof handrails and guardrails, safety cables, hose connection, concrete foundation, concrete floor, cathodic protection system, ultrasonic level indicator, aerator (floating), outlet and inlet piping, drain line, appurtenances, and all other incidentals.
- B. The tank manufacturer shall be responsible for the design of the tank foundation. Tank foundation design shall be stamped by a New York State licensed Professional Engineer.
- C. A pinch valve shall be installed on the tank outlet pipe to control the rate of flow from the tank to the proposed pumping station wet well.
- D. The ultrasonic level indicator shall be used to shut-off the pump(s) before the tank overflows. The level shall also signal an alarm before the pumps are turned off. The alarm shall be signaled at the new pump station and at the Boiler Plant Control Room.
- E. A floating aerator shall be installed within the tank. The aerator contractor shall provide one (1) 7.5hp Directional Aerator as shown on the drawings and as specified herein. The specification defines an electric motor-driven (explosion proof) propeller-type, horizontal, aspirating aerator/mixer. The aerator induces the flow of atmospheric air below the surface of the wastewater and provides subsurface mixing.

1.2 RELATED WORK:

- A. Maintenance of Existing Utilities: Section 01 00 00, GENERAL REQUIREMENTS.
- B. Excavation, Trench Widths, Pipe Bedding, Backfill, Shoring, Sheeting, Bracing: Section 31 20 11, EARTH MOVING.
- C. Concrete Work Reinforcing, Placement and Finishing; Section 03 30 00, CAST-IN-PLACE CONCRETE.
- D. Protection of Materials and Equipment: Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.
- E. Sanitary Sewer Pumping Facilities, Division 22, PLUMBING.
- F. Electrical, Division 26.
- G. Underground piping, plug valves, and manhole: Section 33 30 00, Sanitary Sewerage Utilities.

1.3 QUALITY ASSURANCE:

- A. Tank and accessories shall be furnished by one manufacturer.
- B. Tank shall be furnished and installed with a cathodic protection system as standard equipment.
- C. ANSI/AWWA D103 09 - Tank steel panel materials, design, fabrication and erection shall conform to all pertinent sections of the AWWA Standard for Bolted Steel Tanks unless otherwise specified herein.
- D. The tank structural design shall conform to AISC specifications.
- E. FACTORY MUTUAL (FM) - Certification of annual review of quality control procedures of the manufacturing plant by FM.
- F. IBC Design - Tanks will be designed such that Seismic, Wind and Roof designs conform to the current New York State standards.
- G. ISO 9001 - The tank manufacturer's Quality Assurance program shall be certified to comply with ISO 9001 standards.
- H. Warranty:
 - 1. The tank manufacturer shall include a warranty for the tank materials and coating. As a minimum, this warranty shall provide assurance against defects in material or workmanship and corrosion of the glass-coated surface for the minimum period specified. If within a period of one (1) year from date of completion (or 14 months after delivery), the tank structure or any part thereof shall prove to be defective in material or workmanship upon examination by the manufacturer, the manufacturer will supply a replacement part, will repair, or allow a credit for same. The warranty shall be further extended with the use of a Manufacturer supplied Cathodic Protection system as follows: the glass coated product zone surfaces, that portion of the tank interior below the normal high elevation of the contained liquid will not corrode under normal and proper use, maintenance and operation during the period expiring on the earlier of (i) 60 months after liquid is first introduced into the tank or (ii) 62 months after shipment from the factory.
 - 2. The aerator Manufacturer shall supply a 12 month non-prorated factory warranty. All parts supplied by the aerator Manufacturer must be warranted the same. Field replacement of the aerator components shall in no way effect the factory warranty. The warranty repairs must be done in accordance with the factory O & M manual.
 - 3. All other equipment shall be warranty for at least one year from the date placed in service. Any deficiencies shall be repaired/fixed by the Contractor to the satisfaction of the COR at no cost to VAMC.

- I. Tank erection shall be completed by a contractor trained and certified by the tank manufacturer.
- J. The selection of factory applied glass-fused-to-steel bolt together tank construction for this project has been predicated upon specific criteria, construction methods, and an optimum coating resistance to internal and external tank corrosion. Deviations from the specified design, construction or coating details will not be permitted.
- K. All bids must include a site specific foundation design from the tank manufacturer, with the applicable state PE stamp.
- L. Tank manufacturer shall have at least 20 installations in North America with a record of satisfactory service, presently in wastewater service, in projects of similar magnitude, in similar climates, for a period of not less than ten (10) years. Upon request, manufacture shall provide a list, including contact information.
- M. Aerators:
 - 1. The air will be dispersed as fine bubbles (2.0-2.5 mm diameter) as defined by the U.S. EPA Report Number EPA-600/2-82-003. The Manufacturer shall verify compliance.
 - 2. The equipment Manufacturer shall provide written calculations showing all assumptions made in the design of the system.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturers' Literature and Data: Submit the following as one package:
 - 1. Pipe, Fittings, and, Appurtenances.
 - 2. Glass-Fused-to-Steel Tank, including doomed roof.
 - 3. All Tank Components and Accessories
 - 4. Cathodic Protection System
 - 5. Ultrasonic Level Indicator
 - 6. Aerator
 - 5. Pinch Valve
- C. Shop Drawing: Provide the following shop drawings as one package:
 - 1. Glass-Fused-to-Steel Tank, including doomed roof.
 - 2. All Tank Components and Accessories
 - 3. Cathodic Protection System
 - 4. Concrete Tank Foundation and Concrete Tank Floor
 - 5. Aerator, including floats, supports, anchor
 - 6. Pinch Valve
- D. Structural calculations shall be submitted for tank structures and foundations. The calculations shall be reviewed and the submittals

sealed by a Professional Engineer licensed and registered in New York State.

E. Certifications:

1. Certification that each applicable Section of AWWA D103 is met.
2. A New York State Licensed Engineer shall certify that the tank structures, foundation, and floors are adequate for all loads and conforms to applicable codes.
3. Copy of Builder Certification Program, sponsored by the tank manufacturer, certifying experience of the proposed Builder.
4. Manufacturer's representative shall certify that the tank was installed correctly and is functioning properly.
5. Manufacturer's representative shall certify that the cathodic protection system was installed correctly and is functioning properly.

F. Complete operating and maintenance manuals including wiring diagrams (where applicable), technical data sheets, component parts, maintenance schedule, and information for ordering replaceable parts for the following items:

1. Glass-Fused-to-Steel Tank, including doomed roof
2. All Tank Components and Accessories
3. Cathodic Protection System
4. Aerator
5. Pinch Valve

1.5 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A992/A992M - Standard Specification for Structural Steel Shapes.
3. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
4. ASTM B916 - Standard Test Method for Adherence of Porcelain Enamel Coatings to Sheet Metal.
5. ASTM C633-79 - Standard Test Method for Adhesion or Cohesion Strength of Flame-Sprayed Coatings.

B. American Water Works Association (AWWA)

1. ANSI/AWWA C652 - Standard for Disinfection of Water-Storage Facilities.
2. ANSI/AWWA D100 - Standard for Welded Steel Tanks for Water Storage.
3. ANSI/AWWA D103 - Standard for Factory-Coated Bolted Steel Tanks for Water Storage.

- C. American Welding Society AWS D1.2/D1.2M - Structural Welding Code - Aluminum.
- D. Federal Specification FS TT-S-00230C - Sealing Compound: Elastomeric Type, Single Component (For Calking, Sealing, and Glazing in Buildings and Other Structures).
- E. General Services Administration Commercial Item Description GSA CID A-A-59588A - Rubber, Silicone.
- F. National Sanitation Foundation NSF Standard 61 - Drinking Water System Components.
- G. Society for Protective Coatings SSPC-SP 10/NACE No. 2 - Surface Preparation Standard - Near White Metal Blast Cleaning.
- H. Society of Automotive Engineers (SAE)
 - 1. SAE J429 - Mechanical and Material Requirements for Externally Threaded Fasteners.
- I. International Organization for Standardization (ISO):
 - 1. ISO 28706-1:2008 - Vitreous and Porcelain Enamels - Determination of Resistance to Chemical Corrosion.
 - 2. ISO 2859 - Sampling Procedures for Inspection by Attributes
 - 3. ISO 6370-2 - Vitreous and Porcelain Enamels - Determination of Resistance to Abrasion

PART 2 - PRODUCTS

2.1 TANK:

- A. Furnish and erect glass-fused-to-steel wastewater storage tank(s) constructed of factory prefabricated glass-coated, bolt-together steel panels. Each tank structure shall include a foundation and other accessory components as shown on the contract drawings and described herein. Note that painted, powder coat, stainless steel or galvanized bolt-together tanks are not acceptable.
- B. Tank structures and appurtenances shall be new and not previously used.
- C. Tanks shall be designed and produced in the United States of America, by a manufacturer specializing in the production of glass-coated, bolt-together steel tank systems. All structural steel utilized in the tank structure shall be produced and glass coated in the United States of America.
- D. Design:
 - 1. The factory coated glass-fused-to-steel; bolt together tank shall have dimensions indicated on the drawings.
 - 2. Tank capacity shall be 491,783 gallons (nominal, U.S. gallons) at 33.01 feet liquid depth, including 12 inches of freeboard. The usable volume at 12 inches freeboard shall be 476,885 gallons.

3. Finished floor elevation shall be as indicated on the drawing.

4. DESIGN CRITERIA:

1. Specific Gravity 1.0 (Minimum design shall be 1.0)
2. Design Freeboard 12 inches.
3. Net allowable soil bearing capacity: Refer to Geotechnical Report
4. Seismic Design (current state codes are per IBC / AWWA D103-09 is based on IBC-2006):

- a) Design per New York State Building Code 2010 (NYSBC 2010)
- b) Map Spectral Response: To be determined based on NYSBC 2010 by a NYS P.E.

For NYSBC 2010:

<https://geohazards.usgs.gov/secure/designmaps/us/>

- c) Importance Factor (IE): Based on Use Group III (Category IVEssential) (1.5).
- d) Site Class: To be determined based on NYSBC 2010 by a NYS P.E.
 Site Class A - Hard Rock Site Class B - Rock Site Class C - Very Dense Soil & Soft Rock
 Site Class D - Still Soil Site Class E - Soft Clay Soil
 Site Class F - Soils requiring site response analysis e) Long Period Transition Period (TL): To be determined based on NYSBC 2010 by a NYS P.E.

This will be "6" for most of the north east with the exception of a portion of Chautauqua County, NY being "12"

5. Snow Load

- a) Ground Snow Load: To be determined based on NYSBC 2010 by a NYS P.E.
- b) Importance Factor(Is): Group III (Category IV Essential) (1.2)
- c) Thermal Factor (Ct): To be determined based on NYSBC 2010 by a NYS P.E. (1.0, 1.1, or 1.2)
- d) Exposure Factor (Ce): To be determined based on NYSBC 2010 by a NYS P.E. (0.7, 0.8, 0.9, 1.0, 1.1, or 1.2)

6. Wind Load: To be determined based on NYSBC 2010 by a NYS P.E. (

- a) Basic Wind Speed: To be determined based on NYSBC 2010 by a NYS P.E.
- b) Importance Factor (IW): To be determined based on NYSBC 2010 by a NYS P.E. (1.0 or 1.15)
- c) Exposure Category: To be determined based on NYSBC 2010 by a NYS P.E. (B, C, or D)

F. Tank Wall color (Outside) CoBalt Blue

G. Tank Wall color (Inside) Cream Color

H. Frost Depth = 60"

I. Adequate to support dead and live loads from aerator.

E. Plates and Sheets

1. Plates and sheets used in the construction of the tank shell, floor, or roof shall comply with the minimum standards of AWWA D103, latest edition. All steel shall be smelted and produced in the United States of America.
2. The annealing effect created from the glass coated firing process shall be considered in determining ultimate steel strength. In no event shall a yield strength greater than 50,000 psi be utilized for calculations detailed in AWWA D103, Section 4.4.
3. Design requirements for mild strength steel shall be ASTM A-1011 Grade 30 with a maximum allowable tensile stress of 14,566 psi. High strength steel shall be ASTM A-1011 Grade 50 with a maximum allowable tensile stress of 26,000 psi.
4. When multiple vertical bolt line sheets and plates of ASTM A-1011 Grade 50 are used, the effective net section area shall not be taken as greater than 85% of the gross area.
5. When Rolled Structural Shapes are used, the material shall conform to minimum standards of ASTM A36 or ASTM A992.

F. Horizontal Wind Stiffeners

1. Stiffeners shall be of the "web truss" design, with extended tail to create multiple layers of stiffener, fabricated of steel with hot dipped galvanized coating. Rolled angle stiffeners shall not be permitted for intermediate horizontal wind stiffeners.

G. Bolt Fasteners

1. Bolts used in tank lap joints shall be 1/2-13 UNC 2A rolled thread and shall meet the minimum requirements of AWWA D103, Section 4.2. Bolt material shall be SAE J429 Grade 2 (1" bolt length) with a tensile strength of 74,000-psi minimum, and a proof load of 55,000-psi min. and an allowable shear stress with threads excluded from the shear plane of 18,163-psi min.
2. SAE J429 Grade 5/ASTM A325 (1-1/4" bolt length) and heat treated to a tensile strength of 120,000 psi min and a proof load of 85,000 psi min. and having an allowable shear stress with threads excluded from the shear plane of 29,454 psi min.
3. SAE J429 Grade 8/ASTM A490 (bolts greater than 1-1/4") and heat treated to a tensile strength of 150,000 psi min and a proof load of 120,000 psi min. and having an allowable shear stress with threads excluded from the shear plane of 36,818 psi min.

4. The bolt finish shall be Zinc, mechanically deposited.
5. The entire bolt head shall be encapsulated up to the splines on the shank with high impact polypropylene copolymer. Resin shall be stabilized with an ultraviolet light resistant material such that the color shall appear black. The bolt head encapsulation shall be certified to meet the ANSI/NSF Standard 61 for indirect additives.
6. All lap joint bolts shall be properly selected such that threaded portions will not be exposed in the "shear plane" between the sheets. In addition, bolt lengths shall be sized as to achieve a neat and uniform appearance. Excessive threads extending beyond the nut will not be permitted.
7. All lap joint bolts shall include a minimum of four (4) splines, on the underside of the bolt head at the shank in order to resist rotation during torque wrench application.

H. Sealants

1. Sealant shall be adequate for wastewater applications.
2. The lap joint sealant shall be a one component, moisture cured, polyurethane compound. The sealant shall meet applicable FDA Title 21 regulations, and be manufactured by a United States supplier as well as be suitable for contact with potable water and shall be certified to meet ANSI/NSF Additives Standard No. 61. The sealant shall be used to seal lap joints, bolt connections and sheet edges. The sealant shall be CST Storage, Manus Sealer No. 98. The sealant should have a curing rate at 73°F and 50% RH and be tack free in 6 to 8 hours. Final cure time should be 10 to 12 days. Sealer shall be resistant up to 200-ppm chlorine concentration during disinfection. Neoprene gaskets and tape type sealer shall not be used.
3. Due to poor compatibility with chlorine, the sealant Sika 1A shall not be used.

I. Glass Coating Process

1. The glass coating system shall be in full accordance with the requirements of AWWA D103 Section 12.4 latest revision. Every batch of coating frits shall be individually tested in accordance with PE1 Test T-21. (Citric acid at room temperature)
2. SURFACE PREPARATION - Following the de-coiling and shearing process, sheets shall be steel grit blasted on both sides to the equivalent of SSPC PC 10 (near white metal blast cleaning). Sandblasting and chemical pickling of steel sheets is not acceptable. The surface anchor pattern shall be not less than 1.0 mils. (.0001 inches).

Sheets shall be evenly oiled on both sides to protect them from corrosion during fabrication.

3. CLEANING - After fabrication and prior to application of the coating system, all sheets shall be thoroughly cleaned by caustic wash and hot water rinse followed immediately by hot air drying. Inspection of the sheets shall be made for traces of foreign matter, soil particles, grease or rust. Any such sheets shall be re-cleaned or grit-blasted to an acceptable level of quality.
4. COATING APPLICATION - All sidewall sheets shall receive one coat of a catalytic nickel oxide glass pre-coat to both sides, followed by air-drying.
 1. A second coat of milled cobalt blue glass shall be made to both sides of the sheets and then dried.
 2. A final cover coat of milled glass shall then be applied to the inside of the sheet and the sheet edges. This milled glass shall be formulated with titanium dioxide to produce a finish interior surface with optimum toughness and resistance to conditions normally found in potable water storage tanks. This specific coating shall be Aquastore Vitrium or approved equal.
 3. The sheets shall then be fired at a minimum temperature of 1500 °F in strict accordance with ISO 9001 quality process control procedures, including firing time, furnace humidity, temperature control, etc.
 4. The dry film interior coating thickness shall be 10-18 mils min. The dry film exterior coating thickness shall be 7-15 mils min.
 5. This is a three coating process. The finished tank inside sidewall glass coating shall be white.
 6. The standard tank sidewall finished outside color shall be Cobalt Blue.
 7. Finished outside colors shall not vary noticeably among tank panels. Off color panels will be rejected; replacement panels of matching color shall be supplied by the tank manufacturer.
5. SHEET EDGE COATING - After initial sheet preparation, all four (4) exposed continuous edges of full height vertical wall sheets and all rectangular shaped floor sheets shall be mechanically beveled and coated with a 316 stainless steel corrosion resistant alloy shall be thermally bonded on these edges at a thickness of 1.5 to 5 mils prior to the glass coating of the sheet edges. Hand grinding of the sheet edges is not allowed. All exposed sheet edges will then be coated the same as the glass coating of the sheets. The process shall be equal

to the Edge Coat™ by CST Storage. Sealer or glass overspray as edge coating shall not be acceptable. The coating shall have a tensile strength of 1500 psi.

J. Inspection

1. The manufacturers quality system shall be ISO 9001 certified and refer to ISO (International Organization of Standardization) for the following testing and procedures. All coated sheets shall be inspected for mil thickness using an electronic dry film thickness gage with a valid calibration record. Test frequency shall be every tenth sheet and shall measure thicknesses of glass between 10.0 and 18.0 mils.
2. All sheets shall be measured for color using an electronic colorimeter with a valid calibration record. Test frequency shall be every tenth sheet and the color must fall within the specified tolerance or it shall be rejected.
3. An electrical leak detection test shall be performed on the inside surface of each panel after fabrication. Inside wet sheet surfaces shall be inspected using a low voltage wet sponge holiday tester in accordance with ASTM D5162-91 Method A. HVST testing is not acceptable. The tester shall be used at a voltage of 67.5 volts (+/- 10 %) and set so the alarm is sounded if the electrical resistance of the glass coating falls below 125,000. The tester shall have a valid calibration record. The testing solution used to wet the sponge shall contain a low suds wetting agent added at a ratio of not more than ½ fluid oz. per gallon of water. Every sheet shall be 100% tested for holidays and any sheet with a discontinuity shall be rejected.
4. All inside sheet surfaces shall be holiday free. A dry volt test using a minimum of 1100 volts may be used. Frequency of the test shall be every sheet. Any sheet registering a discontinuity on the interior surface shall be rejected.
5. Adherence of the glass coating to the tank steel shall be tested in accordance with ISO standards. Any sheet that has poor adherence will be rejected. The minimum frequency of testing for this shall be one sheet per gage lot run.
6. Glass coating shall be tested for fishscale by placing the full size production sheets in an oven 400°F for one hour. The sheets will then be examined for signs of fishscale. Any sheet exhibiting fishscale shall be rejected and all sheets from that gage lot will be similarly tested. The minimum frequency of testing for this shall be one sheet per gage lot run.

K. Floors

1. The tank floor shall be constructed of reinforced concrete and the design shall be stamped by New York State Licensed Professional Engineer. If fill is used, the fill under the floor/footing shall be compacted and tested to a minimum of 95% of proctor.
2. CONCRETE FLOOR - Reinforced concrete floors shall be constructed as specified elsewhere in the contract documents. The floor design shall include an embedded glass-coated starter sheet ring per the manufacturers design and in accordance with AWWA D103 section 13.4.

L. Roofs

1. Tank roof shall be furnished by the tank manufacturer and be constructed of triangular aluminum panels as shown on contract drawings. The roof design shall be stamped by New York State Licensed Professional Engineer.
2. Roofs shall be clear span and self-supporting. Center post supports are not permitted. Roof live loads and dead loads shall be carried by tank sidewalls, without additional support. A roof hatch, with a hinged gasketed cover and locking hasp, shall be provided near the outside tank ladder.
3. Roofs shall be manufactured and supplied from the same manufacturer as the tank.
4. ALUMINUM DOME ROOFS
 1. Aluminum dome roofs shall be constructed of non-corrugated, triangular aluminum panels, which are sealed and firmly clamped in an interlocking manner within a fully triangulated aluminum space truss system of wide flange extrusions, thus forming a dome structure. They shall be supplied by the tank manufacturer. Fabric type flashing is not allowed.
 2. The dome shall be self supporting from the periphery structure with horizontal thrust contained by an integral tension ring.
 3. The walkway and handrail shall be constructed of aluminum.
 4. The roof manway opening shall be at least 30" square. The opening shall have a curb of at least 4" in height, and the cover shall have a downward overlap of at least 2". The manway shall be aluminum.
5. Dome Materials:
 - a) Triangulated dome frame struts: 6061-T6 aluminum.
 - b) Structural frame gussets: 6061-T6 aluminum, 0.375 inch nominal thickness.

- c) Triangular closure panels: .050 inch nominal thickness, 3003 H16 aluminum Sheet.
 - d) Triangular skylight panels, (if specified): ¼ inch thick clear acrylic. Skylight square footage shall be 1% of covered area, minimum.
 - e) Perimeter tension/compression ring: 6061-T6 aluminum.
 - f) Fasteners: 7075-T73 anodized aluminum or Series 300 stainless steel.
 - g) Sealant: Silicone by Pecora, General Electric Silpruf or equal.
 - h) Gaskets: Silicone, General Electric SE-44/88 or equal.
 - i) Anchor Fasteners: Series 300 stainless steel.
 - j) Dormers, doors, and hatches: 6061 T6, 5086 H34 or 5052-H36 aluminum, 0.090inch nominal thickness.
- M. Appurtenances: All indicated on drawings, including but not limited to:
- 1. ROOF VENT - A properly sized aluminum vent assembly in accordance with AWWA D103 shall be furnished and installed above the maximum water level. At maximum possible rate of water fill or withdrawal, the resulting interior pressure or vacuum will not exceed 0.5-inch water column. Protection against birds and protection against ice plugging shall be provided. An insect screen shall be provided and designed to open should the screen become plugged by ice formation.
 - a) The vent shall be constructed of aluminum such that the hood can be unbolted and used as a secondary roof access.
 - 2. PIPE CONNECTIONS - Where pipe connections are shown to pass through tank panels, they shall be field located, saw cut, (acetylene torch cutting or welding is not permitted), and utilize an interior and exterior flange assembly. Tank shell reinforcing shall comply with AWWA D103 latest edition. CST Storage Sealer No. 98 or approved equal shall be applied on any cut panel edges or bolt connections.
 - a) Overflow piping shall be irrigation grade seamless aluminum tubing.
 - 3. OUTSIDE TANK LADDER - An outside tank ladder shall be furnished and installed as shown on the contract drawings. Ladders shall be aluminum and utilize grooved, skid-resistant rungs.
 - a) Safety cage and step-off platforms shall be fabricated of galvanized steel. Ladders shall be equipped with a hinged lockable entry device.
 - 4. ACCESS DOORS- Each tank shall be provided with one (1) 30-inch diameter bottom access door as shown on contract drawings per AWWA D103. The manhole opening shall be a minimum of 30 inches in

diameter. The access door and tank shell reinforcing shall comply with AWWA D103 latest edition. A davit to hold the cover plate is required.

5. IDENTIFICATION PLATE- A manufacturers nameplate shall list the tank serial number, tank diameter and height, maximum design capacity, intended storage use, and date of installation. The nameplate shall be affixed to the tank exterior sidewall at a location approximately 5' from grade elevation in a position of unobstructed view.
6. CATHODIC PROTECTION SYSTEM - The cathodic protection system shall be designed by a licensed professional engineer employed by the tank manufacturer. The system shall be designed to protect both the tank and the foundation rebar in concrete floors.
 1. The manufacturer shall design and supply a passive, cathodic protection system.
 2. The anodes shall be floor mounted.
7. Safety Cables: Stainless steel safety cables, hardware, and standoff as indicated on drawings.
8. Hose connection: As indicated on drawings.

N. Packaging

1. All sheets that pass Factory Inspection and Quality Control checks shall be protected from damage prior to packing for shipment.
2. Heavy paper or plastic foam sheets shall be placed between each panel to eliminate sheet-to-sheet abrasion during shipment.
3. Individual stacks of panels will be wrapped in heavy mil black plastic and steel banded to special wood pallets built to the roll-radius of the tank panels. Shipment from the factory shall be by truck, exclusively hauling the tank components. This procedure minimizes contact or movement of finished panels during shipment.

O. Tank shall be AquaStore or approved equal.

2.2 PIPING: Refer to Section 33 30 00

2.3 CONCRETE: Refer to Sections 03 30 00 and 32 05 23.

2.4 REINFORCING STEEL: Refer Sections 03 30 00 and 32 05 23.

2.5 CONCRETE PROTECTIVE COATING:

Concrete coating for the interior tank floor shall consist of an epoxy blended filler sealer, and a cross linked epoxy phenolic cured, resistant protective coating.

2.6 ULTRASONIC LEVEL INDICATOR:

A. Shall be adequate for wastewater applications.

- B. Shall be supplied with all accessories required to install sensor and transmitter. All brackets/supports/hardware required shall be stainless steel unless otherwise approved.
- C. Sensor and transmitter shall be provided as separate units.D.

Required Features and Accessories:

- 1. Sensor shall be adequate for in tank (explosion proof) applications.
- 2. Sensor shall be self cleaning and provided with integrated heating to protect against ice build-up.
- 3. Sensor shall be able to be installed up to 1,000 feet from the transmitter.
- 4. Sensor shall be Prosonic S FDU91F by Endress + Hauser or approved equal.
- 5. Transmitter shall be able to integrate with the new sanitary sewer pump control to prevent pumps from running when level within tank is approximately 3-inches below overflow. Transmitter shall also be able to send signal for tank high level alarm when tank is 2-feet from top of tank. The level of the high level alarm should be user adjustable.
- 6. Transmitter shall be Prosonic S FMU91F by Endress + Hauser or approved equal.

2.7 PINCH VALVES:

- A. Body Material: Cast iron with epoxy coating
- B. Sleeve Material: Buna-N
- C. Actuator: Manual
- D. Adequate for direct bury applications
- E. Aboveground position indicator
- F. No packing, maintenance free design
- G. 100% full port design
- H. Watertight shut-off
- I. Valve shall be rated for 150 psi (working)
- J. Red Valve Series 75B Buried Service or approved equal

2.8 WARNING TAPE: Refer to Section 33 30 00

2.9 AERATOR:

- A. The aerator shall consist of an electric motor drive above the water surface. The motor is connected to a hollow shaft within a protective housing positioned at a 45-degree angle downward into the water, depending on minimum water depth. Aerators with submersible motors are not acceptable. The shaft shall be connected to and drive a propeller beneath the water surface. The propeller shall thrust water past a diffuser to induce a pressure differential, drawing air through intake holes above the water surface down through the rotating hollow shaft and diffuser into the water. Solid shafts are not acceptable.
- B. Aerator shall be provided with a float system for a complete assembly from a single manufacturer.
- C. DELIVERY, STORAGE AND HANDLING:
 - 1. Aerator shall arrive at the installation site fully assembled and ready for attachment to the flotation or support equipment.
 - 2. Aerators with couplings that can become misaligned during shipment are not acceptable.

D. AERATOR DRIVE MOTOR

1. The motor shall deliver 7.5 horsepower at 3600 RPM nominal and shall be rated for 208 volts, 60cycle, 3 phase service. Motors shall be specifically designed for operating at an angle.
2. The motor shall be TEFC, **explosion proof**, and high efficiency.
3. The motor shall, in all cases, equal or exceed current NEMA specifications.
4. The motor windings shall be nonhygroscopic.
5. Insulation shall equal or exceed NEMA Class F with Class B temperature rise.
6. A service factor of 1.15 shall be furnished.
7. A condensate drain shall be located at the lowest point in the lower end-bell housing.
8. A stainless steel nameplate shall be provided with each motor and shall be securely fastened thereto. Information shall include voltage, speed, phase, insulation class, amperage, service factor, wiring diagram, and motor serial number.
9. The motor shaft shall be balanced to within 1 mil to be measured on any part of the motor frame including the C-face.
10. The motor terminal box shall be firmly bolted to the motor frame at four points. The terminal box shall be sized to meet the NEMA standards.
11. The terminal box shall be drilled and tapped to receive one compression watertight fitting to accommodate the appropriate electrical service cables.
12. Complete internal rotating assembly and stator winding shall be epoxy coated to maximize corrosion protection of electrical components.
13. The motor must be supplied with premium insulation for extended life in harsh environments.
14. The motor must use thrust bearings. Conrad-type bearings are not acceptable.

E. MOUNTING FLANGE

1. The mounting flange shall be stainless steel.

F. SHAFT/UNIVERSAL JOINT COUPLING

1. The shaft shall be stainless steel, full-welded to a forged carbon steel universal joint coupling. The shaft must be hollow to promote maximum airflow and oxygen transfer. Units with solid shafts are not acceptable. This shaft shall be dynamically balanced. Units that utilize vibration dampeners to control fatigue stress failures due to vibration are not acceptable.
2. The universal joint coupling shall include a standard grease fitting for maintenance lubrication. Units that utilize flexible couplings to attach the shaft to the motor are not acceptable.
3. The shaft shall be stabilized by a replaceable water lubricated bearing located within one inch from the propeller hub.
4. Units supplied with couplings that require alignment are not acceptable.
5. Any shafts requiring factory replacement to validate warranty requirements are not acceptable.

G. HOUSING

1. The housing shall be stainless steel, non-corrosive, and flanged for mounting to the aerator. The housing shall form a guard around the hollow shaft and support a field replaceable, water-lubricated bearing, press-fitted into the housing lower end. Water lubrication holes shall penetrate the housing in the area surrounding the bearing.

H. BEARING

1. The aerator shall be supplied with a field replaceable abrasion resistant, water lubricated lower support bearing. The bearing shall be constructed of an appropriate material for the application inside

- a fiber backing. The bearing shall be press-fitted into the housing to allow ease of replacement.
- 2. Units utilizing a cantilever design without a lower support bearing or re-greasable tapered roller bearings are not allowed.
- 3. Bearings requiring factory replacement to validate warranty requirements are not acceptable.
- I. SLEEVE
 - 1. The replaceable sleeve shall be the only moving part in contact with the bearing and shall spin with the shaft as one unit. The sleeve shall be solid and homogeneous. Units supplied without sleeves are not acceptable.
- J. PROPELLER
 - 1. The propeller shall be 304 stainless steel specifically designed to maximize oxygen transfer and mixing characteristics. Propellers shall be self-tightening such that the propeller threads tighten on the shaft threads during normal operation. The entire flow of aspirated air shall pass through the propeller via the hollow drive shaft along the axis of the propeller hub. Aluminum and standard marine type propellers are not acceptable.
 - 2. The propeller design shall be tested in clean water and shown to draw a minimum of 85% of the recommended full motor amperage load at nameplate voltage and power factor.
 - 3. The propeller shall be designed to allow easy removal in the field.
- K. DIFFUSER
 - 1. Aerator shall be equipped with a stainless steel, self-tightening, diffuser threaded to the drive shaft. The aspirated air shall flow through the diffuser in one direction parallel with the axis of the diffuser. The entire flow of aspirated air shall exit at the diffuser opening.
- L. VORTEX SHIELD
 - 1. A vortex shield shall be furnished with each unit to eliminate the formation of vortices, maximize shaft airflow, and prevent cavitation damage to the propeller during operation. Units without vortex shields are not acceptable.
- M. FLOTATION
 - 1. The aerator flotation assembly shall be constructed of molded low-density polyethylene with ultraviolet inhibitor, filled with urethane foam. The pontoon shape shall be designed with smooth, beveled edges to allow freezing into ice without breakage. The pontoon(s) shall be connected by stainless steel structural members to prevent corrosion. To allow for servicing by not removing the aerator from the flotation, the flotation assembly shall be designed so the aerator may be pivoted completely out of the water. Structural aluminum is not acceptable. Welded stainless steel floats will not be acceptable.
 - 2) Stainless Steel slide cable assemblies shall be provided to allow the unit to float up and down for the 30' feet of varying water level without binding.
 - 3) Stainless steel float supports shall be provided to allow the unit to rest on the bottom of the tank, without damaging the propeller.
- N. ELECTRICAL SERVICE CABLE
 - 1. Cable shall be CSA/UL approved for severe and hazardous environments, suitable for underwater service and one continuous length.
 - 2. The cable shall be jacketed, flexible stranded cable with individually wrapped conductors rated SEOW or equal.
 - 3. Cable shall be provided with float balls as indicated on the drawings.
- O. Aerator shall be the AIRE-O₂ Aspirating Aerator or approved equal.

PART 3 - EXECUTION

3.1 TANK:**A. Foundation**

1. The tank foundation shall be built in accordance with the approved and stamped Shop Drawings and shall be designed by the manufacturer to safely sustain the structure and its live loads.
2. Leveling of the starter ring shall be required and the maximum differential elevation with the ring shall not exceed 1/8 inch, nor exceed 1/16 inch within any 10 feet of circumference.
3. In no case shall the backfill elevation vary more than one (1) foot around the periphery of the tank shell.
4. A leveling plate assembly, consisting of two anchor rods and a slotted plate shall be used to secure the starter ring, prior to encasement in concrete. Installation of the starter ring on concrete blocks or bricks, using shims for adjustment, is not permitted.
5. Place one butyl rubber elastomeric waterstop seal on the inside surface of the starter ring below the concrete floor line. Place one bentonite impregnated water seal below the butyl rubber seal. Install materials in accordance with tank manufacturer's instructions.
6. Tank footing design shall be based on the soil bearing capacity, as determined by geotechnical analysis. The Geotechnical report is available upon request.
7. Footing design is the responsibility of the tank manufacturer.

B. Floors

1. Plastic encapsulated nuts shall be used to cover the bolt threads exposed on the inside of the floor. The plastic encapsulation shall be Noryl GFN2-701S and NSF compliant (or approved equal).
2. Concrete floors may be poured monolithically for tank diameters up to and including 101 feet. For larger structures, floors shall be quadrant poured. Concentric ring pouring shall not be allowed due to water-stop installation problems.
3. Concrete floor shall slope to the tank outlet pipe as indicated on the drawings.
4. Concrete floor shall receive a protective coating.

C. Tank Structure

1. Field erection of the glass-coated, bolted-steel structures and components shall be in strict accordance with the procedures established by manufacturer and performed by an authorized Contractor/Dealer of the tank manufacturer regularly engaged in erection of these tanks, using factory-trained erectors.
2. Only specialized erection jacks and building equipment developed and supplied by the tank manufacturer shall be used to erect the tanks.
3. Particular care shall be taken in handling and bolting of the glass-coated steel tank panels, appurtenances and members to avoid abrasion of the coating system. Prior to liquid test, all surface areas shall be visually inspected. Chips or scrapes in the glass coating shall be repaired per the tank manufacturer's recommended procedure.
4. An electrical leak test shall be performed during erection using a wet sponge nine-volt leak detection device. All electrical leak points found on the inside surface shall be repaired in accordance with manufacturers published touch-up procedures.
5. No backfill is to be placed against the tank sidewall without prior written approval of the tank manufacturer. Any backfill allowed shall be placed strictly in accordance with the instructions of the tank manufacturer.

D. Field Testing

1. Following completion of erection and cleaning of the tank, the structure shall be tested for liquid tightness by filling to its overflow elevation.

2. Any leaks disclosed by this test shall be corrected in accordance with the manufacturer's recommendations.
3. Water required for testing will be furnished by the Owner following completion of tank erection. Labor and equipment necessary for hydrostatic tank testing shall be included in the contract. Contractor must obtain approval of water disposal method from the VOR.

E. Inspection

1. On or near the (1) year anniversary date of initial tank use (but not more than (14) months from date of delivery of tank materials to job site), the manufacturer's authorized dealer shall make a visual inspection of the tank interior coating and appurtenances, tank exterior coating and appurtenances, and the immediate area surrounding the tank for evidence of leakage. A written summary of the inspection report will be filed with the tank owner and the tank manufacturer. The inspection shall include the cathodic protection system and the inspection shall verify that it is functioning properly. Any deficiencies shall be corrected at no additional cost to the Owner.
2. Water required for the one (1) year anniversary inspection process will be furnished and disposed of by the Owner.

3.2 CONNECTIONS TO VA OWNED MANHOLES/WET WELLS:

- A. During construction of new connections to active manholes or wet wells, it shall be the sole responsibility of the Contractor to maintain continued sanitary sewer service to all buildings and users upstream. The contractor shall provide, install, and maintain all pumping, conveyance system, dams, weirs, etc. required to maintain the continuous flow of sewage. All temporary measures required to meet this requirement shall be subject to the review of the COR.
- B. Core existing structure, install pipe at the design invert. Install an elastomeric gasket around the pipe, and grout the interstitial space between the pipe and the core.
- C. Where applicable, the bench shall be cleaned and reshaped to provide a smooth flowline for all pipes connected.
- D. Connections and alterations to existing manholes shall be constructed so that finished work conforms as nearly as practicable to the applicable requirements specified for new manholes, including concrete and masonry work, cutting and shaping.

3.3 PIPE SEPARATION: Refer to Section 33 30 00.

3.4 GENERAL PIPING INSTALLATION: Refer to Section 33 30 00.

3.5 MANHOLES AND VAULTS: Refer to Section 33 30 00.

3.6 ULTRASONIC LEVEL INDICATOR:

- A. Shall be installed in accordance with manufacturer's recommendations and in accordance with the Contract Documents.
- B. Shall be mounted within the tank so it is accessible from outside the tank.
- C. Shall be mounted and anchored as indicated on the drawing.

- D. A qualified factory-trained servicemen shall assist in the installation and start-up.
- E. Conform to all applicable provisions of the NEMA standards, NEC and local, State and Federal codes when installing the equipment and interconnecting wiring.

3.7 PINCH VALVES:

- A. Avoid setting valves under pavement except where shown on the drawings.
- B. Clean valve interior before installation.
- C. Set valve plumb, restrain ends of valves
- D. Install valve in conformance with manufacturer's instructions.
- E. Paint exposed (aboveground) shaft for manual actuator green with one prime coat and two finish coats. Refer to Section 09 91 00 Painting.

3.8 TESTING OF SANITARY SEWERS: Refer to Section 33 30 00.**3.9 AERATOR:**

- A. Each aerator shall be located substantially as shown on the drawings .
- B. Anchor cables and mooring hardware shall be stainless steel and provided by the Contractor.
- C. Aerator shall be secured to the tank walls and floor as indicated on the drawings.
- D. Each aerator shall be tested in the water under load. The aerator Manufacturer shall supply complete test data with the submittal package. Radial vibration velocity shall not exceed 0.3 inch/second at the upper motor bearing or volute tube below the float.
- E. The aerator Manufacturer, through its factory trained field service technician, shall provide service to verify the proper installation and start-up of the aerators. Operation and maintenance instructions should be given to the Owner through the use of illustrated material within the manual.

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