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

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. This practice does not apply to Conservation Practice 378, Pond.

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. For guidance on livestock water quantity and quality requirements, refer to the National Range and Pasture Handbook (NRPH) and Publication S-147, Waterers and Watering Systems: A Handbook for Livestock Producers and Landowners, by Kansas State University Agricultural Experiment Station and Cooperative Extension Service. For wildlife, base water quantity and quality requirements on targeted species.

Design the watering facility to provide adequate access to the animals that will most likely use the facility. Incorporate escape features into the watering facility design unless local knowledge and experience indicate that wildlife will not be at risk of drowning.

Include design elements to meet the specific needs of the animals—both livestock and wildlife—that will most likely use the watering facility.

Protect areas around watering facilities where animal concentrations or overflow from the watering facility will cause resource concerns. Use criteria in Conservation Practice Standard 561, Heavy Use Area Protection, to design the protection. The protected areas (aprons) around watering facilities shall extend a minimum of 4 feet from the edge of the facility and be at least 8 inches thick when gravels or crushed rock is used. The apron shall extend a minimum of 3 feet from the facility and be at least 4 inches thick when concrete is used. Provide positive drainage away from the apron to alleviate wet conditions around the 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. Preformed watering facilities and large storage tanks constructed of galvanized metal, fiberglass, or high-density polyethylene shall be installed 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.

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

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

Design watering facilities and all valves and controls to withstand or be protected from damage by livestock, wildlife, freezing, and ice damage. Shields or covers shall be installed to protect valves or pipes from damage by livestock or wildlife.

Construct watering facilities from durable materials that have a life expectancy that meets or exceeds the 20-year planned useful life of the installation. Follow appropriate Natural Resources Conservation Service (NRCS) design procedures for the material being used or industry standards where NRCS standards do not exist.

Use the criteria in Conservation Practice Standards 516, Pipeline, and 533, Pumping Plant, to design piping and pumping plants associated with the watering facility. Include backflow prevention devices on facilities connected to wells, domestic water systems, or municipal water systems. Large storage tanks without animal access for drinking may be used to reduce pipeline size or provide better distribution of water. Storage tanks shall be constructed of suitable materials such as galvanized metal, fiberglass, or high-density polyethylene and have the same minimum requirements as other tanks constructed of the same materials.

Automatic water level control and/or overflow facilities shall be provided as appropriate. A cleanout drain shall be provided. Overflow shall be piped to a desirable point of release away from the watering facility where the flows will not cause erosion or other environmental concerns.

If the water source is a spring development, the watering facility (tank) shall be installed as required in Conservation Practice Standard 574, Spring Development.

Tanks shall be constructed of reinforced concrete, galvanized metal, fiberglass, high-density polyethylene, or other materials satisfying the conservation needs and life expectancy requirements. Other suitable materials may include a steel rim, fiberglass rim, rubber tire rim, or rubber track rim. These materials may be embedded in a reinforced concrete floor for support and to provide a watertight storage facility. The use of high-density polyethylene shall be limited to wildlife watering facilities and large storage tanks.

A geosynthetic liner may be used instead of a concrete floor to provide water storage capabilities if adequate support for the rim is supplied by external supports or by the rim itself. The liner shall be watertight with a minimum thickness of 40 mils. It shall be manufactured of materials resistant to ultraviolet degradation or deterioration due to sunlight.

Tanks constructed of corrugated steel sheets or galvanized metal shall conform to the manufacturer's recommended design for thickness or gauge. If such recommendations are not available, then a minimum thickness of 16 gauge shall be indicated on the plans and specifications.

Tanks constructed of fiberglass, high-density polyethylene, or similar materials shall have a minimum thickness of 1/4 inch for the floors and walls. Protective coatings will be applied at the time of manufacture to prevent deterioration due to sunlight.

Concrete structures shall not be installed where experience has indicated the sulfate concentrations in the soil cause rapid concrete deterioration. For steel tanks, if a corrosion problem related to water quality is known or suspected, testing for water pH and electrical conductivity should be conducted. Based on the results of these tests, corrosion potential should be estimated. Protective coatings or non-corrosive tank materials shall be specified where necessary.

The concrete for precast concrete tanks shall have a minimum design strength of 4000 pounds per square inch (psi) at 28 days. The concrete shall have a minimum thickness of 4 inches for the floor and 3 inches for the sidewalls. The inside of the sidewall shall taper at least 1 inch from the floor to the top. Reinforcing steel shall be at least 3/8-inch diameter steel bars and be spaced no further than 12 inches center to center.

Concrete for cast-in-place tanks (floor and walls) shall have a minimum design strength of 3500 psi or as required by the design. Designs for cast-in-place concrete tanks shall meet or exceed the design requirements shown in Forms KS-ENG-429, Reinforced Concrete Storage Tank (Rectangular), and KS-ENG-430, Reinforced Concrete Storage Tank (Circular).

Reinforcing steel, nylon fiber mesh additive, or welded wire reinforcement (WWR) shall be used in concrete as required by the design.

Reinforcing steel or WWR shall be designed in accordance with appropriate engineering procedures and shall be shown on the drawings.

Concrete may be placed without reinforcing steel or WWR in the base of a rim tank if all of the following criteria and site conditions are met:

- The tank base is located on soils that have low or moderate shrink-swell potential to a depth of 3 feet. The shrink-swell potential can be found by converting the linear extensibility using Table 1 below. (Use the most restrictive layer [highest percent] within the desired soil depth.) Linear extensibility is the linear expression of the volume of difference of natural soil fabric at 1/3 bar or 1/10 bar water content and oven dryness and is reported as a percent change of the whole soil. Linear extensibility is obtained from the Soil Data Mart as follows:
  - Click "Select State" button and highlight "Kansas"
  - Click "Select Survey Area" button and highlight the county of interest
  - Click the "Generate Reports" button and highlight the map unit(s) of interest
  - Click on the drop-down menu by the "View Description" button and highlight "Physical Soil Properties"
  - Click "Generate Report" button

Table 1—Shrink-swell potential

Linear Extensibility (percent)	Shrink-Swell Potential
< 3.0	Low
3.0-6.0	Moderate
6.0-9.0	High
> 9.0	Very high

- The concrete has a minimum design strength of 3500 psi at 28 days.
- Nylon fiber mesh is included in the concrete mix as an additive.
- The tank is located to provide positive drainage away from the tank.

Additional Criteria for Livestock

Water requirements of livestock are influenced by multiple factors that include size, rate of gain, pregnancy, lactation, activity, type of diet, feed intake, and environmental temperature. Watering facilities should provide 1 to 2 gallons of water per day per 100 pounds of animal body weight. The highest values for each type of animal in Table 2 below may be used for summer water needs. A lesser volume is adequate based on local experience or when only winter watering is being provided. For livestock species not in Table 2 or in Publication S-147, other references will be used—with the assistance of a range conservationist.

Table 2—Livestock requirements

Type of Livestock	Gallons/Day
Beef cattle	6-18
Dairy cattle	10-30
Sheep and goats	1-4
Horses	8-12

Where wind, power, or pump failure may cause a loss of water supply, a 3-day water supply shall be provided. The minimum capacity may be less than the 3-day livestock water requirement when an auxiliary power source is available, where a rural water district is the supply, where tanks are supplied by gravity flow from ponds, or where a spring development supplies water.

Where water supplies are dependable or the water supply is provided for grazing distribution only, manufactured waterers with little or no water storage capacities may be used. Waterers are generally defined as installations with less than a 200-gallon capacity and with flows controlled by internal automatic water level control devices. They must be capable of delivering the daily water requirements of the entire herd within a short period of time. They shall be installed on a concrete base or in the ground as recommended by the manufacturer. Precast tanks designed to be installed below the ground surface are considered manufactured waterers. The concrete 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.

Locate facilities to promote even grazing distribution and reduce grazing pressure on sensitive areas. The spacing of the facilities and loading requirements will be determined by the range conservationist or other planner working with the cooperator prior to designing the watering facility. Section 600.0505(f), "Facilitating practice—Water development," in the NRPH provides additional guidance.

Additional Criteria for Wildlife

Wildlife water requirements. When designing wildlife watering facilities, consider the species and the following water requirements:

Species	Water Requirement
Antelope	1-2 gallons/animal/day
Deer	1-2 gallons/animal/day
Elk	5-8 gallons/animal/day
Mourning dove	2-5 gals. available continuously
Prairie chicken	2-5 gals. available continuously
Pheasant	2-5 gals. available continuously
Quail	2-5 gals. available continuously
Songbird	1-2 gals. available continuously
Wild turkey	2-5 gals. available continuously

For wildlife species not included in the table, other references will be used—with the assistance of a wildlife biologist.

Spacing between watering sites. Because of the expense of water development, it is advisable to determine the need for wildlife water at a site. Wildlife watering facilities may be provided if the following occurs:

- The range of the desired species of wildlife might be extended by providing additional water developments.
- The present population densities of the desired species can be increased by further water development.
- New habitat can be created.
- The landowner's objectives include attracting wildlife for aesthetic value.

There is no set rule for spacing of wildlife watering facilities. The distance the desired species will travel for water is the main criteria that should be used.

Water should be available at intervals in the landscape so that the ecological needs of the target species are met. Consider the distribution of food and cover, terrain, ecological barriers, disturbance, and any other factors that affect wildlife movement and survival. Follow-up monitoring of wildlife watering facilities can help identify problems so that adjustments can be made to meet the objectives.

The following is an estimate of the distance some wildlife species will travel to water:

Species	Optimum (miles)	Maximum (miles)
Antelope	2	3
Deer	1	3
Elk	1	3
Mourning dove	3	5
Prairie chicken	0.5	1
Pheasant	0.5	1
Quail	0.25	1
Songbird	0.1	0.5
Wild turkey	1	2

Site location. For upland bird habitat, the site chosen for a wildlife watering facility can serve as a covey center. Escape cover should be provided adjacent to the water. A clump of American plum, currant, aromatic sumac, or other adapted shrub species furnishes favorable escape, foraging, and loafing cover near the installation. Brush piles can be used for temporary cover until vegetation can be established at the site. A site within 100 to 200 yards of a roost tree can be desirable for appropriate species.

The necessity for water in an area depends upon the availability of food, cover, and space requirements of the wildlife species that will benefit from the water development. For specific wildlife species, use other references—with the assistance of a wildlife biologist.

Wildlife watering facility design. The minimum storage tank capacity and collection area will be based on the target species using the facility as shown in Table 3. The maximum

tank capacity and collection area may be as large as 2 times the minimum requirements.

Table 3—Wildlife requirements

Target Species	Minimum Tank Capacity	Minimum Collection Area (square feet)
Upland game birds	30-gallon	100
Deer and antelope	150-gallon [1]	450
Elk	350-gallon [2]	1000

[1] Based on 20 animals, 5-day supply

[2] Based on 10 animals, 5-day supply

A typical design for a wildlife watering facility is presented in the attachment to Kansas Conservation Reserve Program (CRP) Technical Guidance Number 70. Other similar designs or manufactured facilities may also meet the minimum tank capacity and collection area requirements. All materials used in manufactured facilities shall have a life expectancy that meets or exceeds the 20-year planned useful life of the installation.

CONSIDERATIONS

Fences associated with the watering facilities should be designed 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 using woven wire fence materials instead of single wire fence or by adding streamers or coverings on the fence.

For watering facilities that will be accessible to wildlife, consider 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.

Freeze proof tanks or electric heaters may be used at some sites. Roofs can be placed over the tank to provide shade and reduce loss of water by evaporation.

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

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

Concrete	3500 psi compressive strength
Galvanized steel	16 gauge thickness
Plastic	Ultraviolet resistance
Fiberglass	Ultraviolet resistance

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.

Steep slopes leading to watering facilities can cause erosion problems from overuse 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.

Watering facilities should not be installed in or near potential wetland areas to avoid disturbance of these areas by animal traffic. Overflow facilities may release water into potential wetland areas as an enhancement if there are no water quality or erosion concerns.

Rim-type tanks constructed of corrugated steel or galvanized metal may have sharp edges along the top rim after installation. Additional reinforcement along the top rim such as galvanized pipe or angle iron will reduce the risk of livestock injury due to sharp edges.

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.

The required drawings may be developed from standard drawings or by accessing sheets for individual watering facility types in the Watering Facility Spreadsheet. These sheets can be printed and used as attachments to Form KS-ENG-25, Watering Facility-614. Additional drawings that are specific to certain materials may be available from manufacturers or suppliers.

A list of approved tank products that can be used for watering facilities is available in Section KS650.1780(b) in NEH 650, *Engineering Field Handbook*. Other tank products that are not on the list may also meet the site-specific design requirements.

OPERATION AND MAINTENANCE

Provide an operation and maintenance (O&M) plan specific to the type of watering facility for 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 ensure 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.

REFERENCES

Brigham, William and Stevenson, Craig, 1997, Wildlife Water Catchment Construction in Nevada, Technical Note 397.

Tsukamoto, George and Stiver, San Juan, 1990, Wildlife Water Development, Proceedings of the Wildlife Water Development Symposium, Las Vegas, Nevada, U.S. Department of Interior Bureau of Land Management.

Yoakum, J. and W.P. Dasmann. 1971. Habitat Manipulation Practices. Chapter 14 in Wildlife Management Techniques, Third Edition. Ed. Robert H. Giles, Jr. Pub. The Wildlife Society. 633 pp.

National Engineering Handbook, Part 650, Chapters 5, 11, 12, and 17, USDA NRCS

National Range and Pasture Handbook, Chapter 5, Section 2, Page 5-39, Chapter 6, Page 6-12, Tables 6-7 and 6-8, USDA NRCS.

National Research Council, 1996 Nutrient Requirements of Domestic Animals, National Academy Press

Kansas State University Agricultural Experiment Station and Cooperative Extension Service publication S-147 "Waterers and Watering Systems: A Handbook for Livestock Producers and Landowners."

Kansas Conservation Reserve Program Technical Guidance Number 70 “Watering Facility Options for Wildlife.”