

TECHNICAL SPECIFICATIONS FOR
THERMOSET EPOXY POWDER COATED BOLTED STEEL WATER STORAGE TANK AS MANUFACTURED BY
UNITED INDUSTRIES GROUP, INC.

**PART 0 – GENERAL**

* 1. **DESCRIPTION**
1. CONTRACTOR shall furnish all labor, materials, equipment, and incidentals required to design, fabricate, deliver, erect, and test tank constructed of factory prefabricated fusion bonded epoxy 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.
2. All required tank materials and principal appurtenances shall be supplied by the tank

manufacturer.

1. Installation shall be executed by a qualified and experienced erection crew,

trained and certified by the tank manufacturer.

1. Tank structures and appurtenances shall be new and not previously used.
	1. **QUALITY ASSURANCE**
2. The Supplier shall offer a factory applied glass coated bolt together shop pre‐fabricated sectional steel tank.
3. The Supplier will offer a new tank structure as a manufacturer specializing

in the design, fabrication and erection of factory applied glass coated, bolted

tank systems. Structural design per the latest AWWA D103 Standard for Bolted Steel Water Storage Tanks (AWWA D103-09).

1. The tank manufacturer shall have completed 10 (ten) Fusion Bonded Epoxy Coated Bolted storage tanks within the last five (5) years.

# 1. MATERIALS SPECIFICATIONS

## 1.1 Plates and Sheets

### 1.1.1 Plates and sheets used in the construction of the tank shell. Plates and sheets used in the tank shell, flanged joint panels are not acceptable. Tank floor (when supplied) and tank roof, shall comply with the minimum standards of AWWA D103 – 2009.

### 1.1.2 Design requirements for mild strength steel shall be ASTM A570, Grade 33, ASTM A1011 grade 33, 36, 40, 45; ASTM A36.

### 1.1.3 Design requirements for high strength steel shall be ASTM A607, Grade 60, ASTM A1011 Grade 50, 55, 60, 65; AST A572 Grade 50, 55, 60.

## 1.2 Rolled Structural Shapes

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

## 1.3 Horizontal Wind Stiffeners

### 1.3.1 Intermediate horizontal wind stiffeners shall be of the “web truss” design with extended tail to create multiple layers of stiffener, permitting wind loads to distribute around tank.

### 1.3.2 Web truss stiffeners shall be of steel with hot dipped galvanized coating.

### 1.3.3 Rolled steel angle stiffeners are not permitted for intermediate stiffeners.

## 1.4 Bolt Fasteners

### 1.4.1 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.

### 1.4.2 Bolt Material

#### 1.4.2.1 SAE Grade 2 (1” bolt length)

#### 1.4.2.1.1 Tensile strength – 74,000 psi Min.

#### 1.4.2.1.2 Proof Load – 55,000 psi Min.

#### 1.4.2.1.3 Allowable shear stress – 18,163 psi (AWWA D103).

#### 1.4.2.2 SAE grade 8/ASTM A490 (> 1” bolt length) heat treated to:

#### 1.4.2.2.1 Tensile Strength – 150,000 psi Min.

#### 1.4.2.2.2 Proof Load – 120,000 psi Min.

#### 1.4.2.2.3 Allowable shear stress – 36,818 psi (AWWA D103).

### 1.4.3 Bolt Finish – Zinc, mechanically deposited or JS500 plating system.

### 1.4.4 Bolt Head Encapsulation

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

#### 1.4.4.2 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.

### 1.4.5 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.

### 1.4.6 All lap joint bolts shall be properly selected such that threaded portions of the bolts will not be exposed to the “shear plane” between tank sheets.

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

### 1.4.8 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.

## 1.5 Sealants

### 1.5.1 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.

### 1.5.2 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 thermoset epoxy powder coating, low shrinkage, and be suitable for interior and exterior use.

### 1.5.5 Final cure time: 10 to 12 days

### 1.5.6 Neoprene gaskets and tape type sealer shall not be used.

### 1.5.3 Sealant curing rate at 730 F and 50% RH

### 1.5.4 Tack-free time: 6 to 8 hours

# 2. THERMOSET EPOXY POWDER COATING SPECIFICATION

## 2.1 Cleaning

### 2.1.1 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 hot air drying.

## 2.2 Surface Preparation

### 2.2.1 Following cleaning, 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.

### 2.2.2 The surface anchor pattern shall be not less than 1.0 mil.

## 2.3 Coating

### 2.3.1 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.

### 2.3.2 Coatings shall be in accordance with AWWA D103, Section 10.6 and interior coatings shall be NSF standard 61 approved. Interior coating shall be ThermalBond 579 applied to 5-7 mils average film thickness (DFT). Exterior coating system shall be as follows:

### Primer – One coat ThermalBond 579 thermoset epoxy powder primer applied to 3-5 mils DFT.

### Topcoat – One coat Super Durable Polyester powder coating applied to 2-3 mils DFT.

# 3 ERECTION

##  3.1 Foundation

### 3.1.1 The tank foundation shall be designed by the manufacturer to safely sustain the structure and its live loads.

###  3.1.2 The tank foundation shall be designed by the to safely sustain the structure and its live loads.

### 3.1.3 Tank footing design shall be based on the soil bearing capacity given in Section 2.5.4 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.

### 3.1.4 Footing designs for soil bearing strengths less than that specified, and those designs deviating from tank manufacturers standard shall be the responsibility of the Owner and his Engineer based on tank live and dead loading data provided by the tank manufacturer.

## 3.2 Tank Floor

### 3.2.1 Thermoset epoxy powder coated steel floor

#### 3.2.1.1 The floor is to be a thermoset epoxy powder-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.

#### 3.2.1.2 A plastic encapsulated nutcap shall be used to cover the bolt threads exposed on the inside of the floor.

#### 3.2.1.3 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.

### 3.2.2 Concrete Floor

#### 3.2.2.1 The floor design is of reinforced concrete with an embedded thermoset epoxy powder coated steel starter sheet per the manufacturer’s design and in accordance with AWWA D103, Sec. 11.4, type 6.

#### 3.2.2.2 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.

#### 3.2.2.3 A leveling plate 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.

####  3.2.2.4 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.

## 3.3 Sidewall Structure

### 3.3.1 Field erection of the thermoset epoxy powder coated, bolted steel tank shall be in strict accordance with the procedures outlined by the manufacturer and performed by an authorized erector of the tank manufacturer, regularly engaged in erection of these tanks, using factory trained and certified personnel.

### 3.3.2 Specialized erection jacks and building equipment developed and manufactured by the tank manufacturer shall be used to erect the tanks.

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

### 3.3.4 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.

### 3.3.5 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.

## 3.4 Roof

### 3.4.1 Thermoset epoxy powder coated steel deck

#### 3.4.2.1 Tank shall include a roof fabricated from thermoset epoxy powder coated, bolted steel panels, as produced by the tank manufacturer, and shall be assembled in a similar manner as the sidewall panels utilizing the same sealant and bolting techniques, to assure a weather/air tight assembly. 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.

### 3.4.2 Clear-span aluminum dome

#### 3.4.2.1 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.

#### 3.4.2.2 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.

#### 3.4.2.3 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.

### 3.4.3 Roof Vent

#### 3.4.3.1 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.

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

#### 3.4.3.3 The vent shall be constructed of aluminum such that the hood can be unbolted and used as a secondary roof access.

#### 3.4.3.4 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.

## 3.5 Appurtenances

### 3.5.1 Pipe Connections

#### 3.5.1.1 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.

#### 3.5.1.2 Overflow piping shall be schedule 80 PVC, seamless aluminum tubing, or FRP.

### 3.5.2 Outside Tank Ladder

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

#### 3.5.2.2 Ladders shall be fabricated of steel and utilize skid-resistant rungs. Finish shall be hot dipped galvanized.

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

### 3.5.3 Access Doors

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

#### 3.5.3.2 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.

**3.6 - FIELD INSPECTIONS & 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. The erector in accordance with the manufacture’s recommendations shall correct any leaks disclosed by this test.
3. The owner shall furnish water required for testing at the time of tank erection completion, and at no charge to the manufacturer or the appointed tank erector. Disposal of test water shall be the responsibility of the owner.
4. Upon request labor, water and equipment necessary for hydrostatic tank testing shall be included in the contract price of the tank as optional.

**3.3 - DISINFECTION**

1. If required, the tank structure shall be disinfected at the time of testing by chlorination in accordance with AWWA Standard C652 “Disinfection of Water Storage Facilities” or as modified by the manufacturer or the appointed erector.
2. Disinfection shall not take place until tank sealant is fully cured.
3. Acceptable forms of chlorine for disinfection shall be:
4. Liquid chlorine as specified in AWWA C652. (Section 4.2.1).
5. Sodium hypochlorite as specified in AWWA C652. (Section 4.2.2).
6. Calcium hypochlorite (HTH) is not acceptable.
7. Acceptable methods of chlorination per AWWA C652:
8. Section 4.3.1.
9. Section 4.3.1.2 – chemical feed pump only (4.3.1.2).
10. Section 4.3.3.
11. Section 4.3.1.3 is not acceptable

**END OF SECTION**