Summary of Modifications/Changes in this Update

This Summary of Changes is for information only. It is not a part of the referenced document, and should not be used for project documentation.

U.S. Department of Veterans Affairs ♦ Office of Construction & Facilities Management

DATE OF THIS VERSION (new)
January 1, 2014

TITLE OF DOCUMENT (new title if applicable):

DATE OF VERSION BEING SUPERSEDED (old):
May 1, 2011

DESCRIPTION OF DOCUMENT (previous title, number, other identifying data):
Facility Elevated, Potable Water Storage Tanks, 22 12 16

SUMMARY OF CHANGES IN THIS VERSION:

1. Added Spec Writer Note regarding Lead Free Standard
2. Added reference to International Plumbing Code
3. Added references NSF 372 to account for “Lead Free” requirements that takes effect on January 4, 2014.
4. Added Section 2.1 MATERIALS to account for “Lead Free” requirements that takes effect on January 4, 2014.
SECTION 22 12 16
FACILITY ELEVATED, POTABLE—WATER STORAGE TANKS

SPEC WRITER NOTES:
1. Delete between /*-----*/ if not applicable to project. Also delete any other item or paragraph not applicable in section and renumber the paragraphs.
2. 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.
3. The "Safe Drinking Water Act" (SDWA) was originally passed into law in 1974. It was amended several times. The "Reduction of Lead in Drinking Water Act" was passed in January 2011 and amends the SDWA to the new lead free standard to include NSF 61 and NSF 372.

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.
   SPEC WRITE NOTE: Provide hazard lighting only, if required by the FAA.
C. Hazard Lighting: Division 26.
E. COMMISSIONING OF PLUMBING SYSTEMS, SECTION 22 08 00: Requirements for commissioning, systems readiness checklist, and training.

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, trained personnel, and facilities to perform the specified work.

3. Submit a list of five completed projects of similar type and references with current position, address, telephone number, and e-mail.

B. System Requirements: AWWA D100 for steel tanks plus the following:
   1. Steel Tower Supporting Elevated Water Tank Design Loads:
      a. Weight of Tank and Water.
      b. Wind Load.
      c. Seismic Load.
      d. Combined Loads: Design for the worst case:
         1) Gravity and wind.
         2) Gravity and seismic.
      e. // Snow Load. //

2. IBC and local building codes.

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. All construction drawings to have a PE Stamp.

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 and stamped by a professional Structural 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):

C. American Society of mechanical Engineers (ASME):
   ANSI/ASME A112.6.3-2001 Floor and Trench Drains
   ANSI/ASME A112.6.3-2001 Cast Iron Pipe Flanges and Flanged Fittings
   ASME.ANSI B16.34-2009 Valves, flanged, threaded and welded end.

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 ............. 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 ............. Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
   C151/A21.51-09 ............. Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
   B300-10 ................. Standards for Hypochlorites
   B301-10 ................. Standards for Liquid Chlorine
   C652-02 ................. Disinfection of Water Storage Facilities
   D100-05 ................. Welded Steel Tanks for Water Storage
ANSI/AWWA D102-06 ..... Coating Steel Water-Storage Tanks

G. International Code Council (ICC)

H. National Fire Protection Association (NFPA):
   NFPA 22-08 ............ Water Tanks for Private Fire Protection
   NFPA 25-08 ............ Standard for the Inspection, Testing and
                         Maintenance of Water-Based Fire Protection
                         Systems

I. Department of Veterans Affairs (Handbook):

J. NSF INTERNATIONAL (NSF)
   NSF/ANSI 61 (2012) ..... Drinking Water System Components–Health Effects
   NSF/ANSI 372 (2011) ... Drinking Water System Components–Lead Content

PART 2 – PRODUCTS

2.1 MATERIALS
   A. Material or equipment containing a weighted average of greater than
      0.25 percent lead shall not be used in any potable water system
      intended for human consumption, and shall be certified in accordance
      with NSF/ANSI 61 or NSF 372.

2.2 TANK

   SPEC WRITER NOTE: Select the type of tank
   required and provide a detailed drawing
   showing the tank height, capacity, high
   and low water levels, VAMC logo 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, AWWA D-100-05 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 minimum thick steel
      plus .01” for corrosion allowance. Tank shall be 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 // International Building Code Requirement //.

F. The balcony and ladder loading shall be as specified in AWWA D100, furnish OSHA approved climbing equipment.

2.3 FOUNDATION

SPEC WRITER NOTE: 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.

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

2.4 ACCESSORIES

A. Comply with // NFPA No. 22 // AWWA D100-05 //. 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 and splash block.

SPEC WRITER NOTE: Use paragraph D, E & F only for double ellipsoidal tanks.

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).

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 Resident Engineer's 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.

H. Vent: Vent shall be welded to the cover plate of the center manhole on the roof. Vent will be tank manufacturer's standard type mushroom vent with aluminum bird screen. The free area of the vent shall be sized 50 percent in excess of the [_____] L/second gpm pump-in rate and [_____] L/second gpm pump-out rate. Screening for vent shall conform to Section 5.7.2 of AWWA D100 //Ensure fail-safe operation in the event that screen frosts over and the bottom of the screen shall be sufficiently elevated for snow consideration in the area//.

I. Ladders and Safety Devices: Ladders and safety devices shall be provided in accordance with Sections 7.4 and 7.5 of AWWA D100. Location of ladders shall be as shown on the drawings. Sections 7.4 and 7.5 of AWWA D100 represent the minimum requirement. In addition, safety cage, rest platforms, roof ladder handrails, and other safety devices shall be provided as required by federal or local laws or regulations.

J. Balconies: Provide a balcony a minimum of 600 mm (2 feet) wide with a standard guard railing. Provide a structural steel railing with a top rail 1050 mm (42 inches) above balcony platform with an intermediate rail halfway between. Guard rail shall be capable of withstanding a force of 888 N (200 pounds) applied in any direction. Install a steel toe board with minimum height of 100 mm (4 inches). Bottom of toe board shall be a maximum 6 mm (1/4 inch) from platform top. Extend guard rail and toe board entire length of balcony except where access openings are required. For balcony floors use diamond plates a minimum of 6 mm (1/4 inch) thick, punched or drilled for drainage. //Equip access openings in guard rail with a gate which closes automatically.// Hatches through balcony floor shall be counterbalanced or otherwise arranged to open from below.

**2.5 PIPING**

A. Pipe:

1. Ductile Iron:
   a. Underground: AWWA C151, working pressure 1025 kPa (150 psig), exterior bituminous coating and interior cement lining.
2. In Pits: AWWA C115, flanged joints only, working pressure 1025 kPa (150 psig).


B. Fittings: Ductile-iron, AWWA C110.

SPEC WRITER NOTE: Coordinate with the mechanical design engineer and modify the following paragraph as required to suit the design conditions.

2.6 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. approved.

C. Gate: Fed Spec WW-V-58, Type II, class I, 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.

2.7 VALVE CHAMBER

A. Valve chamber shall be sufficiently large to house all control valves and fittings; and allow for unobstructed maintenance and replacement. Pipes, valves, and fittings shall be supported on concrete blocks where necessary. The valve chamber shall be constructed to provide not less than _____ mm (_____ feet) of cover over the pipes. The valves and fittings shall extend from the //standpipe//reservoir//riser pipe// connection to a point one length of pipe outside the valve chamber walls on the main or feed line to the //elevated tank//standpipe//. The drain line shall be carried to an outlet as indicated on the drawings. The access manhole shall be not less than 760 mm (30 inches) in diameter.
2.8 FLOOR DRAIN
ASME A112.6.3-2001, Cast iron with light duty grate.
//A. Bottom outlet//.
//B. Side outlet//.

2.9 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.
5. Provide alarming contacts to a DDC (Direct Digital Controls) remotely to the ECC (Engineering Control Center) operator.

2.10 TANK HEATING
SPEC WRITE NOTE: 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 Chapter 16 Water Tank Heating. Maintain water temperature at or above 42°F (5.6°C) at all times.
//B. Electric Heat: Nickel chromium, electric-resistance elements, helix wound, factory-wired with time delay for element staging, and overcurrent and overheat protective devices. //
//C. Hot Water Pipe: Copper tubing.//
//D. Steam Water Heater:
1. Shall consist of cast-iron or steel shell where water circulates around steam tubes or coils of brass or copper.
2. Steam water heater shall be connected to a reliable steam supply with a pressure not less than 0.7 bar (10 psig) and not over 3.4 bar (50 psig).

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 AWWA and NFPA 25 requirements.

3.3 LEAKAGE TEST:
   A. Comply with AWWA, NFPA 22 and NFPA 25 requirements.

3.4 LIGHTNING PROTECTION
   A. Comply with NFPA 22.

   SPEC WRITER NOTE: 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 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.
3.7 FLUSHING
A. 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 with a chlorine and hypochlorite solution 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. Hypochlorite material shall comply with Fed Spec O-C-114 or Fed Spec O-S-602, grade B.
B. Hypochlorite material shall comply with AWWA B300-10.

3.9 COMMISSIONING
A. Provide commissioning documentation in accordance with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS for all inspection, startup, and contractor testing required above and required by the System Readiness Checklist provided by the Commissioning Agent.
B. Components provided under this section of the specification will be tested as part of a larger system. Refer to Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS and related sections for contractor responsibilities for system commissioning.

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