NRCS, KY

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contamination from fecal contamination or surface pollution.

When a watering facility is installed adjacent to a well, provide positive drainage away from the well head.

**Foundation.** Install the watering trough or water storage tank on a firm, level foundation that will not settle differentially. Examples of suitable foundation materials are bedrock, concrete, compacted gravel and stable, well-compacted soils. Where necessary, prepare the foundation by removal and disposal of materials that are not adequate to support the design loads.

Anchor or brace the watering facility to prevent overturning by wind and animals, if needed.

**Tanks.** Analyze the foundation conditions and provide a design that will ensure the stability of with a tank height greater than the tank diameter, also analyze the potential for overturning and identify the anchoring requirements.

Use NRCS design procedures or manufacturer’s guidelines to ensure that buried tanks will withstand all earth and vehicle loads anticipated for the site.

**Stabilization.** For a fixed trough, protect the area around the watering facility where animal concentrations or overflow from the watering facility will cause resource concerns. Use NRCS CPS Heavy Use Area Protection (Code 561) to design the protection.

For a portable facility, move the trough frequently to prevent damage from animal concentrations.

**Appurtenances.** Use the criteria in NRCS CPS Livestock Pipeline (Code 516) to select the components needed to attach the water supply to the trough. Include backflow prevention devices on facilities connected to wells or to domestic or municipal water systems.

Provide a stable outlet for the overflow pipe when an overflow pipe is included in the design. Protect the outlet from damage. Direct overflow from the trough to another beneficial use or to the original watercourse, where possible.

Where water is supplied under pressure to the watering facility, use an automatic water level control or float valve to control the flow of water to the facility in order to reduce energy use and prevent overflows.

As needed, install a float valve on a gravity-fed trough to avoid draining the water source.

Protect valves and controls from damage by livestock, wildlife, freezing, and ice. Freeze-proof troughs or electric heaters may be used.

Equip watering facilities with a capacity larger than 100 gallons with a minimum 1-inch drain plug to facilitate maintenance of the watering facility.

Give gravity fed systems sufficient head to supply the water for the design number of animals. Set the minimum elevation head to 4 feet (planned permanent water surface of pond or spring box to lip of watering facility) when water level is controlled by a valve. Set the minimum elevation head to 1 foot when water flows through the watering facility.

**Materials.** Specify materials whose life expectancy meets or exceeds the planned useful life of the installation. Common construction materials are reinforced concrete, steel, fiberglass, and plastic. Prepare all designs based on the industry standards for the material being used. Refer to generally applicable design requirements and procedures found in the documents referenced at the end of this standard.

Require at least 3-inch thick walls and 4-inch thick floor with a minimum of 8-gauge welded wire for reinforced concrete facilities. Construct them from a concrete mix producing a minimum compressive strength of 3,000 psi at 28 days.

Require galvanized steel tanks with a minimum thickness of 20 gauge.

Require plastic and fiberglass structures made of ultraviolet resistant materials or have a durable coating to protect the structure from deterioration due to sunlight. Require a minimum thickness of the walls and floor of ¼ inch.

When a large equipment tire is used as a watering facility, require suitable quality to perform as intended for the useful life of the practice. Require the tire have no chemicals injurious to livestock. Supply an approved
standard drawing to prepare site specific designs for this type of tank.

Water supply and outlet pipe. Equip the watering facility with a suitable water supply pipe, drainage outlet, and overflow outlet, either as individual outlets or a combination of outlets. Drainage outlets for systems with flow-through water must extend at least 10 feet from the watering facility. Use new galvanized steel, copper, bronze, or plastic pipe and plumbing fittings in conformance with Conservation Practice Standard, Pipeline, Code 516. Require water supply pipelines with a minimum inside diameter of 1 1/4 inch for gravity flow systems or 3/4 inch for pressurized systems. Connect the supply lines in a manner to prevent leakage and provide proper sanitary protection (i.e., backflow prevention).

Ram pumps. Ram pumps require falling water to pump water uphill. Set the minimum vertical fall from drive pipe inlet to the ram at two feet. In order to provide a constant supply and uniform head of water, collect the water in a durable trash-resistant device (inverted PVC pipe, concrete or galvanized metal) before it enters the drive pipe to the ram. Use a ratio of five feet of drive pipe length to one foot of fall to ensure proper operation. Bury the pipe on a constant grade with no turns to the ram. Locate the ram pump on a concrete foundation and appropriately protect or house it. Install a gate valve near the ram entrance for periodic maintenance.

Nose pumps. Anchor nose pumps to concrete or other approved device to prevent damage by livestock. 

**Water Supply** Where water supplies are dependable and livestock are checked daily, troughs with little water storage capacity may be used. Troughs or tanks must provide the daily water requirement of the livestock and provide access to the entire herd within a short period of time.

Use 3 days as minimum storage time where water is supplied by undependable means (i.e., solar, RAM, etc.). However, if an alternate permanent water source (i.e., pond, lake, stream, etc.) is available and readily accessible, then the 3-day storage period is not required.

Replenishment rate. The inflow of water in a 3-hour period plus the individual watering facility (watering facility/tank) capacity shall equal or exceed one-half the daily requirement for the livestock using the facility.

Backflow Protection. Use properly installed back flow prevention devices or air gaps on watering facilities that have a potential to cross-connect with the public water supply system. Meet the requirements of the local water utility’s cross-connection control program. Include measures to prevent backflow or back-siphoning on watering facilities connected to potable water well systems. Acceptable measures to prevent backflow include the use of an air gap or double check valve.

Air gap. Set air gaps a minimum of 2 times the diameter of the supply line above the crest or overflow device of the watering facility. (Example: If the supply line is 1 inch, then the minimum air gap required is 2 inches above the crest of the overflow device.) Protect the supply line and air gap from contact by livestock. Include measures to protect the air gap from inadvertent splashing by the livestock during watering.

Additional Criteria for Wildlife Water

- In Kentucky, Wildlife Watering Facilities refer to excavated or small embankment watering holes. Wildlife Watering Facilities refer to wildlife water holes throughout this document.
- Because each facility is unique to species, habitat, topography, and climate; watering facilities must be planned and installed according to a plan and adapted to the specific site.
- To maximize wildlife use, place water holes either in the woods, wildlife friendly grass fields or grown up areas.
- Exclude wildlife watering holes from livestock.
- The facility must provide permanent, accessible, dependable, and suitable quality water for the critical period.
Soils

Place wildlife watering holes in soils suitable for pond development according to the county soil survey or onsite investigation.

Depth

- minimum depth 2.5 feet
- maximum depth 4 feet.

Pool Area

- minimum 1000 sq. ft.
- maximum of 1,600 sq. ft.

Side Slopes

- Side slopes shall be flat enough to maintain stability, but not steeper than 2 horizontal to 1 vertical. At least 25% of the side slope perimeter shall be 4:1 or flatter.

Embankments

- Design small earth embankments intended to store more 3 feet of water against the embankment according to the Pond (378) standard with the exception of size and depth.

Placement of Spoil

- Spread spoil from excavated type water holes uniformly to a height of 3 feet or less, with the top graded to a continuous slope away from the water hole. Spread spoil from embankment type watering holes below the embankment, if necessary, but not above the pool area.

Vegetation Establishment

- Vegetate disturbed areas according to the (342) Critical Area Planting standard using wildlife friendly species.

Escape Features. For a site west of the 100th meridian, incorporate escape features for wildlife into the design of an open-surface watering facility. For a site east of the 100th meridian, install escape features where local knowledge and experience indicate that wildlife may be at risk of drowning.

Watering Ramps

Where livestock or wildlife will drink directly from a pond or stream, use a watering ramp to provide a stabilized access to the water. Evaluate the existing and proposed fences, grazing patterns, shoreline slope, and water depth when choosing the optimum location for the ramp.

Width. Make the ramp wide enough to accommodate the expected usage.

Length. Extend the ramp into the stream or pond far enough to achieve the desired depth.

Surface drainage. Divert surface runoff from the approach to the ramp.

Slope. Make the slope of the watering ramp consistent with planned animal usage but not steeper than 3:1.

Side slopes. Make all side slope cuts and fills stable for the soil materials on the site. Make the side slopes of cuts or fills in soil materials no steeper than 2 horizontal to 1 vertical (2:1). Make rock cuts or fills no steeper than 1.5 horizontal to 1 vertical (1.5:1).

Foundation. Where necessary, prepare the foundation by removal and disposal of material that are not adequate to support the design loads.

Surface material. Use the criteria in NRCS CPS Heavy Use Area Protection (Code 561) to design the ramp surface. The selected material must be of adequate quality to withstand underwater conditions.

Access. Use fencing or other barriers to delineate the boundaries of the ramp. Use NRCS CPS Fence (Code 382) for the design and construction of a fence. Barriers must be of sufficient size, strength, and quality to meet the intended use of the facility.

Ramps in Streams. Use the criteria in NRCS CPS Stream Crossing (Code 578) for the design and construction of a ford crossing except as noted above.

Locate the watering ramp so that it does not impede the movement of aquatic organisms in the stream.
Ramps in Ponds. A minimum water depth of 3 feet, measured from the designed permanent water level, is recommended. Where the pond depth is greater than 3 feet at the ramp location, it may be necessary to excavate the ramp into the pond bank to provide a stable base at the lower end. Extend the ramp a minimum of 0.5 feet above the designed permanent water level.

CONSIDERATIONS

Not all species need or benefit from supplemental water. Consider impacts to both target and non-target wildlife species before installation of a watering facility. Observed or documented use of a facility by wildlife does not necessarily indicate net benefits. Introducing a new water source within an ecosystem can have effects such as the concentration of grazing, predation, entrapment, drowning, disease transmission, and expansion of the wildlife populations beyond the carrying capacity of the available habitat. Providing a water source for wildlife could enhance the habitat for species that compete with or prey on at-risk species.

Design fences associated with the watering facility to allow safe ingress and egress for area wildlife species. To protect species that access water by skimming across the surface, make fencing materials highly visible with appropriate openings. Add permanent streamers or coverings to wire fences that extend across a watering facility to make them more visible to skimmers.

Wildlife populations within desert or arid regions of the country can become dependent on supplemental watering facilities. Consideration should be given to maintaining year-round water even if livestock is not present.

Consider designing the facility to benefit wildlife. Such designs would include providing ground-level access to water for species that cannot use raised structures such as troughs. Ground-level access can be provided through creation of an overflow collection area or a secondary ground-level water source.

Depending on the target species, planners may want to consider protecting these areas through the use of suitable fencing (marked as needed) that excludes livestock and larger wildlife species while allowing access of the site to small ground-dwelling species.

Consider making watering facilities accessible to small animals. Consider installing escape ramps for small animals. An effective escape device must:

- Meet the inside wall of the tank or trough
- Reach to the bottom of the trough or tank
- Be firmly secured to the trough rim
- Be built of durable material with a rough surface animals can grip
- Have a slope no steeper than 45 degrees
- Be located to cause minimal interference with livestock

Provide one escape device for every 30 linear feet of rim.


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

<table>
<thead>
<tr>
<th>Material</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>3000 psi compressive strength</td>
</tr>
<tr>
<td>Galvanized Steel</td>
<td>20 gauge thickness</td>
</tr>
<tr>
<td>Plastic</td>
<td>Ultraviolet resistance</td>
</tr>
<tr>
<td>Fiberglass</td>
<td>Ultraviolet resistance</td>
</tr>
</tbody>
</table>

Consideration should also be given to prevention of disease transmission at watering facilities. Suitable controls/treatments for water-transmissible diseases and parasites should be considered if they are a problem locally.

When windmill, solar, or other potentially unreliable power source is used, supply additional daily water storage volume (3-5 days), provide a battery back-up system or provide an alternate water source. Use of a float valve on a system with one of these types of power supply may not be practical.

Consider the effects of water development on the balance or budget of water resources in the area of the new project. In some settings, this could be important and may result in...
effects to adjacent or associated habitats and species.

If there is the potential for small livestock, such as lambs or kids, to fall into the trough, provide a ledge or similar structure in the trough to provide an escape route or provide a second trough that has a shorter height.

Debris and algae can collect in watering facilities resulting in the need for frequent cleaning. Covers that shade the facility and reduce debris from falling into the facility, while still allowing animal access, will keep the water cooler, cleaner, and more palatable to animals.

When a roof is placed over the trough to provide shade, design the roof for appropriate snow and wind loads and ensure that it will be durable to withstand anticipated livestock and wildlife activities. Use the criteria in NRCS CPS Roofs and Covers (Code 367) to design the roof. (Shade is normally not recommended for cattle troughs.)

Where debris or algae is a problem, reduce the chances of clogging by increasing pipe sizes for inlets and outlets or by installing a feature such as an inverted elbow at the inlet to the overflow pipe. Maintenance of a watering facility can be made easier by providing a method to completely drain the watering facility. Protect the outlet of a drain from erosion.

Consider installation of a permanent means of ingress and egress for maintenance of a storage tank, if needed.

A watering facility located on a steep slope can have erosion problems from the animal traffic. The steep slopes may also cause problems with piping and valves from excess pressure. Choose the location of the watering facility to minimize problems caused by steep topography.

Provide room for at least 1 animal in 20 to drink from a watering facility at a time. Plan on 20 inches of perimeter for circular watering facilities and 30 inches of length for the straight side of a watering facility for each animal drinking. (Circumference equals diameter X 3.1416. Diameter equals circumference divided by 3.1416).

Use portable watering facilities on rotational grazing systems, so the watering facilities can be relocated to disperse impacts from trampling vegetation.

To ensure uniform grazing and waste distribution in the field, locate the watering facilities so cattle do not travel more than 800 feet.

Locate watering facilities within 500 feet of where lactating dairy cattle are grazing. (See publication “Prescribed Grazing and Feeding Management for Lactating Dairy Cows”, New York State Grazing lands Conservation Initiative and USDA NRCS, January 2000).

Where possible, a watering facility can provide water for 2 to 4 pastures. Gates or gaps may be placed adjacent to the watering facility to allow livestock access to the entire watering facility from any one paddock at a time. Avoid placing feeding areas or other concentrated animal activities above a water source.

Consider fencing ponds serving as a water source for a watering facility, to prevent cattle from damaging pond banks and creating water quality problems with the water source. The fenced boundary around the pond provides a vegetative filter strip for water entering the pond. Install fencing according to Conservation Practice Standard Code 382 - Fence.

Consider locating the watering facility to discourage loafing of the cattle around it. Placing the watering facility under trees encourages loafing and also creates maintenance problems with leaves dropping into it. If water temperature is a concern, partially bury the watering facility or shade it with a roof.

Consider an alternate permanent water source (such as a pond, lake, stream, etc.) to have water available for livestock if the normal water source becomes inoperable.

**Watering ramps.** Where livestock exclusion from a stream is part of the planned installation, consider installing a watering ramp that can be used if emergency access to water is needed. Use a gate to restrict access to the ramp.

The slope of the ramp can influence animal behavior. Steeper slopes tend to discourage loitering in the ramp area.

Select a surface material for the ramp that will discourage loitering but still provide a stable
footing. The larger stone will make the hoof contact slightly uncomfortable.

Avoid locating watering ramps in shady places where possible.

It is difficult to put a fence in the middle of a stream. Where possible, extend the fence completely across the stream. Swinging gates can be used to restrict animal movement.

PLANS AND SPECIFICATIONS

Provide plans and specifications that describe the requirements for applying this practice to achieve its intended purpose. As a minimum, include:

- A map or aerial photograph showing the location of the facility and any associated pipelines
- Type and number of animals expected to use the facility.
- Special conditions for access, as needed
- Foundation stability requirements.
- Site-specific detail drawings showing the facility and necessary appurtenances (foundations, pipes and valves, escape features, anchoring, etc.)
- Requirements for stabilization of any areas disturbed by the installation of the facility
- Fencing, as needed
- Materials and quantities
- Construction specifications describing the installation of the facility

OPERATION AND MAINTENANCE

Prepare an operation and maintenance plan and review it with the operator. The plan will describe the actions that must be taken to ensure that the facility functions properly for its design life. As a minimum, include the following items:

- Regularly check for damage to the facility. Check for leaks, site erosion, and damage to fences, heavy use areas, and appurtenances associated with the watering facility. Repair or replace damaged components, as needed.
- Check the performance of the automatic water level device, if present.
- Ensure that the outlet pipe is freely operating and is not causing erosion.
- Regularly clean the facility.
- Maintain the facility to ensure that there is adequate inflow and outflow.
- Prepare the facility for winter as dictated by the climate. This may include draining supply pipes, emptying tanks, or ensuring that float valves will not be damaged by ice.
- For a portable facility, include the plan for moving the facility and for monitoring/repair of the areas around the facility.

REFERENCES


National Range and Pasture Handbook, Chapter 6, Page 6-12, Table 6-7 & 6-8, USDA-Natural Resources Conservation Service.


Table 1 – Minimum Requirements of Individual Watering Facilities

<table>
<thead>
<tr>
<th>Kind of Livestock</th>
<th>Watering Facility Capacity (Gallons)</th>
<th>Depth (inches)</th>
<th>Minimum Daily Requirement 1/ (Gal/head/day)</th>
<th>Maximum Height Above Normal Ground (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef Cattle</td>
<td>100 (25)²</td>
<td>12</td>
<td>6-18</td>
<td>30</td>
</tr>
<tr>
<td>Horse</td>
<td>100 (25)²</td>
<td>12</td>
<td>8-12</td>
<td>30</td>
</tr>
<tr>
<td>Dairy Cattle (drinking only)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lactating</td>
<td>100 (25)²</td>
<td>12</td>
<td>25-30</td>
<td>30</td>
</tr>
<tr>
<td>Non lactating</td>
<td>100 (25)²</td>
<td>12</td>
<td>10-15</td>
<td>30</td>
</tr>
<tr>
<td>Sheep &amp; Goats</td>
<td>15</td>
<td>6</td>
<td>1-4</td>
<td>18</td>
</tr>
<tr>
<td>Swine</td>
<td>15</td>
<td>6</td>
<td>2-4</td>
<td>18</td>
</tr>
</tbody>
</table>

1/ These requirements vary with climatic conditions, kind of feed, size of animals, and other factors and may be increased as necessary.
2/ The minimum capacity of individual watering facilities may be reduced to 25 gallons provided all the following conditions are met:
   1) The pasture is 14 acres or less.
   2) Water supply into the watering facility is at least 5 gpm.