

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATIONS
WATERING FACILITY

1. Scope

The work shall consist of all construction operations and furnishing all materials as required by the drawings and specifications for the complete installation of a watering facility or large storage tank. The watering facility may be a tank, manufactured waterer, or other similar device that has animal access to water. A large storage tank is utilized to store water for grazing distribution or to reduce pipeline sizes.

2. Location

The location of the watering facility or storage tank shall be as shown on the drawings or as staked in the field. Changes to the location must be approved by the owner/operator and designer prior to construction.

3. Site Preparation

The foundation area shall be cleared of vegetation, boulders, rubbish, or other materials not suited as subgrade material. The foundation and surrounding area shall be smoothed and graded to permit free drainage of surface water away from the facility.

Concrete shall be placed on well-drained, firm subgrade consisting of firmly compacted sand, gravel, or earth. If the soil is a highly plastic material subject to significant swelling, a minimum 4-inch layer of sand or fine gravel shall be placed between the sub-base material and the concrete.

Preformed watering facilities and storage tanks constructed of galvanized metal, fiberglass, high-density polyethylene, or similar materials shall set on a base made of at least 4 inches of sand or fine gravel. Precast concrete tanks shall be placed on a smooth earth or sand surface capable of making contact with the entire base of the tank. The area around watering facilities shall be protected from undermining by an 8-inch layer of coarse gravel (1/2 inch in diameter or larger) or crushed rock extending at least 4 feet away from the tank or 4-inch thick reinforced concrete extending at least 3 feet away from the tank.

4. Waste Material

Waste material from the construction operation such as rocks, frozen soil, mud, roots, logs, or rubbish shall be disposed of by piling or burying at locations outside the work area or as approved by the owner/operator and designer.

5. Concrete

The concrete design mix shall produce concrete that has a minimum design strength of 3500 psi at 28 days for cast-in-place structures. Portland cement shall be Type I or II. An air-entraining admixture shall be used to provide an air content of 5 to 8 percent of the volume of concrete.

Fine aggregate shall consist of well-graded, natural or manufactured sand with particle gradation ranging from coarse (3/8-inch) to fine (#200 sieve). Coarse aggregate shall be hard; be free from dirt and organic materials; and consist of well-graded gravel, crushed stone, or other suitable materials larger than 3/8 inch. Maximum size shall be 1 inch. When nylon fiber mesh is used in the concrete mix, a minimum rate of 1.5 pounds per cubic yard of concrete shall be used.

The proportions of the aggregates shall be such to produce a concrete mixture that will work readily into the corners and angles of the forms and around steel reinforcement when consolidated. The slump at the time of placing shall be 3 to 5 inches.

Where a steel wall is used for a rim-type tank, the metal embedded in the concrete shall be protected by a galvanized coating, asphalt, or a similar material to prevent rusting of the metal at the contact point.

When concrete walls are used, the entire tank should be cast-in-place at one time, or the bond area between the floor slab and wall must be thoroughly roughened and cleaned to ensure a good bond.

Forms shall be wood, plywood, steel, or other approved materials and shall be mortar-tight. The forms shall be unyielding and shall be constructed so that the finished concrete conforms to the specified dimensions and contours.

Prior to placement of concrete, the forms and subgrade shall be free of chips, sawdust, debris, water, ice, snow, extraneous oil, mortar, or other harmful substances or coatings.

Inspection and approval of the forms and steel placement by designated personnel shall be made prior to the placement of concrete. Copies of the concrete delivery tickets shall also be furnished to verify that proper concrete was delivered and placed.

Concrete shall be conveyed from the mixer to the forms as rapidly as practical by methods that will prevent segregation of the aggregates and loss of mortar. Concrete shall not be dropped more than 5 feet vertically except where suitable equipment is used to prevent segregation.

Immediately after the concrete is placed in the forms, it shall be consolidated by spading, hand tamping, or vibrating as necessary to ensure smooth surfaces and dense concrete. All exposed surfaces of the concrete shall be accurately screeded to grade and then wood-floated.

Forms shall be removed in such a way to prevent damage to the concrete. Form removal shall not start until the concrete has cured a minimum of 12 hours. After forms are removed from concrete walls, all exposed voids larger than 3/4 inch deep shall be filled with cement-sand mortar to accomplish a smooth surface.

Concrete shall be prevented from drying for a curing period of at least 7 days after it is placed. Exposed surfaces shall be kept continuously moist for the entire period or until curing compound is applied.

Concrete shall not be mixed nor placed when the atmospheric temperature is less than 40°F or more than 90°F unless facilities are provided to prevent freezing or for cooling as required. If concrete is placed when temperatures may fall below 40°F during the curing period, it will be insulated or heated to maintain a temperature of 50°F for the first 3 days of the curing period.

6. Reinforcing Steel

Reinforcing steel or welded wire reinforcement (WWR) shall be cleaned to remove any loose, flaky rust; mill scale; oil; grease; or other coatings. The reinforcement shall be maintained in a clean condition until it is completely embedded in the concrete.

Bars shall not be bent or straightened in a manner that will injure the material. Bars with kinks, cracks, or improper bends will be rejected.

Reinforcing steel or WWR shall be accurately placed and secured in position in a manner that will prevent its displacement during the placement of concrete. Tack welding of bars will not be permitted. Metal chairs, metal hangers, metal spacers, plastic chairs, and concrete chairs may be used to support the reinforcement. The hangers, spacers, and ties shall be placed in such a manner that they will not be exposed in the finished concrete surface. Precast concrete chairs shall be moist at the time concrete is placed.

7. Preformed Tanks

Fiberglass tanks shall be made of glass-reinforced polyester to the manufacturer's design for the intended purpose. Minimum thickness of the walls and floor shall be 1/4 inch. All surfaces should be painted with white gel coat at the time of manufacture to prevent deterioration due to sunlight; otherwise, a coat of polyester resin may need to be applied after several years to keep the tank serviceable.

Plastic tanks shall be made of high-density polyethylene or similar materials to the manufacturer's design for the intended purpose. Minimum thickness of the walls and floor shall be 1/4 inch. The tanks shall be manufactured with materials that resist ultraviolet degradation, or a protective coating shall be applied at the time of manufacture to prevent deterioration due to sunlight.

Tanks constructed of galvanized metal shall have a minimum thickness of 16 gauge for the walls and floor. All preformed tanks shall be installed as shown on the drawings or as described in Section 3.

8. Precast Concrete Tank

The tank shall be of the manufacturer's design for the intended purpose. For surface installations, (installed on the ground surface) the thickness of the floor shall be a minimum of 4 inches, and the sidewalls shall be a minimum of 3 inches. The inside of the sidewall shall taper at least 1 inch from the floor to the top. The concrete shall have a minimum compressive strength of 4000 psi at 28 days. Reinforcing steel shall be at least 3/8-inch diameter steel bars and be spaced no further than 12 inches center to center. The tanks shall be installed as shown on the detail drawings or as described in Section 3.

For buried installations, the floors and walls shall have a minimum thickness of 3 inches and a minimum design strength of 4000 psi. The minimum steel reinforcement shall be 6 x 6 – W2.1 x W2.1 WWR.

Concrete tanks supplied with internal water-level-regulating devices (float valves) and those intended to be installed below ground level will be considered manufactured waterers or earth-covered tanks. They shall be installed as shown on the drawings or as described in Section 10.

9. Rim-Type Tank

The rim shall conform to the material requirements in the standard. Concrete floors shall consist of reinforced concrete meeting the requirements of Sections 5 and 6 or as shown on the drawings. Steel, fiberglass, or rubber track rims shall be placed a minimum of 2 inches into the concrete floor. For steel rims, provide an additional concrete curb along the inside of the rim for support and seepage resistance along the rim. The curb can be sloping and should be a minimum of 2 inches tall and start at least 3 inches inside the rim.

Geotextile liners used in place of concrete floors shall be watertight with a minimum thickness of 40 mils and be manufactured of materials that resist ultraviolet degradation or deterioration due to sunlight. The liner shall be cut and welded for the particular tank design and include the required attachment devices necessary to secure the liner to the rim. Support for the rim shall be as specified by the manufacturer of the liner based on the foundation soils for the tank location.

Rubber tire rims shall be free of cuts, rips, and holes. The tread wear shall not be worn beyond the tread depth. The top sidewall of the tire shall be removed as needed for animal access to the water. Concrete or other suitable watertight materials shall be used to plug the center hole in the bottom sidewall. The concrete in the plug shall meet the requirements of Section 5 or as shown on the drawings.

10. Manufactured Waterers and Frost-Free (Earth-Covered) Tanks

The waterer or tank shall be installed following the manufacturer's recommendation for placement and installation or as shown on the drawings. Earth-covered tanks constructed of concrete shall meet the requirements of Section 8. Earth-covered tanks constructed of other materials shall have a manufacturer's warranty indicating the suitability of the materials and tank for the intended purpose.

The concrete base for waterers shall meet the requirements of Sections 5 and 6 or as shown on the drawings.

11. Wildlife Watering Facilities

The facility shall be installed as shown on the drawings or following the manufacturer's recommendation for placement and installation if a pre-fabricated facility is used. An escape feature will be provided on all

facilities. The feature can be constructed as part of the facility or may be an additional item such as an escape ramp constructed of expanded metal.

All treated lumber used as posts or for the collection area frame shall be treated in accordance with the applicable American Wood Preservatives Association (AWPA) standard and have a minimum retention rate of 0.25 pound per cubic foot. Typical treatment preservatives would include Alkaline Copper Quaternary (ACQ) or Micronized Copper Quaternary (MCQ).

All fasteners and connectors (bolts and screws) for ACQ-treated lumber shall be stainless steel. Bolts and screws not in contact with ACQ-treated lumber shall be galvanized or stainless steel.

The facility shall be constructed of new materials or of high-quality used materials. Used materials including the lumber and metal roofing will be free of obvious defects and provide the durability requirements to meet or exceed the 20-year life expectancy of the practice.

12. Measurement

Measurements of the completed watering facility shall be made to determine if the as-built dimensions are within reasonable tolerance of the design dimensions. The design storage volume in gallons will be determined using the depth at the installed overflow or 3 inches below the top if no overflow is used. The design storage will be used as the certified amount for all facilities and storage tanks except wildlife watering facilities, manufactured waterers, and earth-covered tanks. Wildlife watering facilities, waterers, and earth-covered tanks are certified as each.

13. Construction Details