FIRE PROTECTION WATER STORAGE TANK SPECIFICATION
FUSION POWDER COATED BOLTED STEEL TANK

1. GENERAL

1.1 SCOPE OF WORK

1.1.1 Furnish and erect bolted RTP (rolled, tapered panel) steel tank for fire protection water storage. Scope to include tank structure, factory powder coat process 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, Fusion Bond powder-coat 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 Fusion Bond 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 tank shown on the contract drawings and specified herein will be a LIQ Fusion 8000 FBE™ powder-coated, RTP bolted tank as manufactured by Tank Connection.

1.2.4 Fusion Bond Powder 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 the Tank Manufacturer. The contractor shall be fully responsible for the entire installation including tank erection, and the ultimate water tightness of the complete installation.

1.2.5 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.

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

1.2.6.1 Typical structure drawing(s)

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

1.2.6.3 Resume of job installation superintendent.

1.2.6.4 The contractor shall have the experience and knowledge necessary to furnish and erect the highest quality 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 an aluminum geodesic 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 If required by the contract drawings the components of the tank that come in contact with stored water shall be certified to meet ANSI/NSF Additives Standard No. 61.

1.2.6.7 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. 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.

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 Fusion Bond powder-coated bolt together tank shall have a nominal diameter of _____ft. with a nominal sidewall height (to roof eave) of _____ft.

2.2 TANK CAPACITY

2.2.1 Tank working capacity shall be_____gallons (nominal).

2.2.2 Freeboard space in top of tank shall be _____ft.

2.3 TANK DESIGN STANDARDS

2.3.1 The materials, design, fabrication and erection of the bolt together tank shall conform to either one of the specifications listed below depending on the requirements of the project:

NFPA 22: Standard for Water Tanks for Private Fire Protection, Latest Edition Factory Mutual 4020/4021: Standard for Ground Supported, Flat Bottom Steel Tanks for Fire Protection

2.3.2 The tank coating system shall conform solely to Section 12.6 Thermoset Powder Coatings of ANSI/AWWA D103, latest addition.

2.3.3 If required by the contract drawings, 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.

2.3.4 The RTP (rolled, tapered panel) bolted tank design shall have lap joint connections on both vertical and horizontal shell seams. American Petroleum Institute (API 12B) flanged panel tank design will not be acceptable.

3. MATERIALS SPECIFICATIONS

3.1 PLATES AND SHEETS

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 the above described codes (see section 2.3)

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 ANSI 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 4.2.

3.4.2 Fin Neck Bolt Material – SAE J429 Grade 8 150,000 psi Min.

3.4.3 Bolt Finish – Tank lap joint hardware to be Electro-plated to pass 1,000 hours of ASTM B117 Salt Spray Testing.

3.4.4 The grades of all other hardware to be as listed on contract drawings.

3.4.5 Bolt Head Encapsulation.

3.4.6 High impact polycap bolt heads utilized in tank liquid zone.

3.4.7 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.

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

3.5 SEALANTS

3.5.1 The lap joint sealant shall be a one component, moisture cured, polyurethane compound. If required by the contract drawings, 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 Fusion Bond 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 hours

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

4. FACTORY POWDER COAT PROCESS

4.1 CLEANING

4.1.1 Following the fabrication process, sheets and tank components shall be thoroughly washed and rinsed.

4.1.1.1 Washing shall be with a suitable detergent using such concentrations as recommended for de-greasing steel. Water temperatures will be elevated to improve the effect of the cleaning process.

4.1.1.2 The soap concentration shall be monitored and maintained according to the range recommended for use by the manufacturer for the cleaning process.

4.1.1.3 Cleaning shall be in a two stage booth. A fresh water rinse shall be used in the second stage of the wash system.

4.1.1.4 All water shall be removed from sheets and tank components with forced air.

4.2 SURFACE PREPARATION

4.2.1 Sheets and tank components shall be blasted on both sides providing an SSPC SP10 (near white blast) surface profile.

4.3 POWDER COATING SYSTEM

4.3.1 After cleaning and blasting, the sheets and tank components shall receive a Fusion Bond powder coating on both sides of steel. The powder coating shall be applied with an electrostatic process. The thermoset powder coat system shall be as specified:

LIQUID STORAGE	FUSION SYSTEM	DFT* Range
Interior Lining	LIQ FUSION 8000 FBE™	5-9 mils DFT
Exterior Coating	FUSION 8000 FBE™ + EXT Fusion SDP™	6-10 mils DFT

*DFT – Nominal dry film thickness

4.3.2 Interior lining, LIQ Fusion 8000 FBE™ will be applied at 6 mils nominal DFT, with a min/max range from 5-9 mils avg.

4.3.3 Exterior prime coat, EXT Fusion 8000 FBE™ will be applied at 3 mils nominal DFT, with a min/max range from 3-5 mils avg.

4.3.4 Coating thickness shall be maintained by the use of PLC controlled automatic spray guns preset for the application, along with applicable re-enforcement during the application process.

4.3.5 Visual inspection for coverage shall be made after powder application and before the first oven cure. Areas with light coverage shall be re-sprayed with a manual spray gun.

4.4 POWDER CURING GEL

4.4.1 Sheets and tank components shall then be heated in an oven to cause the powder to gel adequately to cross-link with top coat.

4.4.2 Visual inspection and dry film test shall be randomly performed before application of top coat.

4.5 EXT FUSION SDP™ TOP COAT (super durable polyester)

4.5.1 SDP top coat shall be applied on all exterior surfaces at 3 mils nominal DFT, with a range from 3-5 mils avg.

4.5.2 The SDP top coat shall provide excellent gloss retention and UV resistance. Color to be selected from standard colors (chart) with special formulated and premium colors as available options.

4.5.3 Visual inspection will be performed randomly before second oven curing.

4.6 FINAL CURING

4.6.1 Sheets and tank components shall then pass through the final cure oven. Oven temperature settings will be based on the proprietary data provided by the coatings supplier. Oven temperatures vary depending on metal thickness.

4.7 INSPECTION

4.7.1 During final cool down, sheets shall be randomly inspected for cure, adhesion, coating thickness and holidays.

4.7.2 Cure shall be controlled by comparing oven data and may be verified using random MEK rub tests.

4.7.3 Adhesion shall be confirmed using 100 squares test (ASTM Class 5B).

4.7.4 Coating thickness shall be confirmed using dry film thickness gage.

4.7.5 Holiday testing shall be performed with tinker & razor wet sponge according to ASTM D5162-01 Method A (or equivalent).

4.8 PACKAGING

4.8.1 After cool down and inspection, the sheets and tank components shall be unloaded and packaged for shipment.

4.8.2 Sidewall sheets shall be stacked on wooden skids with paper placed between each sheet to prevent any scuffing. Skids shall be loaded to 5,600 pound maximum weight. Each skid shall be wrapped in heavy mil, black poly reinforced plastic and then steel banded.

4.8.3 Roof sheets and hopper or bottom sheets as well as other tank components shall be packaged to prevent damage and then wrapped and banded.

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5.0 TANK STRUCTURE

5.1 FUSION BOND POWDER COATED STEEL FLOOR

5.1.1 Fusion Bond powder-coated bolted steel floors are made up of Fusion Bond powder-coated bolted steel panels shall be placed over a compacted gravel base contained by a steel or concrete ringwall, or a concrete slab. A non-extruding and resilient bituminous type filler, meeting the requirements of ASTM D1751, should be placed between the tank floor and concrete ringwall or between the tank floor and concrete slab to act as a cushion.

5.1.2 A suitable plastic nut cap or encapsulated nut shall be used to cover the bolt threads exposed on the inside of the floor.

5.2 ALTERNATIVE EMBEDDED BASE SETTING RING AND CONCRETE FLOOR

5.2.1 The floor design is of reinforced concrete with an embedded fusion coated steel starter sheet per the manufacturer's design and in accordance with AWWA D103, Section 13.4.

5.2.2 A leveling assembly shall be used to secure the starter ring, prior to placement in concrete. Installation of the starter ring on concrete blocks or bricks, using shims for adjustment, is not permitted.

5.2.3 Embedded base setting rings shall be level within +/- 1/16 in. within 10 feet of length and concentric within +/- ¼ in.

5.2.4 Place one elastomer waterstop seal strip on the inside surface of the starter ring below concrete floor line. Install materials in accordance with tank manufacturer's instructions.

5.3 SIDEWALL STRUCTURE

5.3.1 Field erection of the Fusion Bond powder-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.

5.4 ROOF

5.4.1 Fusion Bond powder-coated steel deck.

5.4.1.1 Tank shall include a sectioned roof fabricated from Fusion Bond powder-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.

5.4.2 CLEAR SPAN ALUMINUM DOME

5.4.2.1 The roof shall be constructed of non-corrugated triangular aluminum panels. Panels 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 Triangulated 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 Sealants and gaskets: gunnable silicone and neoprene rubber.

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

5.5 APPURTENANCES

5.5.1 Pipe Connections

5.5.1.1 Overflow piping shall be _____inches nominal diameter schedule 10 carbon steel coated externally or schedule 40 PVC and shall be one pipe size larger than the inlet. A 90 degree internal weir elbow with external downcomer pipe and flap valve shall be provided for the overflow. If tank must conform to Factory Mutual standards, a ¼" mesh stainless steel screen shall be included near the flap valve.

5.5.1.2 Inlet connection shall be _____inches nominal diameter with external 150# RFSO flanged nozzle conforming to the location specified on the plan sheets.

5.5.1.3 Suction connection shall be _____inches nominal diameter with external 150# RFSO flanged nozzle & internal 90 degree elbow & vortex breaker.

5.5.2 TANK LADDERS

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. Outside ladders shall be equipped with a hinged lockable entry device and comply with OSHA 1910.28 (b) (9).

5.5.2.3 An interior un-caged ladder shall be furnished & installed as shown on the contract drawings. If the height of the tank is greater than or equal to 20 feet, a safety climbing device must be installed. The interior ladder is not required for those tanks which must conform to Factory Mutual specification.

5.5.3 ACESS DOORS

5.5.3.1 Two manways shall be provided as shown on the contract drawings in accordance with NFPA-22.

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, Section 7.1.

5.5.4 Roof vent

5.5.4.1 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 design pressure / vacuum will not exceed +2.0 / -0.5 ounces per square inch.

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

5.5.4.3 The vent shall be so designed in construction as to prevent the entrance of birds and/or animals by including a 4 mesh (1/4" opening size) galvanized screen. If required by the contract drawings, a 16 mesh (1/16" opening size) galvanized screen will be installed to prevent the entrance of insects. However, if the tank is located in an area where heavy frost is common during the winter months an additional pressure / vacuum relief valve must also be provided.

5.5.5 Roof Hatch

5.5.5.1 The manufacturer shall furnish two roof openings, one of which shall be placed above the interior tank ladder and the other 180 degrees from the interior ladder. The roof openings shall be provided with a hinged cover and a hasp for locking and shall have a clear dimension of at least twenty-four (24) inches square. The openings 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.

5.5.6 Roof Perimeter Guardrails

5.5.6.1 Two partial perimeter guardrails and toeboard around the perimeter of the deck shall be provided and installed in accordance with NFPA-22.

5.5.7 Liquid Level Indicator

5.5.7.1 A liquid level indicator with stainless steel float, number board, and high visibility target shall be provided and installed as detailed on the project drawings.

5.5.8 Identification Plate

5.5.8.1 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 location approximately five (5) feet from the grade elevation.

6.0 INSTALLATION

6.1 INSTALLATION PROCESS

6.1.1 Field erection of the bolted steel tank will be in strict accordance with manufacturer's procedures using factory trained and certified erectors.

6.1.2 Particular care will be taken to protect the baked-on powder coated panels from damage (i.e., scratches, abrasion) during field installation.

6.1.3 Tank to be constructed utilizing synchronized hydraulic or (hydraulic screw) jacking process, which keeps construction crews at grade level for safety and point access quality control.

6.1.4 Any coating damage will be repaired per manufacturer's recommendations.

6.1.5 No backfill shall be placed against the tank sidewall during or after the construction process.

6.2 FIELD TESTING

6.2.1 Hydrostatic

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

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

6.2.1.3 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.

7.0 DISINFECTION

7.1 STANDARDS

7.1.1.1 If required by the contract drawings, the tank structure shall be disinfected at the time of testing in accordance with AWWA Standard C652-02 "Disinfection of Water Storage Facilities" using chlorination method number two. Disinfection shall be performed by a competent water treatment contractor.

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

8.0 TANK MANUFACTURER'S WARRANTY

8.1.1 The tank manufacturer shall include a warranty on tank materials and workmanship for a specified period. As a minimum, the warranty shall provide assurance against defects in material, coatings and workmanship for a period of one (1) year. As a minimum, the warranty on the interior tank lining will be five (5) years.