POTABLE WATER STORAGE TANK SPECIFICATION
FUSION POWDER COATED BOLTED STEEL TANK

PART 1 – GENERAL

1.1 SECTION INCLUDES

This section includes furnishing and erecting an RTP (rolled, tapered panel) _____ gallon bolted steel reservoir and necessary piping and appurtenances, per AWWA D-103 specifications.

1.2 QUALIFICATIONS OF TANK SUPPLIER

A. The Engineer's selection of a Fusion Bond powder coated bolted steel 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.

B. 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.

C. The tank shown on the contract drawings and specified herein shall be a LIQ Fusion 8000 FBE™ powder-coated, RTP bolted tank as manufactured by Tank Connection.

D. 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.

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.

Tank suppliers wishing to pre-qualify shall submit the following typical structure drawing(s) to the Engineer/Owner for consideration:

1. List of tank materials, appurtenances and tank coating technical specifications.
2. Resume of job installation superintendent.
3. 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.
4. 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.
5. The components of the tank that come in contact with stored water shall be certified to meet ANSI/NSF Additives Standard No. 61.

1.3 SUBMITTAL DRAWINGS AND SPECIFICATIONS

A. 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.

B. The bidder is required to furnish, for the approval of the Engineer and at no increase in contract price, 5 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.

C. When approved, two sets of such prints and submittal information will be returned to the bidder marked "**APPROVED FOR CONSTRUCTION".** 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.

PART 2 – DESIGN CRITERIA

2.1 TANK SIZE

A. 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 AND ELEVATION

A. Tank working capacity shall be _____ gallons (nominal).

B. Freeboard space in top of tank shall be a minimum of _____ft.

C. Tank base elevation shall be at _____ft.

2.3 TANK DESIGN STANDARDS

A. 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 addition.

B. The tank coating system shall conform solely to Section 10.6 Thermoset Powder Coatings of ANSI/AWWA D103, latest addition.

C. 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.

D. 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.

PART 3 – MATERIAL SPECIFICATIONS

3.1 PLATES AND SHEETS

A. Plates and sheets used in the construction of the tank shell, tank floor and tank roof, shall comply with the minimum standards of AWWA D103.

B. Design requirements for plate and sheet steel shall be ASTM A36; or ASTM A1011 Grade 36, 40, 50, 60; or A572 Grade 50, 60; or A656 Grade 50, 60 or 70.

3.2 ROLLED STRUCTURAL SHAPES

A. Material shall conform to minimum standards of ASTM A36, A572 Grade 50, A992 or ANSI 1010.

3.3 HORIZONTAL WIND STIFFENERS

A. The design of such elements shall be limited in use. When the design requires for them, a full and detail calculation to their strength and stresses must follow AWWA D103.

3.4 BOLT FASTENERS

A. 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.

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

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

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

E. Bolt Head Encapsulation.

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

G. 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.

H. 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

A. 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.

B. 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.

C. Sealant curing rate at 73°F and 50% RH

D. Tack-free time: 6 to 8 hours

E. Final cure time: 10 to 12 hours

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

PART 4 – FACTORY POWDER COAT PROCESS

4.1 CLEANING

A. Following the fabrication process, sheets and tank components shall thoroughly washed and rinsed.
   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.
   2. The soap concentration shall be monitored and maintained according to the range recommended for use by the manufacturer for the cleaning process.
   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. All water shall be removed from sheets and tank components with forced air.

4.2 SURFACE PREPARATION

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

4.3 POWDER COATING

A. 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

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

C. Exterior prime coat, LIQ Fusion 8000 FBE™ will be applied at 3 mils nominal DFT, with a range from 3-5 mils avg.

D. 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.

E. Visual inspection for coverage shall be made after powder application, prior to first oven cure.

4.4 POWDER CURING GEL

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

A. SDP top coat shall be applied on all exterior surfaces at 3 mils nominal DFT, with a range from 3-5 mils avg.
B. 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.
C. Visual inspection will be performed randomly before the second oven curing.

4.6 FINAL CURING

A. 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

A. During final cool down, sheets shall be randomly inspected for cure, adhesion, coating thickness and holidays.
B. Cure shall be controlled by comparing oven data and may be verified using random MEK rub tests.
C. Adhesion shall be confirmed using the “100 squares” test (ASTM Class 5B).
D. Coating thickness shall be confirmed using a dry film thickness gage.
E. Holiday testing shall be performed with tinker & razor wet sponge according to ASTM D5162-01 Method A (or equivalent).

4.8 PACKAGING

A. After cool down and inspection, the sheets and tank components shall be unloaded and packaged for shipment.
B. 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.
C. Roof sheets and hopper or bottom sheets as well as other tank components shall be packaged to prevent damage and then wrapped and banded.

PART 5 – TANK STRUCTURE

5.1 FUSION BOND POWDER-COATED STEEL FLOOR

A. The floor is to be a Fusion Bond powder-coated bolted steel floor. Bolted steel panels shall be placed over a compacted gravel base contained by a concrete ringwall. A non-extruding and resilient bituminous type filler, meeting the

requirements of ASTM D1751, should be placed between the tank floor and concrete ringwall.

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

C. Tolerance on finished foundations shall be level within +/- 1/8 in within any 30 ft of circumference under the shell. The levelness on the circumference shall not vary by more than +/- ¼" from an established plane.

5.2 ALTERNATIVE EMBEDDED BASE SETTING RING AND CONCRETE FLOOR

A. The floor design is of reinforced concrete with an embedded fusion coated carbon steel starter sheet per the manufacturer's design and in accordance with AWWA D103, Sec. 13.4, Type 6.

B. 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.

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

D. Place one elastomer water stop seal strip on the inside surface of the starter ring below concrete floor line. Install materials in accordance with tank manufacuturer's instructions.

5.3 SIDEWALL STRUCTURE

A. 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.

B. Particular care shall be taken in handling and bolting of the tank panels and members to avoid abrasion of the coating system.

C. 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.

D. 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.

E. 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

A. Fusion Bond powder-coated steel deck

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 post supported. Both live and dead loads shall be carried by the tank walls and any center supports.

B. Alternative Clear-span Aluminum Dome
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.
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. 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.
4. Materials:
    a. Triangulated space truss: 6061-T6 or 6005A-T6 aluminum struts and gussets.
    b. Triangulated closure panels: .050"t 3003-H16 aluminum sheet.
    c. Tension ring: 6061-T6 or 6005A-T6 aluminum.
    d. Fasteners: 7075-T73 anodized aluminum or series 300 stainless steel.
    e. Sealants and gaskets: gunnable silicone and neoprene rubber.
    f. Dormers, doors, vents and hatches: 6061-T6, 5086-H34 or 3003-H16 aluminum.

5.5 APPURTENANCES

A. Pipe Connections
1. Overflow piping shall be _____ inches nominal diameter schedule 10 carbon steel coated externally or schedule 40 PVC. A 90 degree internal weir elbow with external downcomer pipe and flap valve shall be provided for the overflow.
2. Inlet and outlet connections shall conform to the sizes and locations specified on the plan sheets.

B. Outside Tank Ladders
1. An outside tank ladder shall be furnished and installed as shown on the contract drawings.
2. Safety cage and step-off platforms shall be fabricated of galvanized steel or aluminum as listed on engineering drawings. Ladders will be equipped with a hinged lockable entry device and comply with OSHA 1910.28 (b) (9).

C. Access Doors
1. A shell manway shall be provided as shown on the contract drawings in accordance with AWWA D103.
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.

D. 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 design rate of water fill or withdrawal, the resulting interior design pressure / vacuum will not exceed the tank's rated design pressure / vacuum.
   2. The overflow pipe shall not be considered to be a tank vent.
   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.

E. Roof Hatch
   1. 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 square. 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.

F. Roof Perimeter Guardrail
   1. Perimeter guardrail and toeboard around the perimeter of the deck shall be provided and installed as specified on the project drawings.

G. Liquid Level Indicator
   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.

H. Identification Plate
   1. 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.

PART 6 – INSTALLATION

6.1 INSTALLATION PROCESS

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

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

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

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

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

6.2 FIELD TESTING

A. Hydrostatic

1. Following completion of erecting and cleaning of the tank, the structure shall be tested for liquid tightness by filling tank to its overflow or top operating liquid level elevation.
2. The contractor in accordance with the manufacturer'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 tank erector. Disposal of test water shall be the responsibility of the owner.

PART 7– DISINFECTION

7.1 STANDARDS

A. 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.

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

PART 8 – TANK MANUFACTURER'S WARRANTY

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 two (2) years. The warranty on the tank interior lining will be five (5) years.