SECTION 221216 - FACILITY ELEVATED, POTABLE-WATER STORAGE TANKS

Revise this Section by deleting and inserting text to meet Project-specific requirements.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
	* + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			1. SUMMARY
				1. Section Includes:

Double-ellipsoidal, multiple-column, elevated water-storage tanks.

Hybrid, multiple-column, elevated water-storage tanks.

Torus, multiple-column, elevated water-storage tanks.

Double-cone, single-pedestal, elevated water-storage tanks.

Spherical, single-pedestal, elevated water-storage tanks.

Spheroidal, single-pedestal, elevated water-storage tanks.

Steel-pillar, modified single-pedestal, elevated water-storage tanks.

Composite, modified single-pedestal, elevated water-storage tanks.

Elevated water-storage tank appurtenances.

* + - * 1. Related Requirements:

Retain subparagraph below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.

Section 221219 "Facility Ground-Mounted, Potable-Water Storage Tanks" for welded- and bolted-steel reservoirs and standpipes and concrete tanks.

* + - 1. DEFINITIONS

Retain terms that remain after this Section has been edited for a project.

* + - * 1. Bottom Capacity Level (BCL): Water level above which the specified capacity is provided.
				2. Capacity: Net volume, in gallons, that may be removed from a tank filled to TCL and emptied to BCL.
				3. Minimum Capacity within Operating Range: Capacity when water level is at BCL.
				4. Range of Head: Vertical distance between TCL and BCL.
				5. Top Capacity Level (TCL): Water level defined by the lip of the overflow elevation.
			1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are submitted and tabbed (for combined submittals).
				4. Product Data: For each type of facility elevated, potable-water storage tank, include rated capacities, accessories, appurtenances, and furnished specialties.
				5. Shop Drawings: Signed and sealed by a qualified professional Director’s Representative. Show fabrication and installation details for each facility elevated, potable-water storage tank, including the following:

Tank shell.

Retain first subparagraph below for multiple-column, elevated, potable-water storage tanks.

Riser and columns, for multiple-column, elevated, potable-water storage tanks.

Retain first subparagraph below for single-pedestal, elevated, potable-water storage tanks.

Pedestal, for single-pedestal, elevated, potable-water storage tanks.

Retain first subparagraph below for modified single-pedestal, elevated, potable-water storage tanks.

Pillar, for modified single-pedestal, elevated, potable-water storage tanks.

Balcony, safety railings, ladders, and foundations.

Retain first subparagraph below if multifloors are required in modified single-pedestal, elevated, potable-water storage tanks.

Fabrication and installation details for floors in modified single-pedestal, elevated, potable-water storage tanks.

Plans, elevations, sections, and attachment details.

Structural analysis data signed and sealed by the qualified professional Director’s Representative responsible for their preparation.

Diagrams for power, signal, and control wiring.

Retain "Seismic Qualification Data" paragraph below if required by seismic criteria applicable to Project. Coordinate with Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment." See ASCE/SEI 7 for certification requirements for equipment and components.

* + - * 1. Seismic Qualification Data: Certificates, for elevated, potable-water storage tanks and components, from manufacturer.

Basis for Certification: Indicate calculation upon which withstand certification is based.

Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

Retain "Welding certificates" paragraph below if retaining "Welding Qualifications" paragraph in "Quality Assurance" Article.

* + - * 1. Welding certificates.
				2. Bacteriological test results.

Retain "Field quality-control reports" paragraph below if Contractor is responsible for field quality-control testing and inspecting.

* + - * 1. Field quality-control reports.
			1. CLOSEOUT SUBMITTALS
				1. Operation and Maintenance Data: For the following to include in emergency, operation, and maintenance manuals:

Obstruction lighting.

Lightning protection.

Cathodic protection.

Tank heaters.

* + - 1. QUALITY ASSURANCE
				1. Fabricator Qualifications: Employ a qualified structural Director’s Representative to prepare calculations, Shop Drawings, and other structural data for fabrication and erection of elevated, potable-water storage tanks.

Engineering Responsibility: Preparation of data for elevated, potable-water storage tanks, accessories, specified appurtenances, steel supports and bracing, 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.

Retain "Welding Qualifications" paragraph below if shop or field welding is required. If retaining, also retain "Welding certificates" paragraph in "Informational Submittals" Article.

* + - * 1. Welding Qualifications: Qualify procedures and personnel according to the following:

Retain applicable standards in subparagraphs below.

AWS D1.1, "Structural Welding Code - Steel."

AWS D1.3, "Structural Welding Code - Sheet Steel."

AWS D1.4, "Structural Welding Code - Reinforcing Steel."

Retain "Pipe Welding" paragraph below for pipe welding.

* + - * 1. Pipe Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding, Brazing, and Fusing Qualifications."
1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

* + - 1. PERFORMANCE REQUIREMENTS
				1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 “Standard for Electrical Safety in the Workplace”, by a qualified testing agency, and marked for intended location and application.

Retain "Exception" subparagraph below only for composite, modified single-pedestal, elevated, potable-water storage tanks.

Exception: Portions of composite, elevated, potable-water storage tanks that are not fabricated of welded steel.

Retain "Tanks for Potable-Water Storage and Fire-Suppression Water Supply" paragraph below if tank is used for both potable and fire-protection water storage.

* + - * 1. Tanks for Potable-Water Storage and Fire-Suppression Water Supply: Comply with NFPA 22 “Standard for Water Tanks for Private Fire Protection”, "Water Tanks for Private Fire Protection."
				2. Comply with NSF 61 “Drinking Water Systems Components - Health Effects” and NSF 372 “Drinking Water System Components - Lead Content.
				3. Comply with 29 CFR 1910 “Definition and Requirements for a Nationally Recognized Testing Laboratory”.

Revise wind load in "Structural Performance" paragraph below to suit local conditions.

* + - * 1. Structural Performance: Elevated, potable-water storage tank, including tank shell, structural reinforcement, supports, and foundations, shall withstand the effects of dead and live gravity loads and winds of [**100 mph**] <**Insert value**>.

Retain "Seismic Performance" paragraph below with "Seismic Qualification Data" paragraph in "Informational Submittals" Article for projects requiring seismic design. Delete paragraph if performance requirements are indicated on Drawings. Model building codes and ASCE/SEI 7 establish criteria for buildings subject to earthquake motions. Coordinate with structural engineer.

* + - * 1. Seismic Performance: Elevated, potable-water storage tank, including tank shell, structural reinforcement, supports, and foundations, shall withstand the effects of earthquake motions determined according to [**ASCE/SEI 7**] <**Insert requirement**>.

Retain first subparagraph below to define the term "withstand" as it applies to this Project. Definition varies with type of building and occupancy and is critical to valid certification. Option is used for essential facilities where equipment must operate immediately after an earthquake.

The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified[**and the unit will be fully operational after the seismic event**]."

For life-safety components required to function after an earthquake (such as fire-sprinkler system components that contain hazardous content, and storage racks in structures open to the public), the Component Importance Factor is 1.5. For other components, the Component Importance Factor is 1.0 unless the structure is in Seismic Use Group III and component is necessary for continued operation of facility or failure of component could impair continued operation of facility, in which case the Component Importance Factor is 1.5.

Component Important Factor: [**1.5**] [**1.0**].

See ASCE/SEI 7, Coefficients for Architectural Component Table and Seismic Coefficients for Mechanical and Electrical Components Table for requirements to be inserted in subparagraph below.

<**Insert requirements for Component Amplification Factor and Component Response Modification Factor**>.

* + - * 1. Thermal Movements: Elevated, potable-water storage tank, including tank shell, structural reinforcement, supports, and foundations, 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. Base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

Differential values in "Temperature Change" subparagraph below are suitable for most of the U.S. Revise temperature range below to suit local conditions.

Temperature Change: [**120 deg F, ambient; 180 deg F,** ] <**Insert temperature change**>.

* + - 1. DOUBLE-ELLIPSOIDAL, MULTIPLE-COLUMN, ELEVATED WATER-STORAGE TANKS

Double-ellipsoidal, multiple-column, elevated, potable-water storage tanks in this article have typical capacities of 20,000 to 200,000 gal.

* + - * 1. Description: Ellipsoidal top and bottom and vertical sidewall, with welded-steel plates, bolts, rods, and reinforcing steel.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=2076) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Caldwell Tanks, Inc](http://www.specagent.com/Lookup?uid=123457177230).

[Chicago Bridge & Iron Company N.V](http://www.specagent.com/Lookup?uid=123457177231).

[Pittsburg Tank & Tower Co., Inc](http://www.specagent.com/Lookup?uid=123457177234).

Approved equivalent.

In "Standard" paragraph below, retain option if tank is for fire-suppression water supply. Some authorities having jurisdiction may have more stringent requirements. Consult authorities having jurisdiction and manufacturers.

* + - * 1. Standard: Tanks and accessories shall be designed and fabricated according to AWWA D100 “Standard for Welded Carbon Steel Tanks for Water [**and NFPA 22**] <**Insert standards**>.
				2. Shell Capacity: [**20,000 gal.**] [**200,000 gal.**] <**Insert capacity**>.
				3. Minimum Capacity within Operating Range: <**Insert capacity**>.
				4. Tank Height: <**Insert height in feet**> from top of foundation to overflow level.
				5. Range of Head: <**Insert height in feet**> from BCL to overflow level.
				6. BCL: <**Insert height of level above top of foundation**>.

Do not retain safety grate option in "Riser" Paragraph below if freezing could occur in tank.

* + - * 1. Riser: Welded-steel pipe, with [**12-by-18-inch-**] <**Insert dimensions**> minimum, reinforced-steel manhole with locking device[**; and steel safety grate with 18-by-18-inch- minimum, hinged door over top of riser**].
				2. Pipe Connections: Match size of water-distribution pipe.
				3. Overflow Piping: ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipper, Zinc-Coated, Welded and Seamless”, Grade B, Schedule 40, welded-steel pipe with ASTM A234 “Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service”, Grade WPB, Schedule 40, carbon-steel butt-welded fittings.
				4. Ladders:

Delete first option in "Materials" subparagraph below if painting is required.

Materials: [**Galvanized steel**] [**Steel**].

Safety Devices: As required by 29 CFR 1910 “Standard for Welded Carbon Steel Tanks for Water” (OSHA) safety and health regulations.

Exterior: Located outside tank on one column, shell sidewall, and roof.

Interior: Located inside tank[**and riser**].

Size: Custom sized to tank.

* + - * 1. Roof Opening Hatch at Ladder: Comply with AWWA D100 “Standard for Welded Carbon Steel Tanks for Water”. Steel, hinged cover, [**24 by 24 inches**] <**Insert dimensions**> minimum with [**4-inch**] <**Insert dimension**> curb and [**2-inch**] <**Insert dimension**> downward overlap with hasp and lock, located over interior ladder and adjacent to exterior ladder.
				2. Roof Center Opening: Comply with AWWA D100 “Standard for Welded Carbon Steel Tanks for Water”. Steel, removable [**30-inch-**] minimum-diameter cover with [**4-inch-**] <**Insert dimension**> minimum, height curb and minimum [**2-inch**] <**Insert dimension**> downward overlap with hasp and lock. Construct opening with capability of supporting ventilation fan.

Consult local tank painters to determine if lugs, couplings, or rail option in "Painter's Accessories" Paragraph below is preferred.

* + - * 1. Painter's Accessories: Removable [**12-inch-**] <**Insert dimension**> minimum-diameter cover on tank roof with [**4-inch**] <**Insert dimension**> neck and [**2-inch**] <**Insert dimension**> downward overlap with hasp and lock. Include [**lugs**] [**couplings**] [**rail**] inside and outside the tank for painting.

Retain both options in "Tank Vent" paragraph below if required by authorities having jurisdiction.

* + - * 1. Tank Vent: ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipper, Zinc-Coated, Welded and Seamless”, Grade B, Schedule 40, welded-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 mechanism to maintain clear screen.**]
				2. Balcony with Handrail: Steel, 24-inch- minimum-width balcony with 42-inch- minimum-height handrail, according to 29 CFR 1910 “Definition and Requirements for a Nationally Recognized Testing Laboratory”.

Retain option in "Tower" paragraph below if tank is for fire-suppression water supply.

* + - * 1. Tower: Steel columns, struts, and windage rods according to AWWA D100 “Standard for Welded Carbon Steel Tanks for Water “[**and NFPA 22**].
				2. Riser and Column Foundations: Reinforced concrete. See Section 033000 "Cast-in-Place Concrete."
				3. Siphon System: Include valved connection to overflow pipe for 3/4-inch hose that will be used to siphon water that remains below riser pipe opening when shell is drained.
			1. HYBRID, MULTIPLE-COLUMN, ELEVATED WATER-STORAGE TANKS

Hybrid, multiple-column, elevated, potable-water storage tanks in this article have typical capacities of 200,000 to 500,000 gal.

* + - * 1. Description: Ellipsoidal top, torus bottom, and vertical sidewall, with welded-steel plates, supporting riser, bolts, rods, and reinforcing steel.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=2077) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Caldwell Tanks, Inc](http://www.specagent.com/Lookup?uid=123457177239).

[Phoenix Fabricators & Erectors](http://www.specagent.com/Lookup?uid=123457177241).

[Pittsburg Tank & Tower Co., Inc](http://www.specagent.com/Lookup?uid=123457177242).

Approved equivalent.

In "Standard" paragraph below, retain option if tank is for fire-suppression water supply. Some authorities having jurisdiction may have more stringent requirements. Consult authorities having jurisdiction and manufacturers.

* + - * 1. Standard: Tanks and accessories shall be designed and fabricated according to AWWA D100 ‘Standard for Welded Carbon Steel Tanks for Water “[**and NFPA 22**] <**Insert standards**>.
				2. Shell Capacity: [**200,000 gal.**] [**500,000 gal.**] <**Insert capacity**>.
				3. Minimum Capacity within Operating Range: <**Insert capacity**>.
				4. Tank Height: <**Insert height in feet**> from top of foundation to overflow level.
				5. Range of Head: <**Insert height in feet**> from lower capacity level to overflow level.
				6. BCL: <**Insert height of level above top of foundation**>.

Do not retain safety grate option in "Riser" paragraph below if freezing could occur in tank.

* + - * 1. Riser: Welded-steel pipe, with [**12-by-18-inch-**] <**Insert dimensions**> minimum, reinforced-steel manhole with locking device[**; and steel safety grate with 18-by-18-inch minimum, hinged door over top of riser**].
				2. Pipe Connection: Match size of water-distribution pipe.
				3. Overflow Piping: ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipper, Zinc-Coated, Welded and Seamless”, Grade B, Schedule 40, welded-steel pipe with ASTM A234 “Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service”, Grade WPB, Schedule 40, carbon-steel butt-welded fittings.
				4. Ladders:

Delete first option in "Materials" subparagraph below if painting is required.

Materials: [**Galvanized steel**] [**Steel**].

Safety Devices: As required by 29 CFR 1910 “Definition and Requirements for a Nationally Recognized Testing Laboratory” (OSHA) safety and health regulations.

Exterior: Located outside tank on one column, shell sidewall, and roof.

Interior: Located inside tank[**and riser**].

Size: Custom sized to tank.

* + - * 1. Roof Opening Hatch at Ladder: Steel, hinged cover, [**24 by 24 inches**] <**Insert dimensions**> minimum with [**4-inch**] <**Insert dimension**> neck and [**2-inch**] <**Insert dimension**> downward overlap with hasp and lock, located over interior ladder and adjacent to exterior ladder.
				2. Roof Center Opening: Steel, removable [**20-inch-**] <**Insert dimension**> minimum-diameter cover with [**4-inch**] <**Insert dimension**> neck and [**2-inch**] <**Insert dimension**> downward overlap with hasp and lock. Construct opening with capability of supporting ventilation fan.

Consult manufacturers to determine if lugs, couplings, or rail option in "Painter's Accessories" Paragraph below is preferred.

* + - * 1. Painter's Accessories: Removable [**12-inch-**] <**Insert dimension**> minimum-diameter cover on tank roof with [**4-inch**] <**Insert dimension**> neck and [**2-inch**] <**Insert dimension**> downward overlap with hasp and lock. Include [**lugs**] [**couplings**] [**rail**] inside and outside the tank for painting.

Retain both options in "Tank Vent" paragraph below if required by authorities having jurisdiction.

* + - * 1. Tank Vent: ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipper, Zinc-Coated, Welded and Seamless”, Grade B, Schedule 40, welded-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 mechanism to maintain clear screen.**]
				2. Balcony with Handrail: Steel, 24-inch- minimum-width balcony with 42-inch- minimum-height handrail, according to 29 CFR 1910 “Definition and Requirements for a Nationally Recognized Testing Laboratory.

Retain option in "Tower" paragraph below if tank is for fire-suppression water supply.

* + - * 1. Tower: Steel columns, struts, and windage rods according to AWWA D100 “Standard for Welded Carbon Steel Tanks for Water “[**and NFPA 22**].
				2. Riser and Column Foundations: Reinforced concrete. See Section 033000 "Cast-in-Place Concrete."
				3. Siphon System: Include valved connection to overflow pipe for 3/4-inch hose that will be used to siphon water that remains below riser pipe opening when shell is drained.
			1. TORUS, MULTIPLE-COLUMN, ELEVATED WATER-STORAGE TANKS

Torus, multiple-column, elevated, potable-water storage tanks in this article have typical capacities of 500,000 to 3,000,000 gal. (1890 to 11 350 cu. m).

* + - * 1. Description: Mushroom shape with ellipsoidal top and torus bottom steel shell, with welded-steel plates, supporting riser, bolts, rods, and reinforcing steel.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=2078) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Caldwell Tanks, Inc](http://www.specagent.com/Lookup?uid=123457177243).

[Phoenix Fabricators & Erectors](http://www.specagent.com/Lookup?uid=123457177245).

[Pittsburg Tank & Tower Co., Inc](http://www.specagent.com/Lookup?uid=123457177246).

Approved equivalent.

In "Standard" paragraph below, retain option if tank is for fire-suppression water supply. Some authorities having jurisdiction may have more stringent requirements. Consult authorities having jurisdiction and manufacturers.

* + - * 1. Standard: Tanks and accessories designed and fabricated according to AWWA D100 “Standard for Welded Carbon Steel Tanks for Water “[**and NFPA 22**] <**Insert standards**>.
				2. Shell Capacity: [**500,000 gal.**] [**3,000,000 gal.**] <**Insert capacity**>.
				3. Minimum Capacity within Operating Range: <**Insert capacity**>.
				4. Tank Height: <**Insert height in feet**> from top of foundation to overflow level.
				5. Range of Head: <**Insert height in feet**> from lower capacity level to overflow level.
				6. BCL: <**Insert height of level above top of foundation**>.

Do not retain safety grate option in "Riser" Paragraph below if freezing could occur in tank.

* + - * 1. Riser: Welded-steel pipe, with 12-by-18-inch- minimum, reinforced-steel manhole with locking device[**; and steel safety grate with 18-by-18-inch minimum, hinged door over top of riser**].
				2. Pipe Connection: Comply with AWWA D100 “Standard for Welded Carbon Steel Tanks for Water”. Match size of water-distribution pipe.
				3. Overflow Piping: ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipper, Zinc-Coated, Welded and Seamless”, Grade B, Schedule 40, welded-steel pipe with ASTM A234 “Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service”, Grade WPB, Schedule 40, carbon-steel butt-welded fittings.
				4. Ladders:

Delete first option in "Materials" subparagraph below if painting is required.

Materials: [**Galvanized steel**] [**Steel**].

Safety Devices: As required by 29 CFR 1910 “Definition and Requirements for a Nationally Recognized Testing Laboratory”.

Exterior: Located outside tank on one column, shell sidewall, and roof.

Interior: Located inside tank[**and riser**].

Size: Custom sized to tank.

* + - * 1. Roof Opening Hatch at Ladder: Steel, hinged cover, [**24 by 24 inches**] <**Insert dimensions**> minimum with [**4-inch**] <**Insert dimension**> neck and [**2-inch**] <**Insert dimension**> downward overlap with hasp and lock, located over interior ladder and adjacent to exterior ladder.
				2. Roof Center Opening: Comply with AWWA D100 “Standard for Welded Carbon Steel Tanks for Water”. Steel, removable [**20-inch-**] <**Insert dimension**> minimum-diameter cover with [**4-inch**] <**Insert dimension**> neck and [**2-inch**] <**Insert dimension**> downward overlap with hasp and lock. Construct opening with capability of supporting ventilation fan.

Consult manufacturers to determine if lugs, couplings, or rail option in "Painter's Accessories" Paragraph below is preferred.

* + - * 1. Painter's Accessories: Removable [**12-inch-**] <**Insert dimension**> minimum-diameter cover on tank roof with [**4-inch**] <**Insert dimension**> neck and [**2-inch**] <**Insert dimension**> downward overlap with hasp and lock. Include [**lugs**] [**couplings**] [**rail**] inside and outside the tank for painting.

Retain both options in "Tank Vent" paragraph below if required by authorities having jurisdiction.

* + - * 1. Tank Vent: ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipper, Zinc-Coated, Welded and Seamless”, Grade B, Schedule 40, welded-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 mechanism to maintain clear screen.**]
				2. Balcony with Handrail: Steel, 24-inch- minimum-width balcony with 42-inch- minimum-height handrail.

Retain option in "Tower" Paragraph below if tank is for fire-suppression water supply.

* + - * 1. Tower: Steel columns, struts, and windage rods according to AWWA D100 “Standard for Welded Carbon Steel Tanks for Water “[**and NFPA 22**].
				2. Riser and Column Foundations: Reinforced concrete. See Section 033000 "Cast-in-Place Concrete."
				3. Siphon System: Include valved connection to overflow pipe for 3/4-inch hose that will be used to siphon water that remains below riser pipe opening when shell is drained.
			1. DOUBLE-CONE, SINGLE-PEDESTAL, ELEVATED WATER-STORAGE TANKS

Double-cone, single-pedestal, elevated, potable-water storage tanks in this article have typical capacities of 25,000 to 200,000 gal. (95 to 757 cu. m).

* + - * 1. Description: Inverted cone on upright cone with no sidewall steel shell, with welded-steel plates, bolts, rods, and reinforcing steel.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=2081) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Chicago Bridge & Iron Company N.V](http://www.specagent.com/Lookup?uid=123457177236).

[Pittsburg Tank & Tower Co., Inc](http://www.specagent.com/Lookup?uid=123457177237).

Approved equivalent.

In "Standard" paragraph below, retain option if tank is for fire-suppression water supply. Some authorities having jurisdiction may have more stringent requirements. Consult authorities having jurisdiction and manufacturers.

* + - * 1. Standard: Tanks and accessories shall be designed and fabricated according to AWWA D100 “Standard for Welded Carbon Steel Tanks for Water” [**and NFPA 22**] <**Insert standards**>.
				2. Shell Capacity: [**25,000 gal.**] [**200,000 gal.**] <**Insert capacity**>.
				3. Minimum Capacity within Operating Range: <**Insert capacity**>.
				4. Tank Height: <**Insert height in feet**> from top of foundation to overflow level.
				5. Range of Head: <**Insert height in feet**> from lower capacity level to overflow level.
				6. BCL: <**Insert height of level above top of foundation**>.
				7. Dry Well: Welded steel, located in tank.
				8. Pipe Connection: Match size of water-distribution pipe.
				9. Overflow Piping: ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipper, Zinc-Coated, Welded and Seamless”, Grade B, Schedule 40, welded-steel pipe with ASTM A234 “Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service”, Grade WPB, Schedule 40, carbon-steel butt-welded fittings.
				10. Ladders:

Delete first option in "Materials" subparagraph below if painting is required.

Materials: [**Galvanized steel**] [**Steel**].

Safety Devices: As required by 29 CFR 1910 “Definition and Requirements for a Nationally Recognized Testing Laboratory”.

Size: Custom sized to tank.

Delete option in "Location" subparagraph below if freezing of water inside tank is anticipated.

Location: Inside tank dry well from pedestal to tank roof,[**inside tank from tank bottom to roof,**] and inside pedestal from pedestal base to tank.

* + - * 1. Roof Opening Hatch at Ladder: Steel, hinged cover, [**24 by 24 inches**] <**Insert dimensions**> minimum or as required by OSHA, with [**4-inch**] <**Insert dimension**> curb and [**2-inch**] <**Insert dimension**> downward overlap with hasp and lock, located over interior ladder.
				2. Roof Center Opening: Steel, removable [**20-inch-**] <**Insert dimension**> minimum-diameter cover with [**4-inch-**] <**Insert dimension**> minimum-height neck and minimum [**2-inch**] <**Insert dimension**> downward overlap with hasp and lock. Construct opening with capability of supporting ventilation fan.

Consult manufacturers to determine if lugs, couplings, or rail option in "Painter's Accessories" Paragraph below is preferred.

* + - * 1. Painter's Accessories: Removable [**12-inch-**] <**Insert dimension**> minimum-diameter cover on tank roof with [**4-inch**] <**Insert dimension**> neck and [**2-inch**] <**Insert dimension**> downward overlap with hasp and lock. Include [**lugs**] [**couplings**] [**rail**] inside and outside the tank for painting.

Retain both options in "Tank Vent" paragraph below if required by authorities having jurisdiction.

* + - * 1. Tank Vent: ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipper, Zinc-Coated, Welded and Seamless”, Grade B, Schedule 40, welded-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 mechanism to maintain clear screen.**]

Delete first option in "Tank Handrail" paragraph below if painting is required.

* + - * 1. Tank Handrail: [**Galvanized steel**] [**Steel**], 42-inch- minimum height, according to 29 CFR 1910 “Definition and Requirements for a Nationally Recognized Testing Laboratory”.
				2. Pedestal:

Fabrication: Welded-steel, truncated cone base with cylindrical column.

Platform: [**24-inch-**] <**Insert dimension**> minimum width, inside at top.

Opening between Pedestal and Tank Dry Well: Same diameter as tank dry well.

Manway between Pedestal and Tank Bottom: Steel, waterproof-hinged door with locking device, [**12 by 16 inches**] <**Insert dimensions**> minimum.

Painter's Manway at Platform Level: Steel, [**20-inch-**] <**Insert dimension**> minimum door.

Pedestal Access Door: Steel, [**30 by 60 inches**] <**Insert dimensions**> minimum with locking device.

* + - * 1. Pedestal Foundation: Reinforced concrete. See Section 033000 "Cast-in-Place Concrete."
				2. Painter's Rail: Locate inside and outside of pedestal top, and inside and outside of tank shell.
			1. SPHERICAL, SINGLE-PEDESTAL, ELEVATED WATER-STORAGE TANKS

Spherical, single-pedestal, elevated, potable-water storage tanks in this article have typical capacities of 25,000 to 200,000 gal.

* + - * 1. Description: Spherical steel shell, with welded-steel plates, bolts, rods, and reinforcing steel.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=2084) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Caldwell Tanks, Inc](http://www.specagent.com/Lookup?uid=123457177247).

[Phoenix Fabricators & Erectors](http://www.specagent.com/Lookup?uid=123457177249).

[Pittsburg Tank & Tower Co., Inc](http://www.specagent.com/Lookup?uid=123457177250).

Approved equivalent.

In "Standard" paragraph below, retain option if tank is for fire-suppression water supply. Some authorities having jurisdiction may have more stringent requirements. Consult authorities having jurisdiction and manufacturers.

* + - * 1. Standard: Tanks and accessories shall be designed and fabricated according to AWWA D100 “Standard for Welded Carbon Steel Tanks for Water” [**and NFPA 22**] <**Insert standards**>.
				2. Shell Capacity: [**25,000 gal.**] [**200,000 gal.**] <**Insert capacity**>.
				3. Minimum Capacity within Operating Range: <**Insert capacity**>.
				4. Tank Height: <**Insert height in feet**> from top of foundation to overflow level.
				5. Range of Head: <**Insert height in feet**> from BCL to overflow level.
				6. BCL: <**Insert height of level above top of foundation**>.
				7. Dry Well: Welded steel, located in tank.
				8. Pipe Connection: Match size of water-distribution pipe.
				9. Overflow Piping: ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipper, Zinc-Coated, Welded and Seamless”, Grade B, Schedule 40, welded-steel pipe with ASTM A234 “Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service”, Grade WPB, Schedule 40, carbon-steel butt-welded fittings.
				10. Ladders:

Materials: Galvanized steel.

Safety Devices: As required by 29 CFR 1910 “Definition and Requirements for a Nationally Recognized Testing Laboratory”.

Size: Custom sized to tank.

Delete option in "Location" subparagraph below if freezing of water inside tank is anticipated.

Location: Inside tank dry well from pedestal to tank roof,[**inside tank from tank bottom to roof,**] and inside pedestal from pedestal base to tank.

* + - * 1. Roof Opening Hatch at Ladder: Steel, hinged cover, [**24 by 24 inches**] <**Insert dimensions**> minimum, or as required by OSHA, with [**4-inch**] <**Insert dimension**> curb and [**2-inch**] <**Insert dimension**> downward overlap with hasp and lock, located over interior ladder.
				2. Roof Center Opening: Comply with AWWA D100 “Standard for Welded Carbon Steel Tanks for Water”. Steel, removable [**20-inch-**] <**Insert dimension**> minimum-diameter cover with [**4-inch**] <**Insert dimension**> minimum-height neck and [**2-inch**] <**Insert dimension**> downward overlap with hasp and lock. Construct opening with capability of supporting ventilation fan.

Consult manufacturers to determine if lugs, couplings, or rail option in "Painter's Accessories" Paragraph below is preferred.

* + - * 1. Painter's Accessories: Removable [**12-inch-**] <**Insert dimension**> minimum-diameter cover on tank roof with [**4-inch**] <**Insert dimension**> neck and [**2-inch**] <**Insert dimension**> downward overlap with hasp and lock. Include [**lugs**] [**couplings**] [**rail**] inside and outside the tank for painting.

Retain both options in "Tank Vent" paragraph below if required by authorities having jurisdiction.

* + - * 1. Tank Vent: ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipper, Zinc-Coated, Welded and Seamless”, Grade B, Schedule 40, welded-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 mechanism to maintain clear screen.**]

Delete first option in "Tank Handrail" paragraph below if painting is required.

* + - * 1. Tank Handrail: [**Galvanized steel**] [**Steel**], 42-inch- minimum height, according to 29 CFR 1910 “Definition and Requirements for a Nationally Recognized Testing Laboratory”.
				2. Pedestal:

Fabrication: Welded-steel, truncated cone base with cylindrical column.

Platform: [**24-inch-**] <**Insert dimension**> minimum width, inside at top.

Opening between Pedestal and Tank Dry Well: Same diameter as tank dry well.

Manway between Pedestal and Tank Bottom: Steel, waterproof-hinged door with locking device, [**12 by 16 inches**] <**Insert dimensions**> minimum.

Painter's Manway at Platform Level: Steel, [**20-inch-**] <**Insert dimension**> minimum door.

Pedestal Access Door: Steel, [**30 by 60 inches**] <**Insert dimensions**> minimum with locking device.

* + - * 1. Pedestal Foundation: Reinforced concrete. See Section 033000 "Cast-in-Place Concrete."
				2. Painter's Rail: Locate inside and outside of pedestal top, and inside and outside of tank shell.
			1. SPHEROIDAL, SINGLE-PEDESTAL, ELEVATED WATER-STORAGE TANKS

Spheroidal, single-pedestal, elevated, potable-water storage tanks in this article have typical capacities of 200,000 to 2,000,000 gal.

* + - * 1. Description: Spheroidal steel shell with its long axis [**horizontal**] [**vertical**], and with welded-steel plates, bolts, rods, and reinforcing steel.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=2085) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Caldwell Tanks, Inc](http://www.specagent.com/Lookup?uid=123457177251).

[Chicago Bridge & Iron Company N.V](http://www.specagent.com/Lookup?uid=123457177252).

[Phoenix Fabricators & Erectors](http://www.specagent.com/Lookup?uid=123457177254).

[Pittsburg Tank & Tower Co., Inc](http://www.specagent.com/Lookup?uid=123457177255).

Approved equivalent.

In "Standard" paragraph below, retain option if tank is for fire-suppression water supply. Some authorities having jurisdiction may have more stringent requirements. Consult authorities having jurisdiction and manufacturers.

* + - * 1. Standard: Designed and fabricated according to AWWA D100 “Standard for Welded Carbon Steel Tanks for Water” [**and NFPA 22**] <**Insert standards**>.
				2. Shell Capacity: [**200,000 gal.**] [**2,000,000 gal.**] <**Insert capacity**>.
				3. Minimum Capacity within Operating Range: <**Insert capacity**>.
				4. Tank Height: <**Insert height in feet**> from top of foundation to overflow level.
				5. Range of Head: <**Insert height in feet**> from lower capacity level to overflow level.
				6. BCL: <**Insert height of level above top of foundation**>.
				7. Dry Well: Welded steel, located in tank.
				8. Pipe Connection: Match size of water-distribution pipe.
				9. Overflow Piping: ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipper, Zinc-Coated, Welded and Seamless”, Grade B, Schedule 40, welded-steel pipe with ASTM A234 “Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service”, Grade WPB, Schedule 40, carbon-steel butt-welded fittings.
				10. Ladders:

Materials: Galvanized steel.

Safety Devices: As required by 29 CFR 1910 “Definition and Requirements for a Nationally Recognized Testing Laboratory”.

Size: Custom sized to tank.

Delete option in "Location" subparagraph below if freezing of water inside tank is anticipated.

Location: Inside tank dry well from pedestal to tank roof,[**inside tank from tank bottom to roof,**] and inside pedestal from pedestal base to tank.

* + - * 1. Roof Opening Hatch at Ladder: Steel, hinged cover, [**24 by 24 inches**] <**Insert dimensions**> minimum or as required by OSHA, with [**4-inch**] <**Insert dimension**> curb and [**2-inch**] <**Insert dimension**> downward overlap with hasp and lock, located over interior ladder.
				2. Roof Center Opening: Steel, removable [**20-inch-**] <**Insert dimension**> minimum-diameter cover with [**4-inch-**] <**Insert dimension**> minimum-height neck and minimum [**2-inch**] <**Insert dimension**> downward overlap with hasp and lock. Construct opening with capability of supporting ventilation fan.

Consult manufacturers to determine if lugs, couplings, or rail option in "Painter's Accessories" Paragraph below is preferred.

* + - * 1. Painter's Accessories: Removable [**12-inch-**] <**Insert dimension**> minimum-diameter cover on tank roof with [**4-inch**] <**Insert dimension**> neck and [**2-inch**] <**Insert dimension**> downward overlap with hasp and lock. Include [**lugs**] [**couplings**] [**rail**] inside and outside the tank for painting.

Retain both options in "Tank Vent" paragraph below if required by authorities having jurisdiction.

* + - * 1. Tank Vent: ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipper, Zinc-Coated, Welded and Seamless”, Grade B, Schedule 40, welded-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 mechanism to maintain clear screen.**]

Delete first option in "Tank Handrail" paragraph below if painting is required.

* + - * 1. Tank Handrail: [**Galvanized steel**] [**Steel**], 42-inch- minimum height, according to 29 CFR 1910 “Definition and Requirements for a Nationally Recognized Testing Laboratory”.
				2. Pedestal:

Fabrication: Welded-steel, truncated cone base with cylindrical column.

Platform: [**24-inch-**] <**Insert dimension**> minimum width, inside at top.

Opening between Pedestal and Tank Dry Well: Same diameter as tank dry well.

Manway between Pedestal and Tank Bottom: Steel, waterproof-hinged door with locking device, [**12 by 16 inches**] <**Insert dimensions**> minimum.

Painter's Manway at Platform Level: Steel, [**20-inch-**] <**Insert dimension**> minimum door.

Pedestal Access Door: Steel, [**30 by 60 inches**] <**Insert dimensions**> minimum with locking device.

* + - * 1. Pedestal Foundation: Reinforced concrete. See Section 033000 "Cast-in-Place Concrete."
				2. Painter's Rail: Locate inside and outside of pedestal top, and inside and outside of tank shell.
			1. STEEL-PILLAR, MODIFIED SINGLE-PEDESTAL, ELEVATED WATER-STORAGE TANKS

Steel-pillar, modified single-pedestal, elevated, potable-water storage tanks in this article have typical capacities of 250,000 to 3,000,000 gal.

* + - * 1. Description: Steel shell and fluted-steel pillar, with welded-steel plates, bolts, rods, and reinforcing steel.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=2087) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Caldwell Tanks, Inc](http://www.specagent.com/Lookup?uid=123457177257).

[Phoenix Fabricators & Erectors](http://www.specagent.com/Lookup?uid=123457177256).

[Pittsburg Tank & Tower Co., Inc](http://www.specagent.com/Lookup?uid=123457177259).

Approved equivalent.

In "Standard" paragraph below, retain option if tank is for fire-suppression water supply. Some authorities having jurisdiction may have more stringent requirements. Consult authorities having jurisdiction and manufacturers.

* + - * 1. Standard: Tanks and accessories shall be designed and fabricated according to AWWA D100 “Standard for Welded Carbon Steel Tanks for Water” [**and NFPA 22**] <**Insert standards**>.
				2. Shell Capacity: [**250,000 gal.**] [**3,000,000 gal.**] <**Insert capacity**>.
				3. Minimum Capacity within Operating Range: <**Insert capacity**>.
				4. Tank Height: <**Insert height in feet**> from top of foundation to overflow level.
				5. Range of Head: <**Insert height in feet**> from BCL to overflow level.
				6. BCL: <**Insert height of level above top of foundation**>.
				7. Dry Well: Welded steel, centered vertically in tank.
				8. Roof Opening Hatch at Ladder: Comply with AWWA D100 “Standard for Welded Carbon Steel Tanks for Water”. Steel, hinged cover, [**24 by 24 inches**] <**Insert dimensions**> minimum with [**4-inch**] <**Insert dimension**> neck and [**2-inch**] <**Insert dimension**> downward overlap with hasp and lock, located over interior ladder.
				9. Roof Center Opening: Steel, removable [**20-inch-**] <**Insert dimension**> minimum-diameter cover with [**4-inch**] <**Insert dimension**> neck and [**2-inch**] <**Insert dimension**> downward overlap with hasp and lock. Construct opening with capability of supporting ventilation fan.
				10. Pipe Connection: Match size of water-distribution pipe.
				11. Overflow Piping: ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipper, Zinc-Coated, Welded and Seamless”, Grade B, Schedule 40, welded-steel pipe with ASTM A234 “Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service”, Grade WPB, Schedule 40, carbon-steel butt-welded fittings.
				12. Ladders:

Materials: Galvanized steel.

Safety Devices: As required by 29 CFR 1910 “Definition and Requirements for a Nationally Recognized Testing Laboratory”.

Delete option in "Location" subparagraph below if freezing of water inside tank is anticipated.

Location: Inside tank dry well from pedestal to tank roof,[**inside tank from tank bottom to roof,**] and inside pillar connecting platforms, beginning at pillar base.

* + - * 1. Roof Hatch: Steel, hinged cover, [**24 by 24 inches**] <**Insert dimensions**> minimum with [**4-inch**] <**Insert dimension**> neck and [**2-inch**] <**Insert dimension**> downward overlap with hasp and lock, located over wet tank.

Retain both options in "Tank Vent" paragraph below if required by authorities having jurisdiction.

* + - * 1. Tank Vent: ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipper, Zinc-Coated, Welded and Seamless”, Grade B, Schedule 40, welded-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 mechanism to maintain clear screen.**]

Delete first option in "Tank Handrail" paragraph below if painting is required.

* + - * 1. Tank Handrail: [**Galvanized steel**] [**Steel**], 42-inch- minimum height, according to 29 CFR 1910 “Definition and Requirements for a Nationally Recognized Testing Laboratory”.
				2. Pillar:

Fabrication: Welded fluted-steel cylindrical column.

Platforms: Galvanized steel, [**36-inch-**] <**Insert dimension**> minimum width. Include galvanized-steel handrails, 42-inch- minimum height, according to 29 CFR 1910 “Definition and Requirements for a Nationally Recognized Testing Laboratory”.

Opening between Pillar and Tank Dry Well: Same diameter as tank dry well.

Manway between Pillar and Tank Bottom: Steel, waterproof-hinged door with locking device, [**12 by 16 inches**] <**Insert dimensions**> minimum.

Painter's Manway at Pillar Wall at Top Platform: Steel, [**20-inch-**] <**Insert dimension**> minimum door.

Access Door: Steel, [**30 by 60 inches**] <**Insert dimensions**> minimum with locking device.

Retain "Condensate Ceiling" subparagraph below if dripping condensate from tank bottom is probable.

Condensate Ceiling: Fabric ceiling with plastic drain pipe to grade.

* + - * 1. Pillar Foundation: Reinforced concrete. See Section 033000 "Cast-in-Place Concrete."
				2. Painter's Rail: Locate at inside and outside of pillar at top, and inside and outside of tank shell.
			1. COMPOSITE, MODIFIED SINGLE-PEDESTAL, ELEVATED WATER-STORAGE TANKS

Composite, modified single-pedestal, elevated, potable-water storage tanks in this article have typical capacities of 250,000 to 3,000,000 gal.

* + - * 1. Description: Modified single-pedestal, elevated, potable-water storage tank with steel shell and reinforced-concrete pillar, including welded-steel plates, bolts, rods, reinforcing steel, and concrete pillar.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=2088) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Caldwell Tanks, Inc](http://www.specagent.com/Lookup?uid=123457177263).

[Chicago Bridge & Iron Company N.V](http://www.specagent.com/Lookup?uid=123457177260).

[Phoenix Fabricators & Erectors](http://www.specagent.com/Lookup?uid=123457177262).

Approved equivalent.

In "Standards" paragraph below, retain option if tank is for fire-suppression water supply. Some authorities having jurisdiction may have more stringent requirements. Consult authorities having jurisdiction and manufacturers.

* + - * 1. Standards: Designed and fabricated according to AWWA D107 “Standard for Composite Elevated Tanks for Water Storage” and ACI 318 “Building Code Requirements for Structural Concrete and Commentary” [**and NFPA 22**] <**Insert standards**>.
				2. Shell Capacity: [**250,000 gal.**] [**3,000,000 gal.**] <**Insert capacity**>.
				3. Minimum Capacity within Operating Range: <**Insert capacity**>.
				4. Tank Height: <**Insert height in feet**> from top of foundation to overflow level.
				5. Range of Head: <**Insert height in feet**> from lower capacity level to overflow level.
				6. BCL: <**Insert height of level above top of foundation**>.
				7. Dry Well: Welded steel, centered vertically in tank.
				8. Roof Opening Hatch at Ladder and Rigging Rails: A minimum of two required. [**Painted**] [**Galvanized**] [**Stainless**] steel, hinged cover, [**24 by 24 inches**] <**Insert dimensions**> minimum with [**4-inch**] <**Insert dimension**> curb and [**2-inch**] <**Insert dimension**> downward overlap with hasp and lock, located over interior ladder.
				9. Roof Center Opening: [**Painted**] [**Galvanized**] [**Stainless**] steel, removable [**20-inch-**] <**Insert dimension**> minimum-diameter cover with [**4-inch-**] <**Insert dimension**> minimum-height neck and [**2-inch**] <**Insert dimension**> downward overlap with hasp and lock. Construct opening with capability of supporting ventilation fan.
				10. Tank Floor Manhole: Watertight manhole in floor, accessible from upper platform. [**Painted**] [**Galvanized**] [**Stainless**] steel, [**30-inch-**] <**Insert dimension**> minimum diameter.
				11. Pipe Connection: Match size of water-distribution pipe.
				12. Overflow Piping: ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipper, Zinc-Coated, Welded and Seamless”, Grade B, Schedule 40, welded-steel pipe with ASTM A234 “Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service”, Grade WPB, Schedule 40, carbon-steel butt-welded fittings.
				13. Ladders:

Materials: Galvanized steel.

Safety Devices: As required by 29 CFR 1910 “Definition and Requirements for a Nationally Recognized Testing Laboratory”.

Delete option in "Location" subparagraph below if freezing of water inside tank is anticipated.

Location: Inside tank dry well from pedestal to tank roof,[**inside tank from tank bottom to roof,**] and inside pillar connecting platforms, beginning at pillar base.

Retain both options in "Tank Vent" paragraph below if required by authorities having jurisdiction.

* + - * 1. Tank Vent: ASTM A53 “Standard Specification for Pipe, Steel, Black and Hot-Dipper, Zinc-Coated, Welded and Seamless”, Grade B, Schedule 40, welded-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 mechanism to maintain clear screen.**]
				2. Support Structure Ventilation: Provide one vent, [**corrosion-resistant**] <**Insert material**> material, minimum [**500 sq. in.**] <**Insert dimensions**>, located near the top of the support structure and accessible from interior ladder, platform, or floor. Vent construction to prevent entrance of rain, insects, birds, and animals.

Delete first option in "Tank Handrail" paragraph below if painting is required.

* + - * 1. Tank Handrail: [**Galvanized steel**] [**Steel**], 42-inch- minimum height, according to 29 CFR 1910 “Definition and Requirements for a Nationally Recognized Testing Laboratory”.
				2. Pillar:

Fabrication: Reinforced-concrete cylindrical column.

Platforms: Galvanized steel, [**36-inch-**] <**Insert dimension**> minimum width. Include galvanized-steel handrails, 42-inch- minimum height, according to 29 CFR 1910 “Definition and Requirements for a Nationally Recognized Testing Laboratory”.

Opening between Pillar and Tank Dry Well: Same diameter as tank dry well.

Manway between Pillar and Tank Bottom: Steel, waterproof-hinged door with locking device, [**12 by 16 inches**] <**Insert dimensions**> minimum.

Painter's Manway at Pillar Wall at Top Platform: Steel, [**20-inch-**] <**Insert dimension**> minimum door.

Access Door: Steel, [**30 by 60 inches**] <**Insert dimensions**> minimum with locking device.

Retain "Condensate Ceiling" subparagraph below if dripping condensate from tank bottom is probable.

Condensate Ceiling: Fabric ceiling with plastic drain pipe to grade.

* + - * 1. Pillar Foundation: Reinforced concrete. See Section 033000 "Cast-in-Place Concrete."
				2. Painter's Rail: Locate at inside and outside of pillar at top, and inside and outside of tank shell.
			1. PAINT MATERIALS
				1. Paint: Comply with AWWA D102 “Standard for Coating Steel Water Tanks”.
				2. Primer: Tank fabricator's [**epoxy-polyamide**] <**Insert paint**> paint.

Retain option in first paragraph below if riser will be filled with potable water.

* + - * 1. Tank Shell[**and Riser**] Interior Finish Paint: Tank fabricator's [**epoxy-polyamide**] <**Insert paint**> paint complying with NSF 61 Annex G “Drinking Water Systems Components - Health Effects” and compatible to prime coat.

Delete "( and Steel Support)" option in first two paragraphs below if retaining composite, modified single-pedestal, elevated, potable-water storage tank.

* + - * 1. Tank Shell[**and Steel Support**] Exterior Intermediate Paint: Tank fabricator's [**epoxy-polyamide**] <**Insert paint**> paint compatible with prime and finish paint. Intermediate coat shall have a slight color contrast with finish coat.
				2. Tank Shell[**and Steel Support**] Exterior Finish Paint: Tank fabricator's [**urethane**] <**Insert paint**> paint.

Color: [**As selected by Director’s Representative from tank manufacturer's paint chart**] <**Insert color**>.

Retain "Concrete Pillar Exterior" paragraph below if retaining composite, modified single-pedestal, elevated, potable-water storage tank or if concrete pillar will be painted.

* + - * 1. Concrete Pillar Exterior: [**Not required**] <**Insert finish**>.

Retain paragraph below if lettering or logo is required. Delete "( and Logo)" option if not required.

* + - * 1. Tank Exterior Lettering[**and Logo**]: Tank fabricator's [**urethane**] <**Insert paint**> paint.

Color: [**As selected by Director’s Representative from tank manufacturer's paint chart**] <**Insert color**>.

* + - 1. SHOP PAINTING
				1. Shop Cleaning Interior Surfaces: After fabrication, blast clean according to SSPC-SP 10/NACE No. 2 “Near-White Blast Cleaning”.
				2. Shop Cleaning Exterior Surfaces: After fabrication, blast clean according to SSPC-SP 6/NACE No. 3 “Commercial Blast Cleaning”.
				3. After cleaning, remove dust or residue from cleaned surfaces.
				4. If surface develops rust before prime coat is applied, repeat field surface preparation.
				5. Apply prime coat to shop-cleaned, dry surfaces same day as surface preparation, to a dry film thickness of [**3.0 to 5.0 mils**] <**Insert thickness range**> for tank interior and to a dry film thickness of [**2.0 to 3.0 mils**] <**Insert thickness range**> for exterior tank and support surfaces.
			2. ELEVATED WATER-STORAGE TANK APPURTENANCES
				1. Water-Level Controls: Automatic controls for maintaining water level in tank, with valves, piping, and audible and visual alarms to indicate the following:

High- and low-water levels.

Tank overflowing or tank not filling.

<**Insert required alarms**>.

* + - * 1. Obstruction Lighting: Comply with requirements of authorities having jurisdiction.
				2. Lightning Protection: Comply with requirements in Section 264113 "Lightning Protection for Structures."
				3. Cathodic Protection: Comply with requirements in Section 134713 "Cathodic Protection" and with AWWA D104 “Standard for Automatically Controlled, Impressed-Current Cathodic Protection for the Interior Submerged Surfaces of Steel Water Storage Tanks”.

Retain "Tank Heaters" paragraph below if required.

* + - * 1. Tank Heaters: Comply with NFPA 22 “Standard for Water Tanks for Private Fire Protection” and with capacity to maintain 42 deg F water temperature inside elevated, potable-water storage tank.
1. EXECUTION
	* + 1. INSTALLATION OF ELEVATED WATER-STORAGE TANKS
				1. Erect water-storage tank according to AWWA D100 “Standard for Welded Carbon Steel Tanks for Water”.

Retain "Riser Manhole" paragraph below for multiple-column, elevated, potable-water storage tanks.

* + - * 1. Riser Manhole: Install bottom of manhole [**36 inches**] <**Insert dimension**> above grade.[**Install safety grate at top of riser with hinged manhole.**]

Retain "Overflow Pipe, Multiple Column" Paragraph below for multiple-column, elevated, potable-water storage tanks.

* + - * 1. Overflow Pipe, Multiple Column: Penetrate tank shell at elevation indicated on Drawings, attach to tank shell exterior, attach to one tower column and extend down to [**12 inches**] <**Insert dimension**> above grade, and terminate above concrete splash block.

Retain first "Overflow Pipe, Single Pedestal" paragraph below for single-pedestal, elevated, potable-water storage tanks.

* + - * 1. Overflow Pipe, Single Pedestal: Penetrate wall of tank dry well at elevation indicated on Drawings, attach to exterior of tank dry well and to pedestal and extend down pedestal to [**24 inches**] <**Insert dimension**> above grade. Turn with 90-degree elbow, penetrate pedestal wall, and terminate above concrete splash block.

Retain both paragraphs below for modified single-pedestal, elevated, potable-water storage tanks.

* + - * 1. Overflow Pipe, Modified Single-Pedestal: Penetrate wall of tank dry well at elevation indicated on Drawings, attach to exterior of tank dry well and to pillar and extend down pillar to [**24 inches**] <**Insert dimension**> above grade. Turn with 90-degree elbow, penetrate pillar wall, and terminate above concrete splash block.

Retain option in "Pillar Vents" paragraph below if retaining "Condensate Ceiling" subparagraph in "Composite, Modified Single-Pedestal, Elevated Water Storage Tanks" Article.

* + - * 1. Pillar Vents: Install no fewer than eight vents, each with a minimum diameter of [**10 inches**] <**Insert dimension**>. Place half of vents near top of pillar and the remainder of vents near base.[**Locate upper vents below condensate ceiling.**]
			1. FIELD PAINTING

Retain first paragraph below if painting is specified in Section 099114 "Exterior Painting" or Section 099600 "High-Performance Coatings."

* + - * 1. Surface preparation is specified in [**Section 099114 "Exterior Painting."**] [**Section 099600 "High-Performance Coatings."**]
				2. Apply paint according to AWWA D102 “Standard for Coating Steel Water Tanks”.
				3. Prime-Coat Touchup: Apply primer to cleaned areas and where shop finish has been damaged during shipping, handling, and erection. Apply prime coat to a dry film thickness of [**3.0 to 5.0 mils**] <**Insert thickness range**> for tank interior and to a dry film thickness of [**2.0 to 3.0 mils**] <**Insert thickness range**> for exterior tank and support surfaces.
				4. Tank Shell Interior Finish Coats: Apply two coats of interior finish paint above bottom ring to a dry film thickness of [**4.0 to 5.0 mils**] <**Insert thickness range**>. Apply interior finish paint to surfaces below bottom ring to a dry film thickness of [**8.0 to 10.0 mils**] <**Insert thickness range**>.
				5. Tank Shell[**and Steel Support**] Exterior Coats: Apply intermediate paint to a dry film thickness of [**2.0 to 3.0 mils**] <**Insert thickness range**>. Apply finish paint to a dry film thickness of [**2.0 to 3.0 mils**] <**Insert thickness range**>.

Retain "Composite Tank Concrete Pillar" Paragraph below if retaining composite, modified single-pedestal, elevated, potable-water storage tank or if concrete pillar will be painted.

* + - * 1. Composite Tank Concrete Pillar: Comply with [**Section 099114 "Exterior Painting."**] [**Section 099600 "High-Performance Coatings."**]
				2. Tank Exterior Lettering[**and Logo**]: Apply [**one coat**] [**two coats**] of urethane paint to a dry film thickness of [**2.0 to 3.0 mils**] <**Insert thickness range**>[**for each application**].
				3. Overflow Pipe: Paint pipe exterior that is outside tank and structure as indicated for tank exterior.

Retain "Balcony and Exterior Ladders" Paragraph below for balcony or exterior ladders or if galvanized surface is preferred.

* + - * 1. Balcony and Exterior Ladders: Paint as indicated for tank exterior.
				2. Do not paint if ambient temperature is less than 50 deg F or is expected to drop below 40 deg F in the next 18 hours. Do not paint if temperature of steel surface is higher than 125 deg 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.
				3. Complete daily painting to allow time for paint to dry before condensation is expected.
			1. INSTALLATION OF ELEVATED WATER-STORAGE TANK APPURTENANCES
				1. Install and adjust water-level control valves, piping, and alarms.
				2. Install obstruction lighting according to authorities having jurisdiction.
				3. Install lightning protection according to Section 264113 "Lightning Protection for Structures."
				4. Install cathodic protection according to Section 134713 "Cathodic Protection" and AWWA D104 “Standard for Automatically Controlled, Impressed-Current Cathodic Protection for the Interior Submerged Surfaces of Steel Water Storage Tanks”.
				5. Install tank heaters according to NFPA 22 “Standard for Water Tanks for Private Fire Protection”.
			2. PIPING CONNECTIONS

Coordinate piping installations and specialty arrangements with Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced or omitted.

* + - * 1. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

Connect tanks to water-distribution piping.

Connect drains to storm-drainage piping.

* + - * 1. Install piping specialties furnished by manufacturer, but not factory mounted.
			1. ELECTRICAL CONNECTIONS
				1. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
				2. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
				3. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 “Standard for Electrical Safety in the Workplace” and NECA 1 “Standard for Good Workmanship”.
				4. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."

Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

* + - 1. CONTROL CONNECTIONS
				1. Install control and electrical power wiring to field-mounted control devices.
				2. Connect control wiring according to Section 260523 "Control-Voltage Electrical Power Cables."
			2. FIELD QUALITY CONTROL

Retain one of first three paragraphs below. Retain first option in "Testing Agency" paragraph below if Owner will hire an independent testing agency.

* + - * 1. Testing Agency: [**Director’s Representative will engage**] [**Engage**] a qualified testing agency to perform tests and inspections.

Retain "Manufacturer's Field Service" paragraph below to require a factory-authorized service representative to perform tests and inspections.

* + - * 1. Manufacturer's Field Service: Engage a Company Field Advisor per OGS Spec Section 014216 to test and inspect components, assemblies, and equipment installations, including connections.

Retain "Perform the following tests and inspections" paragraph below to require Contractor to perform tests and inspection and retain option to require Contractor to arrange for the assistance of a factory-authorized service agent.

* + - * 1. Perform the following tests and inspections[**with the assistance of a Company Field Advisor per OGS Spec Section 014216**]:

Tank Weld Test: Use radiographic method according to AWWA D100 “Standard for Welded Carbon Steel Tanks for Water”. Repair failures and retest.

Leak Test: Comply with AWWA D100 “Standard for Welded Carbon Steel Tanks for Water” [**and NFPA 22**]. Fill tanks with potable water and test for leaks after installation. Repair leaks and retest until no leaks exist.

Water will be furnished by Director’s Representative.

* + - * 1. Unit will be considered defective if it does not pass tests and inspections.
				2. Prepare test and inspection reports.
			1. CLEANING

Revise this article as required by authorities having jurisdiction.

* + - * 1. Clean interior and exterior of elevated, potable-water storage tanks.
				2. Disinfect elevated, potable-water storage tanks according to [**AWWA C652**] [**requirements of authorities having jurisdiction**].
			1. DEMONSTRATION
				1. [**Engage a Company Field Advisor per OGS Spec Section 014216 to train**] [**Train**] Facility's maintenance personnel to adjust, operate, and maintain the following:

Obstruction lighting.

Water-level controls.

Tank heaters.

END OF SECTION 221216