

BOLTED

SPECIFICATION FOR EPOXY-COATED, BOLTED STEEL POTABLE WATER STORAGE TANKS AS PROVIDED BY BH TANK.

Revised 09/01/2013

1. GENERAL

1.1 Scope of Work

- 1.1.1 Furnish and erect an epoxy coated, bolted-steel water storage tank, including tank structure and tank appurtenances as shown on the contract drawings and described herein.
- 1.1.2 All required labor, materials and equipment shall be included.

1.2 Qualifications of Tank Supplier

- 1.2.1 The Engineer's selection of a factory applied epoxy coated bolt together storage tank is predicated on a thorough examination of design criteria, construction methods, and optimum coating for resistance to internal and external tank corrosion. Deviations from the specified design, construction or coating details will not be permitted.
- 1.2.2 The bidder shall offer a new tank structure as supplied from a manufacturer specializing in the design, fabrication and erection of factory applied epoxy coated, bolt together tank systems. The manufacturer shall fabricate and coat the tank in the same facility which it owns and operates.
- 1.2.3 The bidder shall supply erectors that have also participated in the fabrication of the supplied tank. This is required to assure pride of ownership and quality workmanship throughout the tank manufacturing and installation process. This also assures single source responsibility for the tank.
- 1.2.4 The tank shown on the contract drawings and specified herein is a model _____ Enduro Coat Tank as manufactured by All State Tank Manufacturing, L.L.C. of Grove, OK.
- 1.2.5 Epoxy coated tank products, as provided by other manufacturers, will be considered for prior approval by the Engineer. Erection of the structure is to be by Tank Manufacture. The contractor shall be fully responsible for the entire installation including piping, tank erection, and the ultimate water tightness of the complete installation.
- 1.2.6 Strict adherence to the standard of design, fabrication, erection, product, quality, and long-term performance, established in this Specification will be required by the Owner and Engineer.

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1.2.7 Tank suppliers wishing to pre-qualify shall submit the following to the Engineer/Owner for consideration:

1.2.6.1 Typical structure and foundation drawing(s).

1.2.6.2 List of tank materials, appurtenances and tank coating technical specifications.

1.2.6.3 Resume of job superintendent.

1.2.6.4 The contractor shall have the experience and knowledge necessary to furnish and erect the highest quality of tank possible. Under no circumstances shall an inexperienced Contractor be awarded the project. The contractor shall be fully responsible for the entire installation including appurtenances and the final product.

1.2.6.5 If a dome roof system is required, the dome erector must have installed, and had in satisfactory service, at least one clear span aluminum dome with a diameter equal to or larger than the unit specified, and shall submit evidence of such with his bid proposal and/or pre-bid submittal.

1.2.6.6 The components of the tank that come in contact with stored water shall be certified to meet ANSI/NSF Additives Standard No. 61.

1.2.7 Only bids from tank suppliers who have successfully pre-qualified will be considered.

1.3 Submittal Drawings and Specifications

1.3.1 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.

1.3.2 The bidder is required to furnish, for the approval of the Engineer and at no increase in contract price, _____ sets of complete specifications and construction drawings for all work not shown in complete detail on the bidding drawings. A complete set of structural calculations shall be provided for the tank structure and foundation. A Licensed Professional Engineer in the state in which the project is located shall stamp all such submissions.

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1.3.3 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 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.

2. DESIGN CRITERIA

2.1 Tank Size

2.1.1 The factory epoxy coated bolt together tank shall have a nominal diameter of _____ feet with a nominal sidewall height (to roof eave) of _____ feet.

2.2 Tank Capacity

2.2.1 Tank capacity shall be _____ gallons (nominal, U.S. gallons) at _____ feet liquid depth.

2.3 Floor Elevation

2.3.1 Finished floor elevation shall be set at Elevation _____.

2.4 Tank Design Standards

2.4.1 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 D103-1997.

2.4.2 The tank coating system shall conform solely to Section 10.6 Thermoset Powder Coatings of ANSI/AWWA D103-1997.

2.4.3 All materials furnished by the tank manufacturer, which are in contact with stored water, shall be certified to meet ANSI/NSF Additives Standard No. 61. Certification of a coating type alone will not be sufficient to meet this requirement. Certification of a distributor, and not the tank or coating manufacturer, will not be accepted.

3. MATERIALS SPECIFICATIONS

3.1 Plates and Sheets

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- 3.1.1 Plates and sheets used in the construction of the tank shell, tank floor (when supplied) and tank roof, shall comply with the minimum standards of AWWA D103-1997.
- 3.1.2 Design requirements for mild strength steel shall be ASTM A36 or ASTM A1011 Grade 30,36,40,or 50 with a maximum allowable tensile stress 18,000 psi.
- 3.1.3 Design requirements for high strength steel shall be ASTM A1011 Grade 42, 50, 55, or 60 with a maximum allowable tensile stress of 30,000 psi, unless otherwise noted in the engineering specifications and/or submittals.

3.2 Rolled Structural Shapes

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

3.3 Horizontal Wind Stiffeners

- 3.3.1 Web truss stiffeners shall be of steel with hot dipped galvanized coating.
- 3.3.2 Rolled steel angle stiffeners are not permitted for intermediate stiffeners.

3.4 Bolt Fasteners

- 3.4.1 Bolts used in tank lap joints shall be ½ - 13 UNC-2A rolled thread, and shall meet the minimum requirements of AWWA D103, Section 2.2.

3.4.2 Bolt Material

3.4.2.1 SAE Grade 5 (1" thru 1 1/2")

3.4.2.1.1 Tensile strength – 105,000 psi Min.

3.4.2.1.2 Proof Load – 74,000 psi Min.

3.4.2.2 SAE Grade 8 (1" thru 1 1/2")

3.4.2.2.1 Tensile Strength – 150,000 psi Min.

3.4.2.2.2 Proof Load – 120,000 psi Min.

- 3.4.3 Bolt Finish – Zinc, mechanically deposited.

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3.4.3.1 - 2.0 Mils Minimum – under bolt head, on shank and threads.

3.4.4 Bolt Head Encapsulation

3.4.4.1 High impact polypropylene copolymer encapsulation of entire bolt head up to the splines on the shank

3.4.4.2 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 NSI/NSF Standard 61 for indirect additives.

3.4.5 All bolts on the vertical tank wall shall be installed such that the head portion is located inside the tank, and the washer and nut are on the exterior.

3.4.6 Bolt lengths shall be sized to achieve a neat and uniform appearance. Excessive threads extending beyond the nut after torquing will not be permitted.

3.5 Sealants

3.5.1 The lap joint sealant shall be a one component, moisture cured, polyurethane compound. The sealant shall be suitable for contact with potable water and shall be certified to meet ANSI/NSF Additives Standard 61 for indirect additives.

3.5.2 The sealant shall be used to seal lap joints and bolt connections and edge fillets for sheet notches and starter sheets. The sealant shall cure to a rubber-like consistency, have excellent adhesion to the epoxy coating, low shrinkage, and be suitable for interior and exterior use.

3.5.3 Sealant curing rate at 73°F and 50% RH

3.5.4 Tack-free time: 6 to 8 hours

3.5.5 Final cure time: 10 to 12 days

3.5.6 Neoprene gaskets and tape type sealer shall not be used in liquid contacting surfaces.

4. EPOXY COATING SPECIFICATION

4.1 Surface Preparation

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- 4.1.1 Following the decoiling and shearing process, sheets shall be steel grit blasted on both sides to the equivalent of SSPC-SP10. Sand blasting and chemical pickling of steel sheets is not acceptable.
- 4.1.2 All sheets shall be powder coated immediately after steel grit blasting.
- 4.2 Cleaning
 - 4.2.1 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 drying.
 - 4.2.2 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.
- 4.3 Coating
 - 4.3.1 No shaping, bending, punching, flanging, or grinding may be done on the steel after blasting and before coating. Field coating, except for touch-up will not be permitted.
 - 4.3.2 Coatings shall be in accordance with AWWA D103, Section 10.6 and interior coatings shall be NSF standard 61 approved. Interior coating shall be Enduro-Coat System applied to 5 mils average film thickness (DFT). Exterior coating system shall be as follows:
 - Primer – One coat corrosion-inhibitor, polyurethane epoxy primer applied to 5 mils nominal.
 - Topcoat – One coat polyester applied to 2.0 mils nominal DFT.The exterior polyester powder coating shall thermally fuse with the primer powder coat to form a single continuous layer bonded to the steel substrate.
 - 4.3.3 The same epoxy coating as applied to the sheet surface shall be applied to the exposed edges.
- 4.4 Factory Inspection
 - 4.4.1 Coated sheets shall be inspected for mil thickness (Mikrotest or equal).
 - 4.4.2 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.
- 4.5 Packaging

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- 4.5.1 All sheets that pass Factory Inspection and Quality Control checks shall be protected from damage prior to packing for shipment.
- 4.5.2 Heavy paper or plastic foam sheets shall be placed between each panel to eliminate sheet-to-sheet abrasion during shipment.
- 4.5.3 Individual stacks of panels will be banded or bolted to special wood pallets built to roll-radius of the tank panels. This procedure eliminates contact or movement of finished panels during shipment.
- 4.5.4 Shipment from the factory will be by truck, hauling the tank components exclusively.

5. ERECTION

5.1 Foundation

- 5.1.1 The tank foundation may be a part of this contract and if so shall be installed by the contractor.
- 5.1.2 The tank foundation shall be designed by the manufacturer to safely sustain the structure and its live loads.
- 5.1.3 Tank footing design shall be based on the soil bearing capacity as determined by geotechnical analysis performed by a licensed soils engineer. The cost of this investigation and analysis is not to be included in the bid price. Copies of the soil report are to be provided to the bidder prior to bid date by the Owner or Engineer.
- 5.1.4 Footing designs for soil bearing strengths less than that specified, and those designs deviating from tank manufacturer's standard shall be the responsibility of the Owner and his Engineer based on tank live and dead loading data provided by the tank manufacturer.

5.2 Tank Floor

5.2.1 Epoxy coated steel floor

- 5.2.1.1 The floor is to be an epoxy-coated bolted steel floor. Bolted steel panels shall be placed over a compacted gravel base contained by a steel or concrete ringwall, or a concrete slab, with a non-extruding and resilient bituminous type filler meeting the requirements of ASTM D1751 placed between the tank floor and gravel base to act as a cushion.

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5.2.1.2 A plastic encapsulated nut shall be used to cover the bolt threads exposed on the inside of the floor. The plastic encapsulation shall be Noryl GFN2-701S.

5.2.2 Concrete Floor

5.2.2.1 The floor design is of reinforced concrete with an embedded epoxy coated steel starter sheet per the manufacturer's design and in accordance with AWWA D103, Sec. 11.4, Type 6.

5.2.2.2 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.

5.2.2.3 A leveling assembly 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.

5.2.2.4 Place one butyl rubber elastomer waterstop seal on the inside surface of the starter ring below concrete floor line. Place one bentonite impregnated water seal below the butyl rubber seal. Install materials in accordance with tank manufacturer's instructions

5.3 Sidewall Structure

5.3.1 Field erection of the epoxy coated, bolted steel tank shall be in strict accordance with the procedures outlined by the manufacturer, using factory trained erectors.

5.3.2 Particular care shall be taken in handling and bolting of the tank panels and members to avoid abrasion of the coating system. Prior to a liquid test, the Engineer may visually inspect all surface areas.

5.3.3 An electrical leak test shall be performed during erection using a wet sponge low voltage leak detection device. All electrical leak points found on the inside surface shall be repaired in accordance with manufacturer's published touch up procedures.

5.3.4 The placement of sealant on each panel may be inspected prior to placement of adjacent panels. However, the Engineer's inspection shall not relieve the bidder from his responsibility for liquid tightness.

5.3.5 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.

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5.4 Roof

5.4.1 Epoxy-coated steel deck

5.4.1.1 Tank shall include a radially sectioned roof fabricated from epoxy-coated, bolted steel panels, as produced by the tank manufacturer, and shall be assembled in a similar manner as the sidewall panels. The roof shall be clear-span and self-supporting or center supported. Both live and dead loads shall be carried by the tank walls and any center supports. The manufacturer shall furnish a roof opening which shall be placed near the outside tank ladder and which shall be provided with a hinged cover and a hasp for locking. The opening shall have a clear dimension of at least twenty-four (24") inches in one direction and fifteen (15") inches in the other direction. The opening shall have a curb at least four (4") inches in height, and the cover shall have a downward overlap of at least two (2") inches, or a gasketed weather-tight cover in lieu of the four (4") inch curb and two (2") inch overlap.

5.4.2 Clear-span aluminum dome

5.4.2.1 The roof shall be constructed on non-corrugated triangular aluminum panels. Which are sealed and firmly clamped in an interlocking manner to a fully triangulated aluminum space truss system of wide flange extrusions, thus forming a dome structure.

5.4.2.2 The dome shall be clear span and designed to be self-supporting from the periphery structure with primary horizontal thrust contained by an integral tension ring. The dome dead weight shall not exceed 3 pounds per square foot of surface area.

5.4.2.3 The dome and tank shall be designed to act as an integral unit. The tank shall be designed to support an aluminum dome roof including all specified live loads.

5.4.2.4 Materials:

5.4.2.4.1 Triangulated space truss: 6061-T6 aluminum struts and gussets.

5.4.2.4.2 Triangular closure panels: .050"t 3003-H16 aluminum sheet.

5.4.2.4.3 Tension ring: 6061-T6 aluminum.

5.4.2.4.4 Fasteners: 7075-T73 anodized aluminum or series 300 stainless steel.

5.4.2.4.5 Sealant and gaskets: gunnable silicone and neoprene rubber.

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5.4.2.4.6 Dormers, doors, vents and hatches: 6061-T6, 5086-H34 or 3003-H16 aluminum.

5.4.3 Roof Vent

5.4.3.1 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 design rate of water fill or withdrawal, the resulting interior pressure or vacuum will not exceed 0.5" water column.

5.4.3.2 The overflow pipe shall not be considered to be a tank vent.

5.4.3.3 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 or stainless steel shall be provided and designed to open should the screen become plugged by frost or debris.

5.5 Appurtenances

5.5.1 Pipe Connections

5.5.1.1 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 and the tank shell reinforcing shall comply with AWWA D103. A single component urethane sealer shall be applied on any cut panel edges or bolt connections.

5.5.1.2 Overflow piping shall be _____ inches inside diameter schedule 10 or 40 carbon steel (dependent upon diameter) coated externally with epoxy, schedule 80 PVC, seamless aluminum tubing, or FRP.

5.5.2 Outside Tank Ladder

5.5.2.1 An outside tank ladder shall be furnished and installed as shown on the contract drawings.

5.5.2.2 Safety cage and step-off platforms shall be fabricated of galvanized steel. Ladders shall be equipped with a hinged lockable entry device.

5.5.3 Access Doors

5.5.3.1 One bottom access door shall be provided as shown on the contract drawings in accordance with AWWA D103.

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5.5.3.2 The manhole opening shall be a minimum of 24 inches in diameter. The access door (shell manhole) and the tank shell reinforcing shall comply with AWWA D103, Sec. 5.1.

5.5.4 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 grade elevation.

6. FIELD TESTING

6.1 Hydrostatic

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

6.1.2 The contractor in accordance with the manufacturer's recommendations shall correct any leaks disclosed by this test.

6.1.3 The owner shall furnish water required for testing 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 owner.

7. DISINFECTION

7.1 Standards

7.1.1 The tank structure shall be disinfected at the time of testing by chlorination in accordance with AWWA Standard C652 "Disinfections of Water Storage Facilities".

7.1.2 Disinfection shall not take place until tank sealant is fully cured (see Sect.3.5.3).

7.1.3 Acceptable forms of chlorine for disinfection shall be:

7.1.3.1 Liquid chlorine as specified in AWWA C652.

7.1.3.2 Sodium hypochlorite as specified in AWWA C652.

7.1.3.3 Calcium hypochlorite (HTH) is not acceptable.

7.1.4 Acceptable methods of chlorination per AWWA C652:

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7.1.4.1 Section 4.1.1.

7.1.4.2 Section 4.1.2 – chemical feed pump only (4.1.2.1.)

7.1.4.3 Section 4.3

7.1.5 Section 4.2 is not acceptable.

8. TANK MANUFACTURER'S WARRANTY

8.1.1 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 for the minimum period specified.

8.1.1 Structure – The tank manufacturer shall warrant the liquid storage tank shall be free from any defect in material or workmanship, under normal and proper use, maintenance and operation, for a period of two (2) years starting ten (10) days after final erection.