

SECTION 13205

GLASS LINED BOLTED STEEL GROUND STORAGE TANK

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish and erect a water storage tank, including foundation, glass-coated, bolted-steel tank structure and tank appurtenances as shown on the Drawings and described herein.
- B. All work, labor, materials, equipment and testing in this section is considered incidental and included in the unit price/lump sum prices bid.
- C. Reinforced concrete design shall conform to the applicable requirements of the ACI Standard Building Code Requirements for Reinforced Concrete” ACI 318 as published by the American Concrete Institute.
- D. Excavated material shall be disposed of by the Contractor in accordance with governing laws and permits.
- E. Contractor shall contact the Ohio Utility Protection Service, the Ohio Oil & Gas Producer’s Protection Service and other utilities as needed prior to commencing any work at the site.
- F. Traffic control is considered incidental to the project and is the responsibility of the Contractor. The cost of this work shall be included within the prices bid for related items.

1.02 QUALIFICATIONS OF TANK SUPPLIER

- A. The Engineer's selection of factory applied glass- fused-to-steel bolt together tank construction for this facility has been predicated upon the design criteria, construction methods specified, and optimum coating for resistance to internal and external tank surface corrosion. Deviations from the specified design, construction or coating details, will not be permitted.
- B. The bidder shall offer a new tank structure as supplied from a U.S.A. manufacturer specializing in the design, fabrication and erection of factory applied glass-fused-to-steel, bolt together tank systems. The manufacturer shall own and operate its production plant, fabricate and glass coat the tank at one U.S.A. location.

- C. The tank shown on the Drawings and specified herein is a Model 4224SSWT Aquastore Tank System as manufactured by CST Industries, Inc. of DeKalb, Illinois.
 - D. Alternate glass-fused-to-steel tank products, as provided by other manufacturers, will be considered for prior approval by the Engineer. Manufacturers lacking the experience requirement will not be considered. The Owner's decision or judgment on these matters will be final, conclusive, and binding.
 - E. Strict adherence to the standards of design; fabrication; erection; product quality; and long-term performance, established in this Specification will be required by the Owner and Engineer.
 - 1. Tank substitutions which cause engineering and contract changes - the tank installation as shown on the Drawings and specified herein, is based on the equipment furnished by one manufacturer. A tank which is offered as a substitute to the specific requirements of these Specifications and which differs in detail and arrangement from that shown may require changes in design and construction. All costs which result from such changes in design and construction are to be borne entirely and unconditionally by the Contractor; said costs to included but not be limited to structural, piping, mechanical and electrical changes and all engineering costs incurred as a result of the substitution, in the revision of Plans and Specifications, review of design changes by others, preparation of change orders, and any other costs directly resulting from said substitution.
 - F. Tank suppliers wishing to pre-qualify shall submit the following to the Engineer/Owner for consideration 10 days prior to bid date:
 - 1. Typical structure and foundation drawing(s).
 - 2. List of tank materials, appurtenances and tank coating specs.
 - 3. Certification from tank manufacturer that the tank meets all of tank design standards listed in Section 2.01.
 - G. Only bids from U.S.A. manufactured tank suppliers who have successfully pre-qualified will be considered.
 - H. The Engineer reserves the right to evaluate all bids based on long term, 20-year minimum operation, coating, and maintenance costs. Values to be used in this evaluation will be at the discretion of the Engineer.
- 1.03 QUALIFICATIONS OF TANK SUPPLIER - DOME
- A. No equipment shall be supplied by any manufacturer not regularly engaged in the manufacturing and production of domes in the size and character herein

specified. The manufacturer must have designed, manufactured and installed at least one (1) dome of the same size as the unit(s) specified herein. This dome must be in satisfactory use for a period not less than ten (10) years.

- B. The cover manufacturer must own and operate its own US-based manufacturing facility, and the use of a fabrication facility that is not US-based and/or owned and operated by the cover manufacturer is expressly prohibited. Manufactures that do not meet these qualifications will not be considered.
- C. The cover manufacturer must be ISO 9001 certified.

1.04 SUBMITTAL DRAWINGS AND SPECIFICATIONS

- A. Construction shall be governed by the Owner's drawings and specifications showing general dimensions and construction details, after written approval by the Engineer of detailed erection drawings prepared by the tank bidder. There shall be no deviation from the drawings and specifications, except upon written order from the Engineer.
- B. The bidder is required to furnish, for the approval of the Engineer and at no increase in contract price, 6 sets of complete specifications and construction drawings for all work not shown in complete detail on the bidding drawings. Three complete sets of structural calculations shall be provided for the tank structure and foundation. All such submissions shall be stamped by a Registered Professional Engineer licensed in the state of project location, as well as, by a Registered Professional Engineer employed on the tank manufacturer's engineering staff.
- C. When approved, two sets of such prints and submittal information will be returned to the bidder marked "APPROVED FOR CONSTRUCTION" and these drawings will then govern for the work detailed thereon. The approval by the Engineer of the tank supplier's drawings shall be an approval relating only to their general conformity with the bidding drawings and specifications and shall not guarantee detail dimensions and quantities, which remains the bidder's responsibility.
- D. The tank manufacturers and installing contractor's standard published warranty shall be included with submittal information.
- E. All steel utilized in the construction of the tank shall be manufactured and produced in the U.S.A. The requirements of Ohio Revised Code §153.011 shall apply to this project.

PART 2 PRODUCTS

2.01 PROJECT INFORMATION:

- A. The following information is in accordance with Section III of AWWA D103 and is made part of this specification:
1. Ground storage tank parameters:
 - a. Total Capacity – 246,000 gallons.
 - b. Working Capacity – 132,000 gallons.
 2. Reservoir parameters: Not applicable.
 3. Time of Completion: See Bid.
 4. Location of Site: Latitude: 40°07'08" N, Longitude: 82°01'12" W. See Drawings for specific location.
 5. Access to Site: Access to site is from West 9th Street
 6. Nearest Community: Dresden, OH
 7. Nearest Railroad: Wheeling & Lake Erie Railroad
 8. Electric Power: Electric service is available at the site. Contractor shall coordinate with Owner if electric power is available for construction operations. Electric service charges related to the construction operations shall be the responsibility of the Contractor.
 9. Compressed Air: Not available at site.
 10. Alternate Bottom Capacity Level: Not applicable.
 11. Pipe Materials: Interior inlet/outlet pipe, AWWA C151 DI PC350. Overflow pipe, Schedule 80 PVC
 12. Snow Loading: 30 psf.
 13. Wind Loading:
 - a. Wind Velocity, $V=100$ mph (per AWWA D103).
 - b. Basic Wind Speed, $V=90$ mph/ Exposure C (Ohio Building Code).
 14. Seismic Design: Per Ohio Building Code and requirements of AWWA D103. Seismic Zone 1. Occupancy Category IV (Ohio Building Code).
 15. Location of Access Manholes, Openings and Ladders to be provided:
 - a. Provide two access hatches through tank shell. Hatch diameters shall be 24-inch.
 - b. A 30-inch square hinged roof hatch with padlock bracket located adjacent to the roof access walkway. The opening shall have a curb four inches high, and the cover shall have a downward overlap of 2 inches.
 - c. Roof Vent: A properly sized aluminum vent assembly in accordance with AWWA D103 shall be furnished and installed above the maximum water level of sufficient capacity so that at maximum possible rate of water fill or withdrawal, the resulting interior pressure or vacuum will not exceed 0.5" water column. The vent shall be so designed in construction as to prevent the entrance of birds and/or animals by including an expanded aluminum screen (1/2 inch) opening. An insect screen of 23 to 25 mesh polyester monofilament shall be provided and designed to open should the screen become plugged by ice formation.
 16. Pipe Connections: 8-inch-diameter inlet and 8-inch diameter outlet. Pipe material to be DI PC350 in conformance with AWWA C151. Installation

- and connection shall be by CONTRACTOR.
17. Removable Silt Stop: To be provided on outlet.
 18. Overflow: Minimum 8-inch-diameter pipe designed for minimum 600 gpm flow. An inverted siphon will not be acceptable as an overflow device. Overflow to terminate in a 45 degree elbow a minimum of 24 inches above grade. Provide stainless steel No. 24 mesh screen on outlet.
 19. Roof Access: Ladder platform.
 20. Safety Devices:
 - a. Safety Cages and Handrails: Provide exterior ladder with safety cage and step-off platforms. Offset ladders with landings not exceeding 20 feet, in conformance with OSHA requirements. Side rails shall be seal welded where rungs are placed. Ladder shall begin 8 feet above the tank base elevation.
 - b. Safety Cages: Provide safety cage on exterior ladder.
 - c. Handrails: Required on the tank roof access walkway and at the roof cap.
 - d. A hinged, lockable gate shall be installed at the base of the ladder safety cage to deter unauthorized access to the top of the tank. The OWNER shall provide and install the lock.
 21. Special Vent: None.
 22. Shop Inspection/Mill-Test Reports: Not Required.
 23. Soil Investigation: Allowable Soil Bearing Pressure – 4,000 psf minimum. See geotechnical report for further clarification.
 24. Tank Bottom: Tank shall incorporate a foundation ring embedded into the concrete foundation and a concrete floor. The concrete floor interior to the tank shall be sealed with a concrete sealant that complies with the requirements of NSF 60/61 for contact with potable water.
 25. Pile Foundation: Not applicable.
 26. Concrete Foundation: The floor design is of reinforced concrete with an embedded glass coated steel starter sheet.
 27. Earth Cover Over Water Main: 4 feet minimum.
 28. Seismic Data: Seismic design data to be provided by Contractor as a part of Tank Design Calculations.
 29. Seismic Design Vertical Acceleration: Per AWWA D103, Section 12.3.6.
 30. Freeboard for Sloshing Wave: 6-inches above specified high water level.
 31. Seismic Design of Roof Framing and Columns: Per Ohio Building Code.
 32. Local Seismic Data: Seismic Site Class C. See geotechnical report for further clarification.
 33. Aluminum Dome Roof: Roofs for tanks greater than 31 ft. diameter shall be constructed of non-corrugated triangular aluminum panels forming a spherical dome structure.
 34. Aluminum Dome Finish: See Section 2.02. F.
 35. Baffle Wall: Not Applicable

B. Tank Design Standards

1. The materials, design, fabrication and erection of the bolt together tank shall conform to the AWWA Standard for "Factory Coated Bolted Steel Tanks for Water Storage" - ANSI/AWWA D103, latest revision.
2. The tank coating system shall conform solely to Section 10.4 of ANSI/AWWA D103. NOTE: Electrostatic applied glass, baked-on epoxy painted or galvanized bolt-together tanks are not considered equal.
3. The vitreous coating on the tank, bolt head encapsulation material, and joint sealant shall have been approved for listing under ANSI/NSF Standard 61 for Indirect Additives.
4. The tank manufacturer shall be ISO-9001 certified to assure product quality.
5. The tank manufacturer shall undergo an annual FM (Factory Mutual) inspection of their glass-coated, bolted-steel tank factory and provide written proof thereof to assure product quality.

C. Additional Design Loads

1. Specific Gravity: 1.0
2. Shape Factor: 0.6
3. Factor of Safety: Per AWWA D103.

2.02 MATERIAL SPECIFICATIONS-TANK

A. Plates and Sheets:

1. All steel shall be smelted and produced in the U.S.A.
2. Plates and sheets used in the construction of the tank shell and tank floor (where applicable) shall comply with the minimum standards of AWWA D103, Section 2.4.
3. Design requirements for mild strength steel shall be ASTM A570 Grade 30 with a maximum allowable tensile stress of 15,000 psi.
4. Design requirements for high strength steel shall be ASTM A607 Grade 50 with a maximum allowable tensile stress of 26,000 psi.
5. The annealing effect created from the glass coated firing process shall be considered in determining ultimate steel strength. In no event shall yield strength greater than 50,000 psi be utilized for calculations detailed in AWWA D103, Sections 3.4 and 3.5.
6. Multiple vertical bolt line sheets and plates of ASTM A607 Grade 50 only shall be manufactured such that holes are staggered in the vertical bolt lines and that no two adjoining holes are in-line horizontally, except at the center of the sheet or plate.
 - a. Bolt seam design shall generally be in accordance with the requirements of AWWA D103 section 3.5.2; bolt spacing may be adjusted in the vertical bolt lines to increase the net section and improve joint efficiency to a maximum of 85%.

- b. Double steel sheeting shall not be permitted to achieve structural requirements.
7. Sheet edges of sidewall and floor plates shall be mechanically rounded and flame coated with stainless steel prior to glass coating. Glass coating of the sheet edges shall be similar to the flat panel surfaces. The process shall be equal to *EDGE COAT™* by CST Industries, Inc.

B. Rolled Structural Shapes

1. Material shall conform to minimum standards of ASTM A36 or AISI 1010.

C. Horizontal Wind Stiffeners

1. Design requirements for intermediate horizontal wind stiffeners shall be of the "web truss" design with extended tail to create multiple layers of stiffener, permitting wind load to transfer around tank.
2. Web truss stiffeners shall be of steel with hot dipped galvanized coating.
3. Rolled steel angle stiffeners are not permitted for intermediate stiffeners.

D. 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 2.2.
2. Bolt Material
 - a. SAE Grade 2
 - 1) Tensile Strength - 74,000 psi Min.
 - 2) Proof Load - 55,000 psi Min.
 - 3) Allowable shear stress - 18,164 psi (AWWA D103).
 - b. SAE grade 8/ASTM A325 heat treated to:
 - 1) Tensile Strength - 150,000 psi Min.
 - 2) Proof Load - 120,000 psi Min.
 - 3) Allowable shear stress - 36,818 psi (AWWA D103).
3. Bolt Finish - Zinc, mechanically deposited.
 - a. 2.0 mils minimum - under bolt head, on shank and threads
4. Bolt Head Encapsulation
 - a. High impact polypropylene co-polymer encapsulation of entire bolt head up to the splines on the shank.
 - b. Natural resin with UV (ultraviolet) light inhibitor. Color to be black.
5. Nuts and Washers
 - a. Nuts and washers utilized in the construction of the tank lap joints shall be manufactured from AISI 304 stainless steel.
6. All tank shell bolts shall be installed such that the head portion is located inside the tank, and the washer and nut are on the exterior.
7. All lap joint bolts shall be properly selected such that threaded portions will not be exposed in the "shear plane" between tank sheets. Also, bolt lengths shall be sized as to achieve a neat and uniform appearance.

Excessive threads extending beyond the nut after torquing will not be permitted.

8. 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 torquing.

E. Sealants

1. The lap joint sealant shall be a one component, moisture cured, polyurethane compound. The sealant shall be suitable for contact with potable water and meet applicable FDA Title 21 regulations, as well as, ANSI/NSF Additives Standard 61.
2. The sealant shall be used to seal lap joints, bolt connections and sheet edges. The sealant shall cure to a rubber like consistency, have excellent adhesion to the glass coating, have low shrinkage, and be suitable for interior and exterior exposure.
3. Sealant curing rate at 73° F and 50% RH
 - a. Tack-free time: 6 to 8 hours.
 - b. Final cure time: 10 to 12 days.
4. The sealant shall be equal to Harvestore Products, Inc. System Sealer No. 79 or equal.
5. Neoprene gaskets and tape type sealer shall not be used.

F. Roof

1. Bolts and Fasteners – Threaded fasteners shall be 300 series stainless steel per ASTM F593, Alloy Group 1. Lockbolts shall be 7075-T73 aluminum, 304 or 305 stainless steel. Screws shall be aluminum or 300 series stainless steel. Triangulated space truss: 6061-T6 aluminum struts and gussets.
2. Plates and Sheets - Plate and sheet material shall be aluminum alloy 3003-H16, 3105- H154, 6061-T6, 5052-H32 or 5052-H36; mill finish AA - M10 as fabricated. Minimum thickness for gussets shall be 5/16". Sheet materials shall be 0.05" minimum thickness. Triangular closure panels: .050"t 3003-H16 aluminum sheet.
3. Structural Shapes - Aluminum structural shapes shall be alloy 6061-T6. The aluminum structural members shall be a minimum of 6 inches deep. To improve torsional stability, the dome's structural members must incorporate a double web. The use of I-beams with only a single web is expressly prohibited.
4. Tension Ring - Tension ring structural shapes shall be 6061-T6 aluminum. Design of the tension ring shall be based on the net cross section of the members and shall not include top flange protrusions used for panel attachment, bolt holes, or outstanding legs that are not connected through the joints.

5. Miscellaneous Shapes - Miscellaneous aluminum shapes shall be alloy 6061-T6 or 6063-T5.
6. Gaskets - All gaskets shall be ozone resistant Silicone only. The gaskets must have a 1/8" minimum thickness.
7. Sealant - All sealants shall be silicone and resistant to ozone and ultraviolet light and conform to Federal Specification TT-S-00230C.
8. Miscellaneous Penetration Seals- All other penetration seals shall be weatherproof rubber seals.
9. Support Bearings - Acceptable bearing surfaces for sliding bearing are Teflon to stainless steel only. In order to avoid damage to the Teflon and to reduce the coefficient of bearing friction, Teflon shall not bear on aluminum surfaces. Dome supports shall utilize only bolted connections. The use of aluminum structural welding at the dome supports is expressly prohibited.
10. Dormers, doors, vents and hatches: 6061-T6, 5086-H34 or 3003-H16 aluminum.
11. Primary horizontal forces into the tank shell shall be contained by an integral aluminum tension ring (unless otherwise specified). The frame shall consist of aluminum structural members with the joints arrayed on the surface of a sphere. The arrangement of members shall result in a pattern of triangular spaces. These spaces shall be closed with light gauge aluminum panels. The members shall be joined by means of bolting their flanges to aluminum gusset plates.
12. All metal components of the aluminum dome structure shall be aluminum or 300 series stainless steel. No galvanized, aluminized, painted, or plated steel shall be used anywhere in the dome above the mounting bracket base plates. Dissimilar materials in the supporting structure shall be isolated from the aluminum dome by means of a compatible elastomeric gasket.
13. The entire structure shall be designed as a watertight system under all design load and temperature conditions. The design shall include sealant to be completely encapsulated by applying it to the gusset covers' inner circumferences, beneath the gusset covers' top closure plates.
14. The aluminum closure panels shall be attached continuously along their edges to the structural members by means of batten bars, which engage the panels in an interlocking joint. Designs that incorporate raised battens, overlapping panels and/or designs that incorporate fasteners which penetrate panels and attach to structural members are expressly prohibited. The roof panels shall be fabricated from continuous 3003-H16 aluminum sheeting.
15. Connection forces shall be transferred through gusset plates connected to the top and bottom flanges of the beam struts. The connections shall be designed as moment connections; a minimum of four bolts shall be used to connect the gusset plate to each strut flange. The structural analysis shall be performed using non-linear, second order, stiffness analysis models in accordance with ADM 2010 Chapter C. Stability shall be

provided for the structure as a whole and for each of its components. The available strengths of members and connections determined in accordance with Section C.3 shall equal or exceed the required strengths determined in accordance with Section C.2

16. Fasteners shall be designed with a factor of safety of 2.34 on ultimate strength and 1.65 on yield strength.

2.03 GLASS COATING SPECIFICATION

A. Surface Preparation

1. Following the decoiling and shearing process, sheets shall be steel grit-blasted on both sides to the equivalent of SSPC-10. Sand blasting and chemical pickling of steel sheets is not acceptable.
2. The surface anchor pattern shall be not less than 1.0 mil.
3. These sheets shall be evenly oiled on both sides to protect them from corrosion during fabrication.

B. Cleaning

1. Sheet edges of sidewall and floor plates shall be mechanically rounded and flame coated with 316 stainless steel prior to glass coating. Glass coating of the sheet edges shall be similar to the flat panel surfaces. The process shall be applied to all four sheet edges, and shall be equal to EDGECOAT™ by CST Storage.
2. After fabrication and prior to application of the coating system, all sheets shall be thoroughly cleaned by a caustic wash and hot rinse process followed immediately by hot air drying.
3. Inspection of the sheets shall be made for traces of foreign matter or rust. Any such sheets shall be re-cleaned or grit-blasted to an acceptable level of quality.

C. Coating

1. All sheets shall be primed with catalytic nickel oxide glass ground-coat on both sides, and then air-dried per section 10.4.2.1 of AWWA D103.
2. An intermediate coat to both sides of the sheets, of cobalt blue glass frit, shall be made.
3. The sheets shall then be fired at a minimum temperature of 1500 degrees F in strict accordance with the manufacturer's quality process control procedures, including firing time, furnace humidity, temperature control, etc.
4. Fired sheets shall receive a final white color coat of titanium dioxide enhanced silica glass coating on the interior surface, color coating on exterior surface, then re-fired in the furnace.
5. Dry film interior coating thickness shall be 10.0 -16.0 mils.

6. Dry film exterior coating thickness shall be 6.0 -11.0 mils.
7. The finished exterior color shall be Cobalt Blue.

D. Inspection

1. All coated sheets shall be inspected for mil thickness (Mikrotest or equal).
2. All coated sheets shall be checked for color uniformity by an electronic colorimeter.
3. An electrical leak detection test shall be performed on the inside surface after fabrication of the sheet. Sheets with excessive electrical leakers shall be rejected so as to minimize field touch up (See Section 3.01.C.4).

E. Packaging

1. All approved sheets 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. This procedure eliminates contact or movement of finished panels during shipment.
4. Shipment from the factory to the job site will be by truck, hauling the tank components exclusively. No common carrier, drop, or transfer shipments.

2.04 APPURTENANCES (per AWWA D103, Section 5)

A. Pipe Connections

1. 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. Sealer shall be applied on any cut panel edges or bolt connections.
2. Overflow piping shall be 8-inch diameter Schedule 80 PVC.

B. Outside Tank Ladder

1. An outside tank ladder shall be furnished and installed as shown on the Drawings.
2. Ladders shall be fabricated of aluminum and utilize grooved, skid-resistant rungs.
3. Safety cage and step-off platforms shall be fabricated of galvanized steel. All shall be supplied with cable safety system in compliance with OSHA regulations.

C. Sidewall Access Manway

1. Two sidewall access manways shall be provided as shown on the Drawings in accordance with AWWA D-103.
2. Such manways shall be as shown on drawings and shall include a properly designed reinforcing frame and cover plate. A davit to hold the cover plate, when opened, is required for tanks in excess of 38' tall.

D. Identification Plate: A manufacturer's nameplate shall list the tank serial number, tank diameter and height, and maximum design capacity. The nameplate shall be affixed to the tank exterior sidewall at a location approximately five (5') feet from the tank base in a position of unobstructed view.

E. Roof Vent

1. A properly sized vent assembly in accordance with AWWA D103 shall be furnished and installed above the maximum water level of sufficient capacity so that at maximum possible rate of water fill or withdrawal, the resulting interior pressure or vacuum will not exceed 0.5" water column.
2. The overflow pipe shall not be considered to be a tank vent.
3. The vent shall be constructed of aluminum.
4. The vent shall be so designed in construction as to prevent the entrance of birds and/or animals by including an expanded aluminum screen (1/2 inch) opening. An insect screen of 23 to 25 mesh polyester monofilament shall be provided and designed to open should the screen become plugged by ice formation.

F. Tank Logo: Specific logo is not required. Contractor shall provide American Flag emblem.

2.05 FOUNDATION

A. General:

1. The tank foundation is a part of this contract.
2. The tank foundation shall be designed by the manufacturer to safely sustain the structure and its live loads.
3. Tank footing design shall be based on the soil bearing capacity or greater as determined by geotechnical analysis performed by a licensed soils engineer.

B. Concrete Floor

1. The floor design is of reinforced concrete with an embedded glass coated steel starter sheet per AWWA D103 and the manufacturer's design, and is an integral element of the tank assembly; therefore the tank foundation

and floor slab (performed in two separate pours) with embedded starter sheet shall be constructed by the tank supplier using manufacturer trained personnel regularly engaged in this type of tank construction.

2. Leveling of the starter ring shall be required and the maximum differential elevation within the ring shall not exceed one-eighth (1/8) inch, nor exceed one-sixteenth (1/16) inch within any ten (10) feet of length.
3. A leveling plate assembly, consisting of two 18" anchor rods (3/4" dia.) and a slotted plate (3 1/2" X 11" X 3/8" thk) 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. The foundation with anchor bolts/leveling plates shall be a separate pour from the concrete floor.
4. Two water stop seals made of a butyl rubber elastomer special for this application shall be placed on the inside surface of the starter ring below the concrete floor line. These materials shall be installed as specified by the tank manufacturer.

C. Concrete Sealant:

1. Concrete sealant shall be utilized to seal the concrete floor of the storage tank that will come in contact with the potable water stored within.
2. The sealant shall be a two component urethane elastomeric coating. The coating shall be fluid applied and shall be formulated specifically for use in water and wastewater applications. The cured coating shall comply with the requirements of ANSI/NSF 61 for materials that are in contact with potable water.
3. The coating utilized shall be CIM 1061 as manufactured by C.I.M. Industries, Inc., or equal.
4. The coating shall be applied in accordance with the manufacturer's recommendations.

D. Additional Requirements:

1. Contractor shall provide three copies of the foundation design calculations to Engineer along with the shop drawings for the concrete foundation and the storage tank. These shall not be designated shop drawings but will be retained for the project files. The design calculations shall be certified by the Ohio Registered Professional Engineer responsible for their preparation.
2. Concrete design shall conform to ACI-318, ACI-117, ACI-347, and ACI 371R and shall meet the requirements of Division 3-Concrete.
3. The overturning moment used to design the pedestal and foundation shall include the moment due to eccentricity of the gravity loads caused by deflection of the structure under wind or seismic conditions.

2.06 TANK MIXING SYSTEM

- A. Contractor shall provide a passive mixing system on the inlet to the proposed water storage tank.
- B. The mixing system shall be a Tideflex Mixing System (TMS) for Potable Water Storage Tanks as manufactured by Red Valve Company, Inc., or approved equal.
- C. Mixing system shall be passive in design requiring no maintenance and utilizing the energy of the fill and draw cycles, without need for an outside energy source.
- D. System manufacturer shall provide a design analysis to outline the optimum system configuration to achieve complete mixing and develop a hydraulic mixing analysis model.
- E. System components shall be NSF 61 Certified.

2.07 SITE ACCESSORIES

- A. Contractor shall construct the tank overflow, splash block, rip rap pit and other related appurtenances as shown on Drawings.

PART 3 EXECUTION

3.01 ERECTION

A. Foundation

1. Construct the tank foundation in accordance with the requirements and procedures of the tank manufacturer and the requirements outlined herein.

B. Sidewall Structure

1. Field erection of the glass-coated, bolted-steel tank shall be in strict accordance with the procedures outlined in the manufacturer's erection manual, and performed by an authorized dealer of the tank manufacturer, regularly engaged in erection of these tanks.
2. Specialized erection jacks and building equipment developed and manufactured by the tank manufacturer shall be used to erect the tanks.
3. Particular care shall be taken in handling and bolting of the tank panels and members to avoid abrasion of the coating system. Prior to liquid test, all surface areas shall be visually inspected by the Engineer.
4. An electrical leak test shall be performed during erection using a nine (9) volt leak detection device. All electrical leak points found on the inside

surface shall be repaired in accordance with manufacturer's published touch up procedure.

5. The placement of sealant on each panel may be observed prior to placement of adjacent panels. However, the Engineer's observation shall not relieve the bidder from his responsibility for liquid tightness.
6. No backfill shall be placed against the tank sidewall without prior written approval and design review of the tank manufacturer. Any backfill shall be placed according to the strict instructions of the tank manufacturer.

3.02 HYDROSTATIC TESTING

- A. Following completion of erection and cleaning of the tank, the structure shall be tested for liquid tightness by filling tank to its overflow elevation.
- B. Any leaks disclosed by this test shall be corrected by the erector in accordance with the manufacturer's recommendations.
- C. Water required for testing shall be furnished by the owner at the time of tank erection completion, and at no charge to the tank erector. Disposal of test water shall be the responsibility of the Contractor.
- D. Labor and equipment necessary for tank testing is to be included in the price bid.

3.03 DISINFECTION

- A. Standards:
 1. The tank structure shall be disinfected at the time of testing by chlorination in accordance with AWWA Specification C652 "Disinfection of Water Storage Facilities".
 2. Disinfection shall not take place until tank sealant is fully cured (10 to 12 days at 73° F/50% relative humidity).
 3. Acceptable forms of chlorine for disinfection shall be:
 - a. Liquid chlorine as specified in AWWA C652.
 - b. Sodium hypochlorite as specified in AWWA C652.
 - c. Calcium hypochlorite (HTH) is not acceptable.
 4. Acceptable methods of chlorination per AWWA C652:
 - a. Section 4.3.3.
 5. Alternate methods outlined within AWWA C652 may be considered if in accordance with OEPA guidelines and upon approval of the Engineer.
 6. Contractor shall be responsible for disposing testing of the excess water from disinfection testing. Contractor shall coordinate disposal with the Owner. Procedures used for disposal shall be in accordance with OEPA guidelines.

- B. Contractor shall coordinate testing of water samples taken following disinfection of the tank. Two sequential bacteriological samples, taken a minimum of 24 hours apart, shall be obtained before placing the tank in service. Testing shall be completed by an OEPA certified laboratory.

3.04 MIXING SYSTEM

- A. Contractor shall install the mixing system in accordance with the system manufacturer's recommendations.

3.05 WARRANTY INSPECTION

- A. On or near the one year anniversary date of initial tank use 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 surround the tank. A written summary of this inspection will be filed with the tank owner and the tank manufacturer.

END OF SECTION