

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE GENERAL SPECIFICATIONS
WATERING FACILITY
TROUGHS & TANKS

(No.)

CODE 614A

SCOPE

These construction specifications cover the materials and installation of livestock and wildlife troughs and tanks as shown on the plans or as staked in the field. Livestock and wildlife troughs and tanks shall be constructed to the dimensions, elevations, and grades as specified on the plans, drawings, or job sheets.

Construction operations shall be carried out in such a manner that erosion and air and water pollution are minimized and held within legal limits. State and local laws concerning pollution abatement must be followed. The completed job shall present a workmanlike finish and shall conform to the lines, grades, and elevations shown in the drawings and as staked in the field.

All operations shall be carried out in a safe and skillful manner. Safety and health regulations shall be observed and appropriate safety measures used.

PUBLIC AND PRIVATE UTILITIES

Utilities are defined to be public or private, overhead and underground power or communication lines, and any pipelines. The landowner/operator/contractor shall conduct their own search and discovery for utilities in order to lessen or avoid potential damages, injuries or loss of life. Prior to construction, the landowner/operator should complete an OK-ENG-45 UTILITIES INVENTORY FORM to document known utilities in order to comply with State law prior to any ground disturbance and return it to a USDA-NRCS representative.

QUALITY CONTROL

Quality Control of all materials and construction procedures is the responsibility of the landowner/operator and contractor. NRCS will make periodic review(s) of the work for the benefit of the agency which will include the final construction check.

PLUMBING

For combination overflow/drain outlets, a coupling shall be set level with the bottom of the facility to permit unscrewing the overflow pipe to allow drainage of the facility. A swivel connection may also be used to allow drainage of the facility. Drain plugs for fiberglass tanks should be located near the bottom of the tank. All plumbing shall be new galvanized steel, copper, bronze, or plastic pipe and fittings. All plastic pipe shall comply with the Oklahoma NRCS Conservation Practice Standard, Livestock Pipeline (516). Pipe fittings may be PVC Schedule 40 unthreaded, Schedule 80 threaded or unthreaded, or galvanized steel.

FOUNDATION PREPARATION

The foundation shall be prepared by leveling, smoothing, and compacting the area where the facility is to be constructed. The base shall be free of debris and rocks or pebbles larger than 3/8 inch in size. When specified, a layer of sand or fine gravel shall be placed between the bottom floor and subgrade. On moderately to high shrink/swell soils or a linear extensibility of 3 or more, a minimum of a 4" layer of 3/8 inch crushed rock or concrete sand shall be used under the facility for a base, it shall be

saturated to consolidate the sand or crushed rock base. The material shall be free of organic material, excess fines, and rock larger than 3/8 inch in size.

The drainpipe shall be positioned before final grading of the foundation.

HEAVY USE AREA PROTECTION

All areas around watering facilities which are accessible by livestock shall have a total minimum protected area of 8 feet extending from the outer edge of the facility. Facilities with floor extensions beyond the edge of the tank (as described below) can include the width of the floor extension when designing the Heavy Use Area Protection such that the total protected area is a minimum of 8 feet. Criteria for the protected area shall be in accordance with the Oklahoma NRCS Conservation Practice Standard and Specification, Heavy Use Area Protection (561).

REINFORCED CONCRETE

Reinforcement shall be placed as shown on the plans and shall be free of oil and other foreign matter such as loose coatings of rust, scale, or dirt. Reinforcing steel for concrete walls shall be secured in place by tying the vertical bars to the horizontal bars. The vertical bars shall be fastened in position as needed for rigidity. The vertical bars shall be placed so that the horizontally projecting leg is 2½ to 3 inches below the finished surface of the floor slab. The floor slab reinforcement shall be tied in place so that it is 2 to 2½ inches below the finished surface of the floor slab. The slab reinforcement shall rest on the horizontally projecting legs of the vertical bars. Welded wire, as shown on the standard drawing, or fiber reinforcement can also be used.

The concrete shall be good quality using sound and clean aggregates. A job or ready-mix concrete shall consist of approximately 1 part cement, 2 parts sand, and 4 parts coarse aggregate (1 ½ inch maximum size). The water-cement ratio shall be no more than 6 gallons of water to 1 sack of cement when dry aggregates are used. If the sand and gravel used is moist, the water shall be reduced to no more than 5 gallons per sack of cement.

Unless otherwise specified, the concrete shall produce strength of not less than 3,000 psi in 28 days. All concrete is to consist of a workable mix that can be placed and finished in an acceptable manner. The concrete shall be delivered to the site and discharged into the forms within 1 ½ hours after the introduction of the cement to the aggregates unless a mix design with set retarder is approved for use by the technician.

Concrete shall be placed to the lines and grades as shown on the plans or as staked in the field. The concrete shall be placed after the reinforcement is in place. Care shall be used in placing the concrete to avoid segregation.

Concrete floors shall have a minimum thickness of 5-inches. The concrete for the floor slab shall be placed after the vertical bars, the intervening tie bars, and the slab reinforcement are in place. Care shall be used in placing the concrete to avoid segregation. The top of the floor slab shall be troweled to a reasonably smooth finish.

Unless the entire facility can be poured at one time, the bond area between the floor slab and the wall shall be left untroweled and shall be thoroughly cleaned to insure a good bond between the floor and wall.

The concrete shall be consolidated in the forms as it is placed to ensure a tight bond to reinforcing steel and to yield dense concrete reasonably free of voids. Either metal or wood forms may be used. After the forms are removed, all exposed voids shall be filled with cement-sand mortar. The entire wall surface shall be wet rubbed to accomplish a dense smooth surface.

Concrete shall not be placed when the outside temperature is below 40 degrees or above 90 degrees Fahrenheit. Concrete placed during cold weather shall be protected from freezing during the curing period. The concrete shall be cured by covering it with burlap, canvas, or other suitable material and kept from drying out for at least 7 days. The concrete may be cured by coating the surface with an approved white-pigmented curing compound.

CONCRETE WALLS

Reinforced concrete walls shall have a minimum thickness of 6 inches, and the reinforcing shall consist of 3/8 inch round bars spaced on 8-inch centers in both directions. The vertical bars shall have a 15-inch leg projection horizontally into the floor with the vertical leg extending to within 2 inches of the top of the wall. Bars shall be placed so as to have a minimum cover of 2 inches. Where horizontal wall bars meet or are spliced, there shall be an overlap of at least 12 inches.

Facilities originally constructed with a concrete floor and a steel sidewall, which has deteriorated, may be reconstructed as concrete facilities provided all of the following requirements are met:

1. The floor is determined to be sound with no signs of deterioration.
2. The steel sidewall shall be removed to the floor surface unless it can be used as a form for a new concrete wall.
3. The contact area for the concrete replacement wall with the floor surface shall be thoroughly cleaned for a good bonding surface. Waterstop or other similar products should be used to prevent seepage or leakage from the cold joint.
4. Reinforcement shall be as stated for "Concrete Walls" except that the horizontal projection into the floor shall not be required. Instead, the vertical bars shall be anchored in 3-inch deep drilled holes in the floor. Wall thickness shall be 6 inches.
5. Concrete and reinforcing steel placement shall be as stated in the General Specifications above.

Facilities with reinforced concrete walls require a minimum 30-inch wide concrete apron, which is an extension of the floor and has the same thickness as the floor, for structural stability. The heavy use area protection beyond the edge of this concrete apron shall be in accordance with the Oklahoma NRCS Conservation Practice Standard, Heavy Use Area Protection (561).

CONCRETE SILO STAVE WALLS

Concrete silo stave walls shall be installed according to plans. The concrete silo stave walls shall be set in position, the hoops in place, and the floor reinforcement in place prior to pouring the floor. The bond area between the floor and wall shall be thoroughly cleaned to insure a good bond. Care shall be used in placing the concrete to avoid segregation. The outer edge of the floor shall be 10 inches thick adjacent to the stave sidewall and sloped 2:1 to the point of a 5-inch floor thickness. The floor shall be otherwise be 5 inches thick. The top of the floor and apron shall be troweled to a reasonably smooth finish.

The concrete silo staves for all facilities 10 feet in diameter and larger shall be 10 inches wide by 30 inches high by 3 5/8 inches thick. The staves shall be of interlocking tongue and groove construction. The hoops shall be 9/16 inch galvanized steel rod with lugs and nuts. The number of hoops required is as follows:

Tank Diameter (ft.)	Number of Hoops
16	2
>16-22	3
>22	4

The inside of the facility shall be finished by applying 3 successive coatings of Portland cement and water grout. The cement grout for finishing the inside of the slab shall be mixed to a creamy consistency. The grout shall not be allowed to dry or set-up between the applications of the successive coats. Once the application is completed, curing shall be the same as for the other concrete. The floor and apron are not to be connected as a continuous pour.

If a concrete heavy use area protection apron is installed with a concrete silo stave walls facility, the apron shall be separated from the stave sidewall by using a bituminous or cork expansion material with a minimum thickness of 3/8-inch.

METAL SIDE WALLS

Metal walls shall be installed according to the plans, and all joints shall be made watertight. In areas where the water causes rapid deterioration of the metal wall, coatings as approved by the state conservation engineer shall be used to provide a longer life structure.

Metal walls shall be made of new material selected from one of the following:

1. Galvanized corrugated steel 16 gauge or thicker.
2. Ungalvanized or galvanized sheet steel with a minimum thickness of 1/8 inch (10 gauge, 0.1345 inches thick is greater than 1/8 inch).

Ungalvanized material shall be treated with a rust preservative treatment.

Metal walls shall be embedded at least 2 inches into the concrete floor, and the floor at this junction shall be made at least 2 inches thicker directly below the metal wall to compensate for the wall depth into the floor. This additional thickness shall extend at least 6 inches each direction from this junction. The part of the metal wall that extends into the concrete floor shall be coated with asphalt or similar coating before the floor is poured. The coating shall extend approximately 2 inches above the finished floor. The same treatment shall be given any metal pipes which extend through the concrete floor. The top edge of the metal wall, except smooth steel 3/16 inch (7 gauge or thicker) and corrugated galvanized steel of 12 gauge or thicker, shall be strengthened and protected either by a rolled edge or by welding to it, a pipe with ½ inch minimum diameter or angle iron with minimum dimensions of 1" x 1". After welding, the edge shall be protected against rust by a rust preventative treatment.

Facilities with reinforced concrete walls require a minimum 30-inch wide concrete apron, which is an extension of the floor and has the same thickness as the floor, for structural stability. The heavy use area protection beyond the edge of this concrete apron shall be in accordance with the Oklahoma NRCS Conservation Practice Standard, Heavy Use Area Protection (561).

FIBERGLASS FACILITIES

Fiberglass facilities shall be included in the "Oklahoma Pre-Approved Structures, Components, and Appurtenances" list in Section 4 of the Field Office Technical Guide or meet one of the following: ASTM D-4097 or ASTM D-3299. The facility shall be made of glass reinforced polyester to the manufacturer's design for the intended purpose. Facilities shall be made of ultraviolet resistant materials or have a durable coating to prevent deterioration due to sunlight and to keep the facility serviceable. Minimum thickness of the walls and floor shall be ¼ inch. The top edge of the facility rim shall be protected with a 1 to 2 inch molded flange or other acceptable reinforcement.

Fiberglass tanks may be placed on existing concrete pads provided the minimum heavy use area protection apron as stated in the Oklahoma NRCS Conservation Practice Standard, Watering Facility (614) is met and the tank is adequately anchored.

If a concrete heavy use area protection apron is installed with a fiberglass facility, the apron shall be separated from the sidewall by using a bituminous or cork expansion material with a minimum thickness of 3/8-inch.

PRE-CAST CONCRETE AND PREFABRICATED FACILITIES

Pre-cast concrete tanks and prefabricated energy-free fountains require approval of the state conservation engineer. This may be by individual analysis or by inclusion on the "Oklahoma Pre-Approved Structures, Components, and Appurtenances" list in Section 4 of the Field Office Technical Guide. Manufacturers may submit designs of structures for inclusion in the "Oklahoma Pre-Approved Structures, Components, and Appurtenances" list.

Pre-cast concrete freeze proof tanks supplied by a pond shall have a minimum of 4 feet of head from the planned permanent water level (considering evaporative and seepage losses) to the lip of the tank. A substantial area of the pond shall be fenced to protect the pond banks, water quality, and wildlife. To prevent freezing, a 2-foot layer of soil is required over the tank. A bulkhead shall be installed to prevent soil from spilling into the tank. If the pre-cast bulkhead needs to be extended, the extension shall be constructed of sound, durable materials with sufficient foundation and/or anchoring to resist overturning.

If a concrete heavy use area protection apron is installed with a pre-cast concrete facility, the apron shall be separated from the sidewall by using a bituminous or cork expansion material with a minimum thickness of 3/8-inch.

Prefabricated energy-free fountains shall meet all manufacturers' recommendations; this includes the minimum and maximum herd capacity, and the concrete under or around the fountain. The minimum heavy use area protection apron as stated in the Oklahoma NRCS Conservation Practice Standard, Watering Facility (614) must still be met.

These type facilities must meet all the criteria listed in the appropriate Job Sheet.

HEAVY EQUIPMENT TIRE TROUGH

Heavy equipment tires used for troughs shall be of suitable quality to perform as intended for the useful life of the practice. The tires shall be free of chemicals injurious to livestock and certified by the supplier as safe for livestock. If this type of tank or facility is to be used to water horses, the operator should be cautioned about the possible ingestion of rubber.

The hub shall be either filled with concrete reinforced with polypropylene fibers (FRC) or have 3/8" reinforcing bars placed on 12" centers in both directions and filled with concrete. The concrete shall meet the requirements stated previously in this specification.

The top edge of the tire shall be cut so that the lip is a maximum of 8" wide.

STORAGE FACILITIES

Closed top facilities shall be vented in accordance with the manufacturer's recommendations. Storage Facilities shall have a maximum height of 16 feet and a maximum diameter of 20 feet.

Circular commercial storage facilities fabricated from steel, fiberglass, or polyethylene material may be used.

Sidewall height and minimum thickness for steel shall be as follows:

2.5' to 4.0'	16 gauge galvanized corrugated steel or 10 gauge sheet steel with a rust preventative coating.
4.1' to 6.0'	16 gauge galvanized corrugated steel or 7 gauge sheet steel with a rust preventative coating.
6.1' to 16.0'	¼ inch steel plate with a rust preventative coating.

Fiberglass Storage Facilities shall be included in the "Oklahoma Pre-Approved Structures, Components, and Appurtenances" list in Section 4 of the Field Office Technical Guide or meet one of the following: ASTM D-4097 or ASTM D-3299. The facility shall be made of glass reinforced polyester to the manufacturer's design for the intended purpose. Facilities shall be made of ultraviolet resistant materials or have a durable coating to prevent deterioration due to sunlight and to keep the facility serviceable. Sidewall height and minimum thickness for fiberglass shall be as follows:

2.5' to 5.0'	¼" (1/32" tolerance)
5.1' to 12.0'	5/16" (1/32" tolerance)
12.1' to 16.0'	3/8" (1/32" tolerance)

Polyethylene Storage Facilities shall be included in the "Oklahoma Pre-Approved Structures, Components, and Appurtenances" list in Section 4 of the Field Office Technical Guide.

All joints and seams shall be suitably reinforced.

Storage facilities may require protection against overturning and sliding from wind forces. This may be accomplished by maintaining a minimum required water depth in the facility or by installing suitable rod anchors into the soil or rock underlying the facility. Storage depth for stability may not be counted in storage needs for livestock water.

REFURBISHED STEEL TANKS

Used steel tanks (oil, gasoline, etc.) are acceptable provided the wall thickness meets the requirements stated under Storage Facilities. Tanks shall be refurbished at a commercial tank refurbishing facility and be certified as safe for storing livestock water.

GUZZLERS FOR WILDLIFE

Refer to Oklahoma Standard Engineering Drawing 518a and 518b for construction details of wildlife water guzzlers with precipitation collecting structures, underground storage tanks, and watering troughs.

Prefabricated, commercially available wildlife water guzzlers in the list of "Oklahoma Pre-Approved Structures, Components, and Appurtenances" in Section 4 of the Field Office Technical Guide are approved for use by wildlife, however, these structures may require an additional precipitation collecting structure to meet the Oklahoma NRCS Conservation Practice Standard, Watering Facility (614). These facilities shall be installed so that the watering area (trough, ramp, etc.) are accessible for use by the targeted wildlife species, as identified in the wildlife habitat management plan.

VEGETATION

A protective cover of vegetation shall be established on all exposed disturbed areas, including earthfill areas, excavated areas, spoil areas, and borrow areas, according to the guidelines in Conservation Practice Standard 342, Critical Area Planting. Vegetation must be in accordance with the recommendations documented in the Vegetative Data Worksheet (OK-ECS-4) for the given field location and conservation plan, or according to specifications developed for the project.

ADDITIONAL CONSTRUCTION DETAILS

Refer to the appropriate approved design plans for site specific additional items of work and construction details.