

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

WATERING FACILITY

(No.)

CODE 614

DEFINITION

A permanent or portable device to provide an adequate amount and quality of drinking water for livestock and or wildlife.

PURPOSE

To provide access to drinking water for livestock and/or wildlife in order to:

- Meet daily water requirements
- Improve animal distribution
- *Protect streams, ponds and water supplies from contamination by providing alternative access to water.*
- *Create or expand suitable habitat for wildlife.*

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all land uses where there is a need for new or improved watering facilities for livestock and/or wildlife.

DEFINITIONS

Watering facility – Any water storage facility, drinking facility, or combination drinking and storage facility planned to provide water to livestock and/or wildlife.

Drinking facility – Any trough or tank that contains less than two days' water storage for the class of livestock and/or wildlife the facility is planned to serve.

Water storage facility – Any trough or tank that contains two or more days' water storage for the class of livestock and/or wildlife the facility is planned to serve.

Dependable water supply – Any pumping system powered by electricity, system served by a rural water district or other public water system, or a pond or stream that is accessible to livestock and typically does not go dry (Ref. EFH Chapter 11, Table 11-3).

Water storage volume – For the purposes of this standard the water storage volume of a water storage facility does not include any water volume required for stability.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service State Office, or download it from the electronic Field Office Technical Guide.

**NRCS, Texas
October 2008**

CRITERIA

General Criteria Applicable To All Purposes

Design watering facilities with adequate capacity and supply to meet the daily water requirements of the livestock and/or wildlife planned to use the facility. Include the storage volume necessary to provide water between periods of replenishment. Refer to the National Range and Pasture Handbook for guidance on livestock water quantity and quality requirements. For wildlife, base water quantity and quality requirements on targeted species needs. *Refer to Tech Note 19 Biology TX-19 for information on wildlife watering facility designs and drawings.*

A water resource inventory will be made for each operating unit prior to sizing the watering facility. It will include existing capacity of wells, water supply pipelines, watering facilities, ponds and streams.

Required storage will be based on existing water resources, potential forage production, planned grazing systems, the frequency that livestock is checked and the expected down time for repairs of pumps and wells. Daily water requirement tables are included in this standard for domestic livestock (Table 1) and wildlife species for which watering facilities are commonly constructed (Table 2).

The water storage facility or combination water storage and drinking facility will provide sufficient capacity for a minimum of:

- *two days water demand when the source is a public water supply,*
- *four days water demand when the source is an electric pump, or*
- *seven days water demand when another source is used.*

As a general rule the weaker the well, the greater the need for additional storage.

Where a minimum water depth is to be maintained for stability, the minimum storage requirements will be met in that portion of the water storage facility above the standpipe (water supply outlet) or water supply inlet, whichever is lowest.

Table 1

Domestic Livestock	Gallons/ Day / 1000 lbs. Live Animal Weight
<i>Beef Cattle</i>	<i>15</i>
<i>Dairy Cattle</i>	<i>20</i>
<i>Goats</i>	<i>25</i>
<i>Horses</i>	<i>15</i>
<i>Sheep</i>	<i>25</i>
<i>Swine</i>	<i>20</i>
<i>Poultry</i>	<i>120</i>
<i>Bison</i>	<i>15</i>

Table 2

Wildlife Species	Number of Animals	Gallons of Water per Day
<i>Antelope</i>	<i>Each</i>	<i>1-2</i>
<i>Deer</i>	<i>Each</i>	<i>1-2</i>
<i>Elk</i>	<i>Each</i>	<i>5-8</i>
<i>Quail</i>	<i>Covey</i>	<i>1-2</i>
<i>Turkey</i>	<i>Flock</i>	<i>2-3</i>
<i>Pheasant</i>	<i>Local Population</i>	<i>2-5</i>
<i>Dove</i>	<i>Local Population</i>	<i>2-5</i>
<i>Songbirds</i>	<i>Local Population</i>	<i>1-2</i>

Locate facilities to promote even grazing distribution and reduce grazing pressure on sensitive areas. *Tables 3 and 4 provide guidance for use in determining the location of watering facilities.*

Design the watering facility to provide adequate access to the animals planned to use the facility. Incorporate escape features into the watering facility design where local knowledge and experience indicate that wildlife may be at risk of drowning.

Include design elements to meet the specific needs of the animals that are planned to use the watering facility, both livestock and wildlife.

Table 3

Type of Terrain	Travel Distance, min. (miles)
Rough (slopes > 15%)	1/4 - 1/2
Rolling (8 - 15%)	3/8 - 3/4
Level (<8%)	3/4 - 1

Table 4

Wildlife Species	Distribution of Facilities
Antelope	1 per 1-2 square miles
Deer	1 per square mile
Elk	1 per 2-4 square miles
Quail	1 within 0.25 mile of food and cover areas
Turkey	1 within 1 mile of roost areas
Pheasant	1 within 0.5 miles of feeding areas
Dove	1 within 2 miles of feeding areas
Songbirds	1 within 0.25 miles of feeding areas

Protect areas around watering facilities where animal concentrations or overflow from the watering facility will cause resource concerns. *The site will be well drained; if not, drainage measures will be provided.* Use criteria in NRCS Conservation Practice Standard 561, Heavy Use Area Protection to design the protection.

Adjacent to the watering facility the areas that will be trampled by livestock will be protected with a minimum of 6 inches of gravel, 4 inches of concrete, or otherwise treated to provide firm footing and reduce erosion. The protection will extend a minimum of 5 feet out from the drinking facility.

Install permanent watering facilities on a firm, level, foundation that will not settle differentially. Examples of suitable foundation materials are bedrock, compacted gravel and stable, well compacted soils.

STABILITY

Design and install watering facilities to prevent overturning or sliding by wind and animals.

This may be accomplished by maintaining a minimum required water depth in the water storage facility or by installing suitable rod anchors into the soil or rock underlying the water storage facility. Anchors for water storage facilities will be installed according to manufacturer recommendations.

When protection against overturning and sliding of a water storage facility is to be accomplished by maintaining a minimum required water depth in the water storage facility, the minimum water depth in feet will be that determined by the following expression:

$$h_w = 0.735(h/d)^2 + 1.33 h/d$$

h_w is the required minimum depth of water to be maintained, in feet of depth.

h is the height of the water storage facility, in feet.

D is the diameter of the water storage facility, in feet.

Example: Water storage facility of 12 feet in height and 8 feet in diameter.

$$h_w = 0.735 (12/8)^2 + 1.33 (12/8)$$

$$= 0.735 (1.5) + 1.33 (1.5)$$

$$h_w = 1.65 + 1.99 = 3.6 \text{ feet, (rounded off)}$$

To assure that the minimum water depth for stability is not unknowingly withdrawn below the required depth, the water supply outlet pipe will be 1) fitted through the sidewall of the water storage facility at the distance "hw" above the floor of the water storage facility, or 2) made as a standpipe through the bottom of the water storage facility with the height of the standpipe within the water storage facility being the distance "hw" above the inside floor. A sluice valve may be placed at the bottom of the water storage facility for cleanout and maintenance, but the supply outlet will not be connected to such cleanout facility.

Drinking facilities will require protection against overturning and sliding from wind forces. When the drinking facility is equipped with an automatic inflow float valve on a pressurized inflow supply line, and the water level is maintained at or near full capacity, no further protection for stability is required. Without such provisions for automatically maintaining a near-filled drinking facility, overturning and sliding will be prevented by either 1) a method recommended by the manufacturer, 2) embedding the facility a minimum depth of 6 inches below ground surface (finished surface of the concrete or gravel scour protection), 3) anchors attached to the drinking facility and embedded in the ground a minimum of 2 feet, or 4) the weight of the facility's concrete floor. Anchors will be a minimum of three in number equally spaced on the perimeter and either screw anchors, embedded anchors, steel T-posts, or grouted rock anchors. Alternative methods of anchorage may be accepted if they have been designed by a professional engineer licensed in Texas.

WATERING FACILITY MATERIALS

Design watering facilities and all valves and controls to withstand or be protected from damage by livestock, wildlife, freezing and ice damage.

Construct watering facilities from durable materials that have a life expectancy that meets or exceeds the planned useful life of the installation. Follow appropriate NRCS design procedures for the material being used or industry standards where NRCS standards do not exist.

All fiberglass watering facilities will be manufactured in accordance with ASTM D4097 or ASTM D3299.

Concrete watering facilities will be constructed from a concrete mix producing a minimum compressive strength of 3,000 psi at 28 days and meet ACI318.

Precast concrete watering facilities manufactured under plant control conditions must have minimum 3" wall thickness except that this wall thickness will be increased to 4" where corrosive conditions are expected. All manufactured watering facilities will have drains and overflow devices as needed.

For watering facilities constructed with a concrete base and steel plate wall, the steel plate will be a minimum of 3/16" thick. Steel plate walls should not be used in corrosive water conditions.

Polyethylene is the only plastic material currently approved for use in Texas for watering facilities and its use is limited to upright water storage facilities.

Polyethylene upright water storage facilities must have a minimum depth of 3.5 feet and be designed in accordance with ASTM D1998.

Unlined galvanized metal watering facilities will have a minimum wall thickness of 20 gauge and a minimum bottom thickness of 20 gauge. Galvanizing will meet or exceed the requirements of ASTM A653, G90.

*Galvanized watering facilities **will not be used** where corrosive water or soil conditions are encountered. Galvanized watering facilities will not be used when the "Suitabilities and Limitations Ratings for Use" for corrosion of steel is rated medium or high in the Soil Data Mart.*

Galvanized metal water storage facilities with a minimum depth of 5 feet and a reinforced plastic liner will have a minimum galvanized metal thickness of 23 gauge. The reinforced plastic liner will have a minimum thickness of 20 mils and meeting the following specifications:

<i>Property</i>	<i>Test Method</i>	<i>Value</i>
<i>Penetration Resistance</i>	<i>ASTM D751</i>	<i>50 lbs. (Min.)</i>
<i>Breaking Force</i>	<i>ASTM D751 (Grab Test) Length – Width –</i>	<i>375 lbs. (Min.) 275 lbs.(Min.)</i>

PLUMBING

Use the criteria in NRCS Conservation Practice Standard 516, Pipeline to design piping associated with the watering facility. Include backflow prevention devices on facilities connected to wells, domestic or municipal water systems.

Plumbing will be new galvanized, copper, bronze, or plastic pipe in conformance with Conservation Practice Standard, Pipeline, Code 516. PVC plastic schedule 40 unthreaded, or schedule 80 threaded pipe may be used.

Galvanized steel pipe as shown on the approved standard drawings for concrete watering facilities contained in Appendix A of the Engineering Field Manual is acceptable.

Double check valves or other measures prescribed in local plumbing codes are required at watering facility inlets when watering facilities are connected to waterlines that have domestic users.

Shut-off valves will be installed on inlets and outlets to control and/or cut off flow to repair or protect the watering facility and/or pipeline and to preserve the supply in case of pipeline failure.

Watering facilities will be equipped with a drainage outlet and an overflow outlet, as either individual outlets or combinations of outlets. Watering facilities supplying water to a pipeline will be equipped with a water supply outlet. Control devices will be installed to regulate the water level in the watering facility. All fittings shall comply with the ASTM standard for the type of fitting and material used.

Overflow outlets will be piped to a stable or suitable point of release.

On fiberglass watering facility outlets, short nipples of fiberglass pipe as a part of the plumbing are acceptable if equal in quality to the watering facility material.

CONSIDERATIONS

Design fences associated with the watering facilities to allow safe access and exit for area wildlife species. To protect bats and other species that access water by skimming across the surface, fencing material should not extend across the water surface. If fencing across the water is necessary it should be made highly visible by avoiding the use of single wire fences and using fencing materials such as woven wire or by adding streamers or coverings on the fence.

For watering facilities that will be accessible to wildlife, give consideration to the effects the location of the facility will have on target and non-target species. Also consider the effect of introducing a new water source within the ecosystem in the vicinity of the facility. This should include things such as the concentration of grazing, predation, entrapment, drowning, disease transmission, hunting and expansion of the wildlife populations beyond the carrying capacity of available habitat.

Consider the following guidelines for materials commonly used for watering facilities.

Concrete	3000 psi compressive strength
Galvanized Steel	20 gauge thickness minimum
Steel Plate	3/16" minimum
Plastic	Ultraviolet resistance
Fiberglass	Ultraviolet resistance

Where water is supplied continuously or under pressure to the watering facility consider the use of automatic water level controls to control the flow of water to the facility and to prevent unnecessary overflows.

Watering facilities often collect debris and algae and should be cleaned on a regular basis. Consider increasing the pipe sizes for inlets and outlets to reduce the chances of clogging. Maintenance of a watering facility can be made easier by providing a method to completely drain the watering facility.

Consider painting fiberglass or plastic watering facility to prevent deterioration due to sunlight and reduce algae growth.

Steep slopes leading to watering facilities can cause erosion problems from over use by animals as well as problems with piping and valves from excess pressure. Choose the location of watering facilities to minimize these problems from steep topography.

ROOFS AND COVERS

Consideration will be given to placing a roof, cover, or shade over the watering facility to reduce evaporation and control algae. Roofs and insulated floating covers also help to keep water cooler in the summer and warmer in the winter. If wildlife species that access water during flight are a concern then a roof or cover may not be desirable.

When a cover (roof, shade, or floating cover) is placed over the watering facility, the cover will be designed for the appropriate snow and wind loads and able to withstand anticipated livestock and wildlife activities.

Closed top water storage facilities will be vented in accordance with the manufacture's recommendations.

Floating covers on watering facilities will be designed to provide adequate space around the perimeter for animals to water.

Floating covers consisting of chemically inert materials may be used to limit evaporation. Such covers will protect at least 80% of the facility's surface area from evaporation and will be stable for the expected range of weather conditions for that site. The manufacturer's warranty will match the expected life of the facility except in those cases where provisions are made for future replacement as needed. A minimum 10-year warranty may be accepted in those cases. Manufacturer's recommendations for installation will be followed.

PLANS AND SPECIFICATIONS

Plans and specifications for watering facilities shall provide the information necessary to install the facility. As a minimum this shall include the following:

- A map or aerial photograph showing the location of the facility
- Detail drawings showing the facility, necessary appurtenances (such as foundations, pipes and valves) and stabilization of any areas disturbed by the installation of the facility
- Construction specifications describing the installation of the facility

Development of plans will be guided by Engineering Field Handbook, Chapter 5, and will be in accordance with National Engineering Manual, Parts 541 and 542.

Standard drawings for watering facilities are available on the eFOTG website under Section I.A.15.b.State Standard Drawings.

Texas Biology Technical Note 19 contains details for watering facilities for wildlife facilities including plans and specifications.

Plans and specifications shall be approved by the NRCS before construction of the watering facility.

CERTIFICATION

A written certification is required from the facility manufacturer certifying that the facility supplied meets the material and manufacturing requirements of this standard.

OPERATION AND MAINTENANCE

Provide an O&M plan specific to the type of watering facility to the landowner. As a minimum include the following items in the plan:

- a monitoring schedule to ensure maintenance of adequate inflow and outflow;
- checking for leaks and repair as necessary;
- if present, the checking of the automatic water level device to insure proper operation;
- checking to ensure that adjacent areas are protected against erosion;
- if present, checking to ensure the outlet pipe is freely operating and not causing erosion problems;
- a schedule for periodic cleaning of the facility.
- *check for debris, algae, sludge or other materials in the watering facility which may restrict the inflow or outflow system;*
- *prepare guidance for winter weather.*
- *ensure that wildlife species access and escape is adequate and operating properly.*

REFERENCES

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APPROVAL AND CERTIFICATION

Watering Facility

(No.)

CODE 614

PRACTICE STANDARD APPROVED:

John W. Mueller
State Conservation Engineer

10/30/08
Date