SECTION 22 12 16
FACILITY ELEVATED, POTABLE-WATER STORAGE TANKS

SPEC WRITER NOTES:
1. Use this section only for NCA projects.
2. Delete between //------// if not applicable to project. Also delete any other item or paragraph not applicable in section and renumber the paragraphs.
3. Specify cathodic protection for underground water piping only if severe corrosion problems exist in the area. Discuss with local Water Authority and the VAMC, and specify cathodic protection, if warranted.
4. Provide hazard lighting if required by FAA.

PART 1 - GENERAL

1.1 DESCRIPTION
A. An elevated steel water storage tank and tower, completed, including risers, piping, drains, materials, labor, equipment, painting, sterilization and all accessories as required.

1.2 RELATED WORK
A. Protection of Materials and Equipment: Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.
B. Lightning Protection: Section 26 41 00, FACILITY LIGHTNING PROTECTION.

1.3 QUALITY ASSURANCE
A. Criteria:
   1. Manufacturer regularly and presently manufactures the item submitted as one of their principal products.
   2. Installer, or supplier of a service, has technical qualifications, experience and trained personnel, and facilities to perform the specified work.
B. System Requirements: NFPA No. 22 for steel tanks plus the following:
   1. Steel Tower Supporting Elevated Water Tank Design Loads:
      a. Weight of Tank and Water.
      b. Wind Load.
      d. Combined Loads: Design for the worst case:
         1) Gravity and wind.
         2) Gravity and seismic.

1.4 SUBMITTALS
A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Manufacturers' Literature and Data:
   1. Piping.
   2. Valves.
   3. Floor Drain.
   4. Steel Tank and Accessories.
   5. Alarm System.
   6. OSHA approved climbing equipment for maintenance personnel.
   7. Tank Heating Equipment.
   8. Lightning Protection.
C. Calculations and completely detailed erection procedure with and shop drawings.
D. Foundation, footings and calculation, designed by a professional structure engineer.

1.5 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
B. American Institute of Steel Construction (AISC):
   Steel Construction Manual, Thirteenth Edition
C. American Society of Mechanical Engineers (ASME):
   A112.6.3-2001 Floor and Trench Drains
   B16.1-2005 Grey Iron Pipe Flanges and Flanged Fittings
D. American Society of Civil Engineers (ASCE):
   Minimum Design Loads for Buildings and Other Structures - ASCE 7-05
E. American Society for Testing and Materials (ASTM):
   A36/A36M-08 Standard Specification for Carbon Structural Steel
   A53/A53M-07 Standard Specification for Pipe, Steel, Black and Hot-dipped, Zinc-coated, Welded and Seamless
   A123/A123M-09 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
   A153/A153M-09 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
   A234/A234M-07 Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel For Moderate and High Temperature Service
F. American Water Works Associations (AWWA):
   C110/A21.10-03 Ductile-Iron and Gray-Iron Fittings for Water
   C115/A21.15-05 Standard for Flanged Ductile-Iron Pipe with Threaded Flanges
PART 2 - PRODUCTS

2.1 TANK

SPEC WRITER NOTES: Select the type of tank required and provide a detailed drawing showing the tank height, capacity, high and low water levels, VAMC logo, hazard lighting and other pertinent data for a complete installation. Due to its esthetics the pedestal tank is preferred.

A. Shall be in accordance with NFPA 22 and ASTM A36.
B. The tank shall be of the double ellipsoidal type and supported by columns (Double ellipsoidal // Pedestal Sphere or Spheroid) //.
C. The tank shall be constructed of one quarter inch thick steel and welded throughout.
D. The wind loading shall be ____kg/m² (___lb/ft²) on the vertical surfaces, ____kg/m² (___lb/ft²) on the projected areas of cylindrical surfaces and ____kg/m² (___lb/ft²) on projected area of conical and double-curved plate surfaces. The entire structure shall withstand a ___km/hr (____mph) winds.
E. Design the tank to withstand earthquake zone ______ as defined by the Veterans Affairs Handbook H-18-8.
F. The balcony and ladder loading shall be as specified in AWWA D100, furnish OSHA approved climbing equipment.

2.2 FOUNDATION

SPEC WRITER NOTES: Provide at least one soil boring in the area of the proposed tank for the contractor reference.

A. The elevated water tower contractor shall be responsible for the soil borings, design and installation of the foundation and footings.

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B. The soil borings shall be performed by an independent and established soils engineering firm.

2.3 ACCESSORIES

A. Comply with NFPA No. 22. Main riser and overflow shall be schedule 40 steel, ASTM A53 with schedule 40, ASTM A234, butt welded fittings.
B. The main tank riser shall be ______mm (___inch).
C. Overflow: Provide a ___ mm ___ (inch) steel pipe extended to grade with an overflow visible before spilling into a storm sewer inlet. The overflow shall be provided with an insect screen.
D. Rigging Lugs for future maintenance: Provide 6 mm (1/4 inch) minimum diameter holes. Lugs shall be located to access all portions of the tank and shall be capable of sustaining a load of 450 kg (1000 pounds).

SPEC WRITER NOTES: Use paragraph E, F & G only for double ellipsoidal tanks.

E. Protection Shields: Provide each column with a circular protection shield projecting at least 600 mm (2 feet) from column. Shield on ladder column shall be 6 mm (1/4 inch) steel plate and other shields shall be 3 mm (1/8 inch) steel plate. Hinged trap door in ladder column shield shall swing up and left. Trap door shall have a welded-on hasp and staple, and a pin tumbler type padlock with chain welded to shield. Key padlock in RE/COTR set.
F. Riser: Steel riser shall be ____mm (____ inch) diameter. Supply pipe shall be ____mm (____ inch) diameter. Riser manhole shall be 600 mm (24 inches) minimum.
G. Perimeter Safety Railing for Riser Opening in Tank: Provide a circular steel railing around perimeter of riser opening in bottom of tank. Railing shall be 1050 mm (3 feet 6 inches) high and constructed of four 50 mm by 50 mm by 10 mm (2 inch by 2 inch by 3/8 inch) angle uprights welded to riser compression ring or tank construction at bottom, one 50 mm by 50 mm by 10 mm (2 inch by 2 inch by 3/8 inch) circular angle top member, and two 40 mm by 6 mm (1-1/2 inch by 1/4 inch) circular bars with first bar located 200 mm (8 inches) above bottom of tank, and second bar at midpoint between first bar and top member of railing.

2.4 PIPING

A. Pipe:
   1. Ductile Iron:
      a. Underground: AWWA C151, working pressure 1025 kPa (150 psig), exterior and interior bituminous coating.
      b. In Pits: AWWA C115, flanged joints only, working pressure 1025 kPa (150 psig).
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B. Fittings: Ductile-iron, AWWA C110.

2.5 VALVES
A. Altitude: Differential type, hydraulically operated, diaphragm-actuated iron body, bronze mounted, self-contained unit. Valve shall close when water level in tank reaches a point 150 mm (6 inches) below tank overflow.
1. //Single Acting Valve: Shall remain closed against upstream pressure until water level in tank drops to a point 600 mm (2 feet) below tank overflow //.
2. //Double Acting Valve: Shall remain closed until upstream pressure drops below pressure available when water is 150 mm (6 inches) below tank overflow //.
B. Check: Iron body, bronze trim swing type, vertical or horizontal installation, flange connection, 1375 kPa (200 psig) WOG, Underwriters Laboratories Inc. listed and approved.
C. Gate: Flanged, non-rising stem type. Valve shall turn counterclockwise to open. Furnish hand wheel for operation. Ends of valves shall suit, or be adapted to pipe furnished.

2.6 FLOOR DRAIN
//A. Cast iron with light duty grate, bottom outlet //.
//B. Cast iron with light duty grate, side outlet //.

2.7 HIGH AND LOW WATER LEVEL ALARM SYSTEMS
A. Provide high and low level devices for alarm monitoring and an intermediate device for tank water level status.
1. All three water levels shall be indicated by their respective pilot lights; green for high, amber for intermediate and red for low water levels, and a buzzer for low and high water levels.
2. Buzzer and the respective pilot lights at high and low water levels shall be energized while the high or low water level pilot device is actuated.
3. Depressing a silencing button shall silence the buzzer indicating the water level and shall remain in OFF condition. The pilot light shall remain energized.
4. Resetting the pilot light shall de-energize the pilot light and release the buzzer from its sealed-off condition.

SPEC WRITER NOTES; Coordinate with the mechanical design engineer and modify the following as required to suit the design conditions.
5. Provide alarming contacts to a DDC (Direct Digital Controls) remotely to the operator. //

2.8 TANK HEATING

SPEC WRITE NOTES: Provide heating for tanks located where the lowest mean temperature for one day is less than -15 degrees C (5 degrees F). NFPA 22 defines many ways for heating the tank water including steam coils, hot water coils, solar panels, direct discharge of steam, etc.

A. Provide tank heating to protect the tank from freezing in accordance with NFPA 22.

//B. Electric Heat: Nickel chromium, electric-resistance elements, helix wound, factory-wired with time delay for element staging, and overcurrent and overheat protective devices. //

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install Tank and tower in accordance with NFPA 22.

B. Install safety ladders in accordance with NFPA 22 and OSHA requirements.

3.2 TANK INSPECTION

A. Comply with NFPA 25.

3.3 LEAKAGE TEST

A. Comply with NFPA 22 and NFPA 25.

3.4 LIGHTNING PROTECTION

A. Comply with NFPA 22.

SPEC WRITER NOTES: Select either painting or metallic coatings.

// 3.5 FIELD PAINTING

A. After construction, all weld seams, unprimed margins, field bolts, lugs and any area where the factory primer has been damaged shall be blast cleaned and re-primed with the same factory primer. Apply paint in accordance with NFPA No. 22 and AWWA D102. The exterior paint color and the VAMC logo shall be as directed by the VAMC //.

// 3.6 METALLIC COATINGS

A. Tower members, protection shield, ladders, ladder safety cages, rigging lugs, overflow pipe and riser shall be zinc-coated (galvanized) by the hot-dip method, ASTM A123. Bolts and similar fasteners shall be zinc-coated by the hot-dip method, ASTM A153. Hot-dip galvanized surfaces abraded or burned off by welding operations shall be repaired with zinc repair compound in stick or powder form, applied in accordance with the manufacturer's printed instructions.
B. All interior surfaces and all interior components of the tank shall be zinc metallized, and all exterior surfaces of the tank and any additional surfaces not previously designated shall be aluminum metallized after construction and testing. Application of metallized coatings shall be as specified in Section 09 06 00, SCHEDULE FOR FINISHES. //

//C. Option: In lieu of hot-dip galvanizing members, all such members may be aluminum metallized as specified in Section 09 06 00, SCHEDULE FOR FINISHES.//

3.7 FLUSHING

After tests and // painting // metallizing //, flush tank and connecting pipelines.

3.8 DISINFECTION/ STERILIZATION

A. After flushing, thoroughly disinfect and sterilize the tank and connecting piping as required by AWWA C652. Following a contact period of 24 hours, flush the system with clean water until the residual chlorine content is not greater than that of the water supply. All valves in water line being disinfected shall be opened and closed several times during the 24 hour period.

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