ELEVATED WATER STORAGE TANK SPECIFICATION
COMPOSITE PEDESTAL DESIGN

PART 1 – GENERAL

1.1 DESCRIPTION

A. The work of this section includes but is not limited to;

1. Design, furnish and erect an elevated storage tank, including foundation, concrete support column with one of the following; LIQ Fusion 8000 FBE™ coated/Stainless Steel/Stainless Steel Fusion Bond coated bolted tank structure and tank appurtenances as shown on the Contract Drawings and described herein (Reference applicable tank design requirements/specifications if other than Fusion Bond Coated.)

2. Contractor shall provide all required labor, materials and equipment.

1.2 QUALITY ASSURANCE

A. Qualifications of Tank Supplier:

1. The bidder shall offer a new elevated water storage tank as supplied from a U.S.A. tank manufacturer specializing in the design and erection of flat panel bolted steel tanks.

2. The tank shown on the drawings and specified herein will be an RTP bolted tank as manufactured by Tank Connection.

3. The engineer's selection of a bolted tank is predicated on a thorough examination of design criteria, construction methods, and optimum coating for resistance for internal and external tank corrosion. Deviations from the specified design will not be permitted.

4. The foundation, pedestal base support and water storage tank must be installed and or fabricated by the tank manufacturer; use of subcontractors to perform these portions of work is strictly prohibited. (Where adequate soil bearing is absent use of a caisson or piling sub will be permitted)

1.3 SUBMITTALS

A. General: Submit in accordance with Section_____.

B. Design Drawings:

1. Submit detailed design drawings for tank accessories bearing the seal of a Professional Engineer registered in _____.

C. Tank Foundation Drawings:

1. Submit tank foundation and footing design computations bearing the seal of a Professional Engineer registered in _____.

2. Submit specification for foundation concrete describing ingredients, concrete compressive strength, reinforcement, air content, slump, placement and consolidation, curing and finishing. Submit concrete design mix including ingredient proportions, minimum cement content, and water/cement ratio.

3. Submit detailed shop drawings of reinforcing bars including bar lists.

D. 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.

E. Certificates

1. Submit certification attesting that all materials, accessories and design incorporated into the tank complies with AWWA D103, these specifications or applicable standards as required.

PART 2 – PRODUCTS

2.1 DESIGN CRITERIA

A. Tank size: As shown on the Contract Drawings.

B. Tank capacity:

1. Tank working capacity shall be _____ gallons; with the bottom of water elevation (pedestal height) set at _____ ft.

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

3. Tank Diameter _____ft.

4. Tank height _____ft.

2.2 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 12.6 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.

E. The tank manufacturer will be ISO-9001 Certified.

F. Design Loads

1.) Specific Gravity: 1.0
2.) Wind velocity per IBC/AWWA
3.) Shape Factor: 0.6
4.) Allowable Soil: _____ psf
5.) Roof Snow Load: _____ psf
6.) Seismic per IBC/AWWA
7.) Soil Site Class_____

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 (min), 40, 50, 60 or 70.

1. Mild strength steel shall meet ASTM A1011 Grade 30 with a maximum allowable tensile stress of 15,000psi.

2. High strength steel shall meet ASTM A1011 Grade 50 with a maximum allowable tensile stress of 26,000psi

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. Web truss stiffeners will not be allowed.

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 torqueing will not be permitted.

I. Nut and washer will be capped with polypropylene caps.

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 and sheet notches. 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.

3.6 CATHODIC PROTECTION

A. The Manufacturer; if required will provide a cathodic protection system consisting of sacrificial magnesium anodes which provide corrosion protection for the portions of the structure immersed in liquid. The anodes are equally spaced (to the nearest vertical bolt line) around the structure, attached to the floor, and bolted through existing shell sheet bolt holes. In special cases where anodes may be spaced differently, a layout plan will be provided as part of the submittal package. Lead wires and buss bars are used to ensure continuity between anodes and structure shell sheets.

B. The design life shall be calculated at 10 years. The cathodic protection system shall be designed for protection of uncoated steel surfaces in the product zone, including rebar within an uncoated concrete tank floor.

PART 4 – FUSION BOND POWDER COAT SPECIFICATION

4.1 CLEANING

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

B. 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.

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

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

E. 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.

C. 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.

D. 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 SUPPORT PEDESTAL / COLUMN – Concrete pedestal design

A) The support column for the water storage tanks shall be of jump-form concrete construction in accordance with ACI standards 313-91 and ACI 371R-98.

B) The support column will have an outside diameter of _____ft and a height of _____ft above finished grade.

C) Concrete:

1. Compressive Strength:

   a. Concrete support structure = _____ psi (28Mpa)

   b. Foundations = _____ psi (24Mpa)

2. Air Entrainment:

   a. Per ACI 318 – 4-6% in the wall.

3. Curing:

   a. Conform to ACI 318 and ACI 308.

4. Formwork

   a. Formwork design, installation and removal shall conform to the requirements of ACI 318 and the recommendations of ACI 347 R.

5. Concrete Finish

   a. Per Section 3.5 of ACI 371R-98.

   b. A beveled-edge rectangular pattern shall be formed into the outer column surface.

6. An opening shall be made at the base of the column for a 3’ x 7’ personnel door.

7. An opening shall be made near the top of the column for 3’ x 7’ personnel door.

8. An opening shall be made at the base of the column for a roll-up access door; size to be determined as allowed by structural design.

9. A 6" thick reinforced concrete floor poured over a 3" compacted layer of crushed #57 or 2A stone shall be installed inside at the base of the column.

5.2 ROOF

A. 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.

5.3 ROOF VENT

A. A properly sized vent assembly in accordance with AWWA D103 shall be furnished and installed 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.

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

C. The vent shall be constructed of aluminum.

D. 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.

5.4 APPURTENANCES

A. Pipe Connections

1. Overflow piping shall be schedule 80 PVC, aluminum or stainless steel pipe shall comply with AWWA D103, Section 7. The piping shall be installed on the exterior of the tank (as close to the tank as possible), pass thru the walkway, pass into and down the inside of the column, and exit the column near the base emptying onto a stone rip-rap trench.

2. Inlet and outlet piping shall extend thru the tank floor, column floor and down the inside wall of the column with standoff brackets every 10 ft. The piping shall extend thru the floor of the column and be encased in concrete as it extends out under the tank foundation below the applicable frost level where connections will be made to valves or other yard piping.

B. Access Ladders

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

2. An interior caged ladder shall be furnished and installed as shown on the contract drawings.
3. Ladders will be fabricated of hot-dipped galvanized carbon steel or aluminum and comply with OSHA 1910.28 (b) (9).

4. Safety cage as well as intermediate and top step-off platforms shall be fabricated of hot-dipped galvanized carbon steel.

C. Perimeter Walkway

1. One outside perimeter walkway shall be supplied and installed by the tank contractor as shown on the Contract Drawings.

D. Walkway materials

1. Extruded shapes & bars – LIQ Fusion 8000 FBE™ coated ASTM A36 carbon steel, hot-dipped galvanized carbon steel or aluminum material.

2. Bolts, nuts, washers – SAE Gr. 2 (min) galvanized or 304/316 grade stainless steel.

3. Concrete anchors – 304/316 grade stainless steel.

4. Grating – LIQ Fusion 8000 FBE™ coated ASTM A36 carbon steel, hot-dipped galvanized carbon steel or aluminum.

5. Nosing - LIQ Fusion 8000 FBE™ coated ASTM A36 carbon steel, hot-dipped galvanized carbon steel or aluminum

E. Handrail Materials

1. Posts and horizontals – LIQ Fusion 8000 FBE™ coated ASTM A36 carbon steel, hot-dipped galvanized carbon steel or aluminum.

2. Toe Plate- LIQ Fusion 8000 FBE™ coated ASTM A36 carbon steel, hot-dipped galvanized carbon steel or aluminum.

3. All hardware – SAE Gr. 2 (min) galvanized or stainless steel.

4. Post spacing – not to exceed 5'-6".

F. Walkway Fabrication

1. Platform Sections

   a. Where indicated will be shop assembled in sections.
   b. Weld corners and seams continuous complying with AWS recommendations at exposed connections, grind exposed welds smooth and flush.

   c. Finish: LIQ Fusion 8000 FBE™ coated A36 carbon steel, hot-dipped galvanized carbon steel or aluminum.

2. Standards

   a. Complies with OSHA codes.

   b. Designed to support a superimposed live load of 100 PSF.

3. Handrail Fabrication:

   a. Finish: LIQ Fusion 8000 FBE™ coated A36 carbon steel, hot-dipped galvanized carbon steel or aluminum.

b. Complies with OSHA codes.

c. Designed for 200 pound load or 50 pounds per square foot

5.5 ACCESS DOORS

A. A 3' x 7' mandoor shall be installed at the base or the column for entry of utility personnel.

B. A 3' x 7' mandoor shall be installed at the top of the column for entry to the exterior platform. The door shall include and 8" square (minimum) window and 6"H x 12"L louvered & screened vent.

C. A vertical lift door shall be installed at the base of the column to permit entry for vehicles, equipment, and water utility supplies.

5.6 TANK MANWAYS

A. One or two tank sidewall access manway(s) shall be provided as shown on the contract drawings in accordance with AWWA D103.

B. 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.

C. 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 – EXECUTION

6.1 ERECTION

A. EWT Installation

1. Foundation, pedestal installation and tank erection shall be performed by factory trained personnel.

B. Foundation and Support Column

1. The tank column and foundation shall be designed by a Registered Professional Engineer retained by the Tank Manufacturer to provide a design capable of safely sustaining the structure and its live loads.

2. Tank column footing design shall be based on _____ psf soil bearing capacity or greater as determined by geotechnical analysis. The cost of this investigation and analysis is to be included in the bid price.

C. Concrete Tank Floor (support column cap)

1. The tank floor/support column cap design is of reinforced concrete with an embedded starter sheet per AWWA D103 section 13.4.6 and the Tank Manufacturer's design.

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 ½" X 11" X 3/8" thick), shall be used to secure the starter ring, prior to encasement in concrete.

4. Two water stop seals made of a butyl rubber elastomer 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.

D. Steel Tank Floor

1. Steel floor support beams:

   a. Shall be constructed of members meeting ASTM requirements.

   b. Members and connection shall be designed per AISC Manual of Steel Construction and ANSI/AISC 360 Specification for Structural Steel Buildings.

   c. Finish: LIQ Fusion 8000 FBE™ coated.

E. Sidewall Structure

1. Field erection of the bolted steel tank shall be in strict accordance with the procedures outlined by the manufacturer, and performed by an authorized dealer of the Tank Manufacturer, regularly engaged in erection of these tanks.

2. Specialized synchronized jacks and building equipment developed by the Tank Manufacturer shall be used to erect the tanks.

3. Particular care shall be taken to avoid damage (i.e., scratches, abrasion) to the baked-on powder coatings when handling and bolting tank panels and members during field installation.

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

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. Any leaks disclosed by this test shall be corrected by the erector in accordance with the manufacturer's recommendations.

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.