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All-Weather Surfaces for Cattle Watering Facilities

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A livestock watering area includes a watering facility and the heavy-use-area (HUA) surrounding it. Without protection, the HUA can develop surface depressions. Surface depressions can render the watering facility inaccessible and no longer frost-proof. Surface depressions also collect rainwater and excrement, creating mud and conditions adverse to livestock health (Figure 1).

Installing a watering facility can be a big investment. To protect this investment, the watering facility should be placed on a properly sized and constructed all-weather surface. Although this practice increases the initial cost, it can soon be recouped by production benefits such as a reduced risk of foot rot and feet injuries, lowered fly burdens, and improved animal performance. Conversely, an improperly sized and constructed all-weather surface could cost more money in the long run because of maintenance and repairs.

Strategically locating the watering facility will also provide production benefits such as increased forage utilization and improved access to water, and may possibly reduce the cost per pasture of providing water. This publication will provide guidelines for the location, design, and construction of all-weather surfaces for cattle watering facilities.

All-Weather Surface Options

Three options for all-weather surfaces will be discussed in this publication. Table 1 provides a comparison of the design life expectancies, relative costs, maintenance, and land restrictions associated with each option.

Option 1

Option 1 is an 18-by-18-foot concrete pad. This option is the most durable (3000-3500 psi) and maintenance free. It is ideal for watering facilities that are frequently and heavily used by livestock. The size of the concrete platform extends beyond the area that typically develops a surface depression to the entire area affected by cattle congregating around the watering facility (see the diameter of the bare soil area in Figure 1). At a minimum, the size of the concrete platform should accommodate the watering facility and the entire length of the drinking animal; this is the area that typically develops a surface depression.

Terminology

Heavy-use area (HUA): An area heavily or frequently used by livestock. If unprotected, these areas are typically denuded, compacted, and muddy. A watering area is a HUA.

All-weather surface: A durable surface used to prevent depressions, mud, and erosion in HUAs. All-weather surfaces are commonly made with concrete, rock, or a combination of both.

Watering facility: Any water source other than surface waters such as streams and ponds, used to provide an adequate supply of clean, fresh drinking water to livestock. Common watering facilities include automatic fountains, concrete tanks, and heavy equipment tires with a float.

Watering area: The watering facility and the HUA (protected or unprotected) surrounding it.

Figure 1. Without an all-weather surface, the HUA has eroded to the point where the watering facility is almost inaccessible and is no longer frost-proof. The depression also poses a threat to livestock health because livestock have to stand in mud and excrement to drink. Note the diameter of the bare soil area (18′). Photo by Jeff Lehmkuhler.

Table 1. Comparison of the design life expectancies, relative costs, maintenance, and land restrictions associated with the three different options for all-weather surfaces surrounding a watering facility.

	Design Life Expectancy[1]	Relative Cost	Maintenance	Land Restrictions
Option 1	Concrete has an indefinite life expectancy.	Most expensive to install	Little to no maintenance	Requires a large, flat area
Option 2	Concrete component has an indefinite life expectancy. Rock component can last up to 15 years before maintenance is needed.	Moderately expensive to install	Periodically reapplying rock and grading the surface	Can be installed on up to 12% slope
Option 3	Varies depending on slope.	Least expensive to install	Frequently reapplying rock and grading the surface	Can be installed on up to 12% slope

[1] Design life expectancy assumes proper installation techniques.

Option 2 (NRCS Recommendation)

Option 2 incorporates a 10-by-10-foot concrete platform and a 15-by-15-foot compacted dense grade aggregate surface to achieve an all-weather surface that is 25 feet in diameter. This option is ideal for frequently and heavily used watering facilities on steep slopes (up to 12%) or that have other land restrictions. Note that the size of the concrete platform does not extend past the length of the drinking animal with this option.

Option 3

Option 3 is the same as Option 2 except the size of the concrete platform is smaller. The size of the concrete platform extends just inches beyond the size of the watering facility so cattle cannot step on the concrete. This option should only be considered if the watering facility is lightly used or its use is highly controlled. This option requires frequent maintenance in order to maintain a uniform grade of rock around the watering facility.

Installation Guidelines

Location

Producers should carefully plan the location of a watering facility to provide access for multiple pastures and so that cattle never have to travel more than 800 feet (maximum) to drink; 500 feet is the preferred distance.

"Wagon wheel" pasture systems are no longer recommended for Kentucky. An improved system uses square-shaped pastures divided by one central lane that contains a watering facility (Figure 2). This system can be further subdivided using temporary fencing, and livestock access can be restricted from the entire lane and adjacent pastures using spring-fence (Figure 3). By concentrating livestock and vehicular traffic in the lane, pasture loss is minimized. The lane also facilitates cattle relocation within the pasture grazing system, providing increased forage utilization.

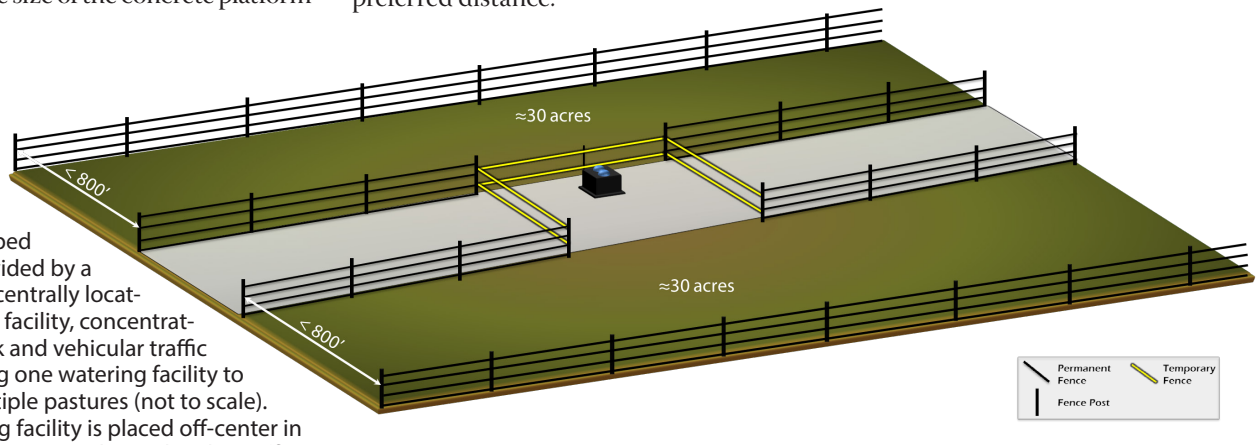

Figure 2. Square-shaped pastures divided by a lane with a centrally located watering facility, concentrating livestock and vehicular traffic and allowing one watering facility to service multiple pastures (not to scale). The watering facility is placed off-center in the lane to accommodate vehicular traffic. Figure by Donnie Stamper.

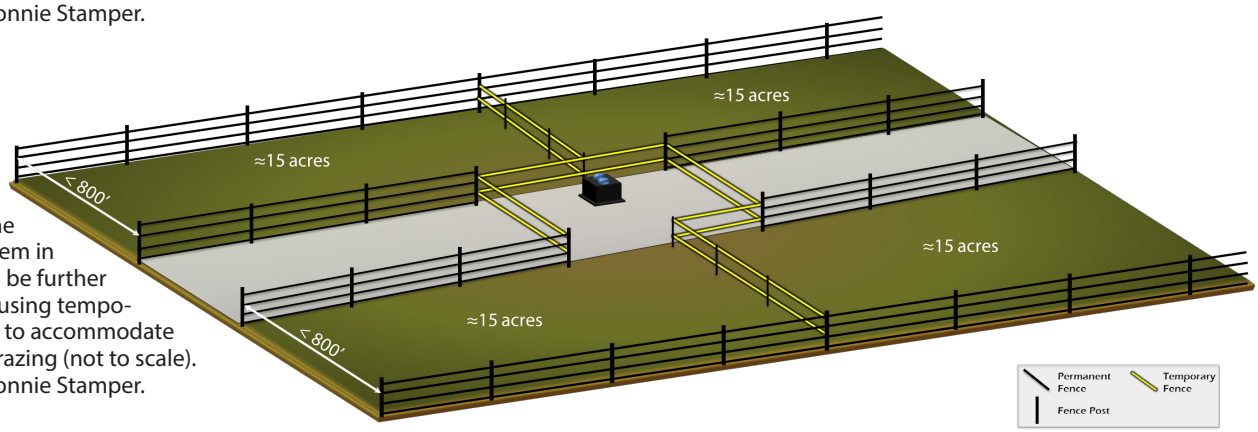

Figure 3. The pasture system in Figure 3 can be further subdivided using temporary fencing to accommodate rotational grazing (not to scale). Figure by Donnie Stamper.

The watering area and pasture accesses in the lane should be protected with all-weather surfaces, but the majority of the lane could remain as pasture. This arrangement would allow the lane to be flash grazed periodically. This type of system distributes the cost of the watering area over multiple pastures and creates a more efficient rotational grazing system.

A watering facility can also be positioned as a single structure within a pasture, but this increases the cost per pasture of providing water. In all cases, watering facilities and lanes should be placed at a higher elevation than the surrounding area and have good soil drainage to allow water and excrement to flow away from the HUA and infiltrate into the soil more easily.

One of the main purposes of a watering facility is to provide clean drinking water for livestock to increase their performance. Placing the watering facility near unrestricted surface water sources (e.g. stream or pond) defeats this purpose. Watering facilities should be used to lure livestock away from streams, ponds, and other environmentally sensitive areas to avoid animal health and water quality compliance concerns (Figure 4). Sensitive areas such as riparian areas should be fenced off so that livestock are excluded, regardless. **Note:** Kentucky No Discharge Operational Permit holders are required to exclude livestock from surface and ground water resources.

Figure 4. Watering facilities located next to accessible surface water sources defeats the purpose of providing livestock with a watering facility and is a water quality compliance concern. Photo by Amanda Gumbert.

Size and Shape

Although many producers choose to use a square platform, octagonal (Figure 5) and circular designs (Figure 6) may be very functional as well and may lower installment expenses.

The thickness of the concrete platform should be a minimum of 4 inches. If heavy trucks and tractors are going to be traveling across the platform, a thickness of 5 to 6 inches is preferred.

Figure 5. Octagonal concrete platforms provide a viable alternative to square concrete platforms. Photo by Steve Higgins.

Figure 6. Circular concrete platforms provide a viable alternative to square concrete platforms. Note that the bare soil is due to construction. Photo by the Natural Resources Conservation Service of Kentucky.

Sub-base Preparation

The key to a durable all-weather surface is to construct it on a proper sub-base. Placing a prefabricated or poured concrete platform on the existing topsoil will cause the platform to shift, settle, or crack and can lead to other maintenance or repair issues.

After determining the location and size of the watering area, excavate the watering area to a depth of at least 10 inches (Figures 7, 8, and 9). Line the excavated area with a nonwoven geotextile fabric to provide reinforcement and soil and gravel separation, and to extend the working life of the surfaces. The Natural Resources Conservation Service can provide a recommendation on the appropriate fabric. The fabric should overlap by at least 1.5 feet and be stretched so there are no wrinkles, as wrinkles prevent adequate distribution of loads and could compromise the platform.

Once the wrinkles are removed, use turf pins to hold the fabric in place. The fabric should not be exposed at the surface because sunlight will degrade the integrity of the fabric and foot traffic could cause the fabric to unravel. To prevent this from occurring, cover all of the fabric with rocks.

A minimum of 6 inches of compacted #57 stone or compacted dense grade aggregate should be placed on top of the geotextile fabric. Be careful not to tear or shift the fabric. To prevent damage to the fabric, rock should not be dropped on the fabric from a height greater than 3 feet. Use caution when dumping the first load of rock to avoid ripping or wrinkling the fabric—the fabric will not be as effective as a reinforcement material if it is wrinkled or damaged.

Placing the Concrete

The form for the concrete platform should be placed on top of the leveled and compacted gravels. The top of the form for the concrete should be installed flush with the ground so that animals can walk directly onto the hardened surface. It can be elevated slightly above the existing ground elevation, but never below. The surface of the concrete should be level or slightly sloping away from the watering facility to drain excrement and splashed water. The surface of the concrete should be smooth in the area where the watering facility will be mounted. It may be finished with a rough texture (optional) where livestock will be standing to provide traction (e.g. broom or stiff rake finished or 0.75" wide by 0.75" deep grooves on 6" centers). After the concrete has set and cured for at least three days, the forms should be removed and the watering facility can then be fastened to the platform.

Rock Surface (Options 2 and 3)

The remaining excavated area should be filled with 4 to 6 inches of dense grade aggregate. Wet and compact the dense grade aggregate until the surface is level with the concrete and the surrounding area so that animals can walk directly onto the all-weather surface (i.e. no step).

Figure 7. A cross-section of Option 1 (not to scale). Figure by Donnie Stamper.

Figure 8. A cross-section of Option 2 (not to scale). Figure by Donnie Stamper.

Figure 9. A cross-section of Option 3 (not to scale). Figure by Donnie Stamper.

Options 2 and 3 Layouts

Figures 10 through 13 demonstrate several acceptable layouts for different slopes using Options 2 and 3. These layouts are all acceptable because the stone sub-grade is excavated into the soil/subsoil. By excavating a recessed square, the undisturbed sidewalls of the soil will hold the rocks in place and help prevent them from "walking off." A 6:1 or flatter slope can be created on steeper land slopes (Figure 10 and 11) to provide drainage but not enough to create erosion. Figure 12 shows how a steep land slope can be cut and filled to provide a level foundation on the side of a hill. The filled area must be compacted or reinforced with soil cement. The areas cut need to be vegetated so the slope will be more stable. Figure 13 shows how the platform can be elevated to provide drainage and a smooth transition for livestock from the ground to the watering facility. However, this option is prone to higher maintenance because the gravel is more easily displaced.

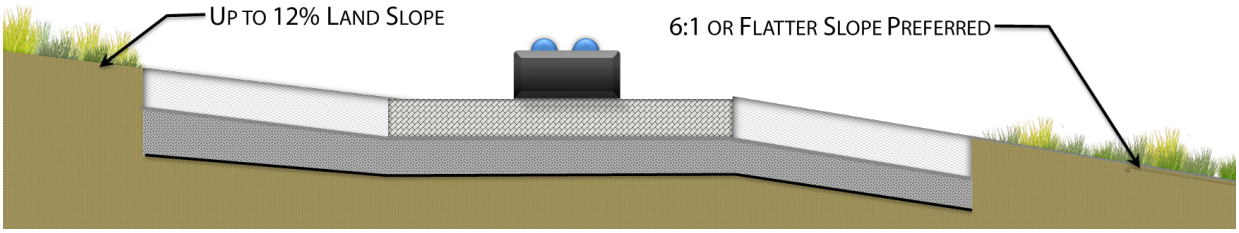

Figure 10. A watering area (not to scale) can be installed on land slopes up to 12 percent. Figure by Donnie Stamper.

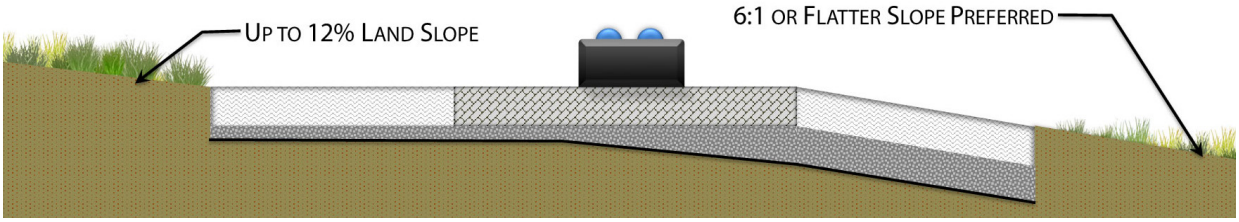

Figure 11. Similar to Figure 8 but with the left side of the HUA surface level as opposed to following the land slope (not to scale). Figure by Donnie Stamper.

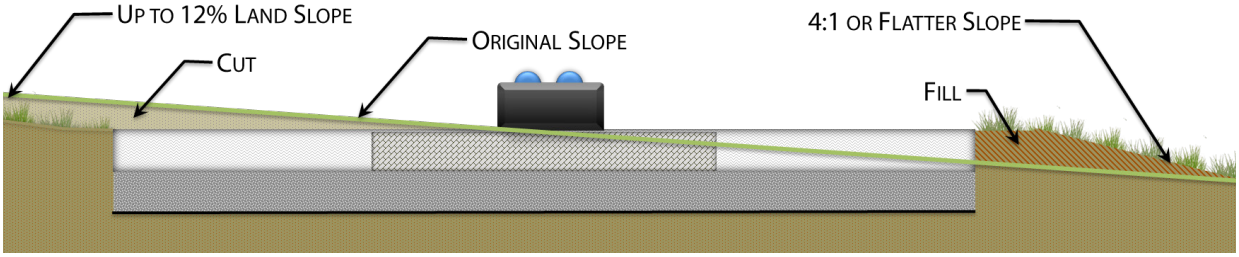

Figure 12. A land slope of up to 12 percent can be cut and filled to create a level watering area (not to scale). Figure by Donnie Stamper.

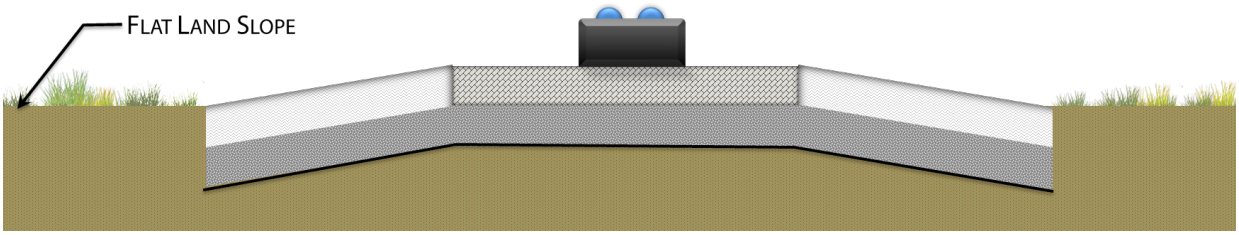

Figure 13. How to slightly elevate (no more than 6:1 slope) the concrete platform to achieve positive drainage (not to scale). Figure by Donnie Stamper.

Financial and Technical Assistance

Financial assistance may be available through the Natural Resources Conservation Service (NRCS) or the Kentucky Division of Conservation. However, the NRCS only provides financial assistance for Option 2. A producer wanting to install something more expensive, such as Option 1, can still receive financial assistance, but the amount will not exceed the cost to install Option 2. For more information, contact the local offices of the NRCS or the local Conservation District.

Technical assistance with watering facilities is available through the University of Kentucky Cooperative Extension Service and the NRCS. Contact your local offices to learn more.

For information on other farm applications of all-weather surfaces and other materials that can be used, see the University of Kentucky Cooperative Extension publication *Appropriate All-Weather Surfaces for Livestock* (AEN-115): http://www2.ca.uky.edu/agc/pubs/AEN/AEN115/AEN115.pdf.

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