SECTION 221216 - FIRE WATER STORAGE TANKS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide, design and install two 200,000 gallon (nominal capacity and usable capacity) Fire Water factory coated, bolted steel holding tanks, including tank foundations, tank structures, free span domes, piping to and including flanges outside of tanks, and tank appurtenances as indicated on the Drawings, in accordance with these specifications and as needed for a complete and proper installation.

1.2 ACTION SUBMITTALS

A. Product data: After the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section.
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
3. Shop drawings showing plan, elevation and sectional views, material of construction, foundation details, the location of all openings, vents, manways and erection details sign and sealed by a Professional Engineer in the State of Arkansas.
4. Complete set of structural calculations for the tank structure and concrete foundation signed and sealed by a Professional Engineer licensed in the State of Arkansas.

B. Provide Operation and Maintenance Manuals.

C. The Engineer of Record shall review and approve all submittals.

1.3 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates, for water storage tanks and components, from manufacturer.

B. Welding certificates.

C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Fabrication Qualification: Employ a qualified structural engineer to prepare calculations, Shop Drawings, and other structural data for fabrication and erection of surface water storage tanks.

1. Engineering Responsibility: Preparation of data for surface water-storage tanks, accessories, specified appurtenances, and concrete supports and foundations, including Shop Drawings, based on testing and engineering analysis of manufacturer’s standard units in assemblies, similar to those indicated for this Project.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
3. AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."

C. Pipe Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding, Brazing, and Fusing Qualifications."

1.6 PRODUCT HANDLING

A. Handle and store all tank components in accordance with tank manufacturer's instructions.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Surface water-storage tank, including structural reinforcement and foundation, shall be capable of withstanding the effects of dead and live gravity loads.

B. Seismic Performance: Surface water-storage tank, including structural reinforcement and foundation, shall be capable of withstanding the effects of earthquake motions determined according to authorities having jurisdiction.

C. Thermal Movements: Surface water-storage tank, including structural reinforcement and foundation, shall allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with AWWA D103, "Factory-Coated Bolted Steel Tanks for Water Storage," and with AWWA M42, "Steel Water-Storage Tanks," for bolted-steel, surface water-storage tanks.

F. Comply with NFPA 22, "Water Tanks for Private Fire Protection," for surface water-storage tanks for fire-suppression water supply.

2.2 BOLTED-STEEL SUCTION TANKS

A. Provide factory coated steel, bolted tank.

B. Description: Bolted-steel plates, bolts, rods, and reinforcing steel; designed and fabricated according to AWWA D100, AWWA M42, and NFPA 22.

1. Capacity: 200,000 gallons (nominal capacity)
2. Shell Roof: Comply with AWWA D103.
3. Reservoir Shell Diameter: to be determined by AE.
4. Standpipe Shell Height: to be determined by AE from top of foundation to overflow level.
5. Range of Head: to be determined by AE from lower capacity level to overflow level.
6. Pipe Connection: Match size of water-distribution pipe.
7. Overflow Piping: ASTM A 53/A 53M, Grade B, Schedule 40, welded-steel pipe with ASTM A 234/A 234M, Grade W.B., Schedule 40, carbon-steel butt-weld fittings.
8. Interior Ladder with safety cage and aluminum Exterior Staircase with handrails.
9. Roof Hatch: Steel, hinged cover, 24 by 15 inches minimum (600mm by 375mm) with 4-inch (100mm) neck and 2-inch (50mm) downward overlap with hasp and lock, located over the interior ladder and adjacent to the exterior stair.
10. Roof Manhole: Steel, removable, 20-inch (500mm) minimum diameter cover with 4-inch (100mm) neck and 2-inch (50mm) downward overlap with hasp and lock. Construct opening with capability of supporting ventilation fan. AE to review and confirm that the sizes are local code compliant.
11. Shell Sidewall Manholes: Two, steel, circular, 24 inches (600mm) in diameter.
12. Tank Vent: Steel pipe with stainless-steel screen.
13. Foundation: Reinforced concrete. Refer to Section 033000 "Cast-in-Place Concrete".
14. Tank Signage to indicate tank as containing Non-Potable Fire Protection Water.

2.3 DESIGN

A. Conform to the following standards:

1. Tank design: NFPA 22 Chapter 6 Factory Coated, Bolted Steel Tanks.
2. Materials, fabrication and erection: NFPA 22 Section 6.2, 6.5, & 6.6.
3. Corrosion Protection/Tank coating system: NFPA 22 Section 6.3.
4. Tank Gaskets: NFPA 22 Section 6.2.1.
5. Tank Sealant: NFPA 22 Section 6.2.1.
6. Tank Filling: NFPA 22 Section 14.4.
7. Tank Heating: NFPA 22 Section 16.2.
8. Acceptance Test Requirements: NFPA 22 Chapter 17.

B. Design loads:

1. Comply with NFPA 22 for specific load requirements.

C. Provide FM approved tanks.

2.4 PAINT MATERIALS

A. Paint: Comply with AWWA D102.

B. Primer: Tank fabricator's standard epoxy-polyamide paint.

C. Tank Shell Interior Finish Paint: Tank fabricator's standard epoxy-polyamide paint complying with NSF 61 Annex G and compatible with prime coat.

D. Tank Shell Exterior Intermediate Paint: Tank fabricator's standard, two-component epoxy paint compatible with prime and finish paint. Intermediate coat shall have a slight color contrast with finish coat.

E. Tank Shell Exterior Finish Paint: Tank fabricator's standard urethane paint.

1. Color: As selected by Owner from tank manufacturer's paint chart.

2.5 CONCRETE TANK FLOOR

A. Tank foundation design shall be based on the soil bearing capacity given and estimates of differential center to edge settlement 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.

B. Design tank foundation per geotechnical report recommendations and in accordance with Div 03 specs.

2.6 FREEZE PROTECTION

A. Provide a tank heating system in accordance with NFPA 22 requirements.

B. Maintain a minimum 42°F (5.5°C) water temperature.

C. Provide heat tracing on exposed fill line in accordance with NFPA 13 and NFPA 22 with a capacity to maintain a minimum temperature of 42°F (5.5°C).

2.7 ACCESSORIES

A. Tank heaters:

1. Provide tank with a heating system in accordance with NFPA 22 requirements where the lowest mean temperature is <5°F (-15°C).
2. Maintain a minimum 42°F (5.5°C) water temperature at -10°F ambient temperature (-23°C).
3. Connect tank heater controls to fire-alarm systems according to NFPA 13 and NFPA 22.

B. Heat Tracing: Comply with NFPA 13 and with capacity to maintain 42 degree F water temperature inside exposed fill line.

1. Connect heat-tracing controls to fire-alarm systems according to NFPA 12 and NFPA 22.

C. Piping: 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 latest edition. A single component urethane sealer shall be applied on any cut panel edges or bolt connections.

D. The Contractor shall furnish and install base elbows and the connecting piping for the tank inlet, outlet, overflow, and drain, as follows (refer to Contract Drawings for locations):

1. Inlet: The 8 inch (203mm) inlet pipe shall begin 6 inches (150mm) above the tank's expected maximum operating water level. Connect tank to domestic water supply for filling/refill.
2. Outlet: The 12 inch (304mm) outlet pipe shall begin 18 inches (450mm)above the bottom and shall terminate with a long radius bend complete with anti-vortex plate installed in a concrete pipe pit. The pit dimensions shall be proposed to suit.
3. Overflow: The overflow shall be 10 inch (250mm) MJ pipe installed on the exterior of the tank beginning at the overflow level.
4. Drain: Connect drains to storm drainage piping.

E. Water storage tank fill line shall be piped to enter top of adjacent water storage tank with air gap a minimum 12" above tank overflow for backflow prevention.

F. Tank fill valve float sensing lines shall be installed within tank to minimize potential for freezing.

G. Gate Valves: Valves shall be double disc gate valves with non-rising stems and handwheel operator. Valves shall be manufactured in accordance with AWWA C500. Valve ends shall be flange type. Valves shall open left and shall have O ring stem seals.

H. Storage tank fill valve: Provide hydraulically operated and pilot controlled altitude valve for filling of adjacent surface water storage tank:

1. Basis of design: Cla-Val 610-01 or approved equivalent.
2. Protect valve and sensing tube from freezing.

I. Instrumentation: Flanged connections for instrumentation.

J. Water-Level Controls: Automatic controls for maintaining water level in tank, with valves, piping, and audible and visual alarms to indicate the following:

1. High- and low-water levels. Signals communicate to the fire alarm system for monitor.
2. Tank overflowing or tank not filling. Signals communicate to the fire alarm system for monitor.
3. Monitor valves through the Fire Alarm Control Panel in accordance with NFPA 72.

K. Obstruction Lighting: Comply with the requirements of authorities having jurisdiction.

L. Lightning Protection: Comply with the requirements in Div 26.

M. Provide pipe supports designed for and at the intervals necessary to provide support for piping within and on the tank.

N. Interior Tank ladder:

1. Provide stainless steel or FRP interior ladder from the top of the foundation to the roof and locate near the roof manway with safety cage and step off platforms.

O. Exterior Tank stair:

1. Provide aluminum stair from the top of the foundation to the roof with intermediate landings conforming to OSHA/EU OSHA, and local legislation requirements.

P. Exterior Visual Level Indicator:

1. Provide one (1) Model 6700 Varec liquid gauge or approved equivalent with float and aluminum gauge board (full travel).

Q. Electrode Connection:

1. The Tank Manufacturer shall furnish and install in the roof, two 2-1/2 inch (65mm) stainless steel pipe couplings with standard pipe threads and plugs.
2. Couplings shall be welded in place on the top of the tank at locations adjacent to the outside tank stair.
3. The Contractor shall furnish and install a 3/4 inch (22mm) wire conduit from each coupling to the base of the tank:

    a. Conduit shall be rigid heavy duty type with screwed joints properly fastened to the tank.

R. Level Gauge Connection:

1. Furnish and install a ¾" (22mm) bossed tap with standard pipe thread and plug. The tap shall be installed in the side of the tank 5' (1,500mm) above the top of the tank foundation.

S. Tank ventilation:

1. Steel pipe with stainless-steel screen, constructed to prevent entrance of rain, insects, birds, and animals. Include pressure-vacuum screened vent or separate pressure-vacuum relief mec hanism to maintain clear screen.

T. Overflow Switch:
1. Provide roof flange mounted overflow switch and all necessary appurtenances required for installation.

U. General:

1. Provide brass or stainless steel identification plate attached to the outside of the pedestal approximately 5' (1,500mm) above the foundation near the stair:

a. Stencil into the metal: Manufacturer, erection date, capacity, height to overflow from the top of the foundation and height to low water line from the top of the foundation.

2. Provide additional accessories as needed and/or required by OSHA.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELEVATED WATER-STORAGE TANKS

A. Foundation: The tank foundation shall be designed and installed by the Tank Supplier.

B. Tank Floor:

1. The floor design is of reinforced concrete with an embedded glass coated steel starter sheet per the manufacturer's design and in accordance with AWWA D103, Sec 11.4. Slot mount style foundation is not acceptable.

C. Sidewall structure:

1. Field erection of the coated, bolted-steel tank shall be in strict accordance with the procedures outlined in the manufacturer's erection manual, and performed by an authorized dealer of the tank manufacturer, regularly engaged in erection of these tanks.
2. Use specialized erection jacks and building equipment developed and manufactured by the tank manufacturer to erect the tanks.
3. Take particular care in handling and bolting the tank panels and members to avoid damage of the coating system.
4. Prior to a liquid test, all surface areas shall be visually inspected by the Engineer.
5. 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.
6. 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.
7. Perform an electrical "holiday" detection test during erection using a 9-volt leak detection device. All electrical leak points found on the inside surface shall be repaired in accordance with the manufacturer's published touch-up procedure using urethane sealer.

a. Reject sheets with excessive "holidays" so as to minimize field touch- up.

D. Water level, control valves, piping, and alarms. Connect valve tamper switches to alarm system for monitoring per NFPA 72.

E. Install tank heaters according to NFPA 22.

F. Install tank heater and heat tracing control panels in fire pump house.

3.2 CONNECTIONS

A. Connect tanks to water-distribution piping.

B. Connect drains to storm-drainage piping.

C. Ground equipment according to Division 26.

D. Connect wiring according to Division 26.

3.3 SURFACE PREPARATION OF STEEL TANKS

A. Field Cleaning: After erecting tank shell, remove burrs, dirt, and construction debris and repair damaged fi nishes.

B. Field Surface Preparation: After field cleaning, prepare steel surfaces where shop prime coat has been damaged, according to Specifications listed above for shop cleaning, and remove dust or residue from cleaned surfaces.

C. If surface develops rust before prime coat is applied, repeat field surface preparation.

D. Overflow Pipe: Paint pipe exterior that is outside tank and structure as indicated for tank exterior.

E. Exterior Stairs to Roof Hatch: Paint as indicated for tank shell exterior.

F. Do not paint if ambient temperature is less than 50 degree F or is expected to drop below 40 degree F in the next 18 hours. Do not paint if temperature of steel surface is higher than 125 degree F. Do not apply paint if surfaces are wet or damp, if precipitation is expected, or if relative humidity will exceed 85 percent. Do not spray paint when wind velocity exceeds 15 mph. Maintain at least a 24-hour waiting period between coats. Provide adequate ventilation in tank during painting to maintain clear atmosphere and provide explosion -proof flood lighting and spot lighting.

G. Complete daily painting to allow time for paint to dry before condensation is expected.

3.4 FIELD TESTING

A. Testing and acceptance of tank, piping and accessories shall be in accordance with NFPA 22 requirements.

B. Concrete Testing: Refer to in situ concrete specification .

C. Leak Test for Bolted Tanks:

1. Comply with AWWA D103 and NFPA 22. Fill tanks with non-potable water and test for leaks after installation. Repair leaks and retest until no leaks exist.
2. Water will be furnished by the Owner.
3. Test and adjust control and safeties. Replace damaged and malfunctioning controls and equipment.

D. Remove and replace malfunctioning units and retest as specified above.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the following:

1. Obstruction lighting.
2. Water-level controls.
3. Tank heating system.

END OF SECTION 221216