Handling Beef Cattle

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The proper handling of beef cattle requires knowledge of cattle behavior and the presence of adequate handling facilities with sufficient fencing, watering, and feeding facilities to allow you to utilize recommended management procedures. Facilities on your farm should be adequate to do the job and as economical as possible. They should last a long time and lead to better care of your farm and animals.

Using Cattle Psychology for Proper Handling of Cattle

Cattle producers should manage their herds so that they minimize stress and the chance of injury to themselves and their cattle. Beef operations in Kentucky tend to be more intensively managed than those of our western counterparts. Thus, our market favors docile cattle that can be handled with ease.

Cattle behavior is affected by both genetics and environment. Producers can improve the temperament of their cow herd by culling those animals intended for the breeding herd that are wild and retaining those that have calm dispositions.

Calves that are being considered for herd replacements should have their temperament evaluated every time they are caught in the chute. Rate them according to these Beef Improvement Federation (BIF) guidelines:

1 = Docile
2 = Restless
3 = Nervous
4 = Flighty (wild)
5 = Aggressive

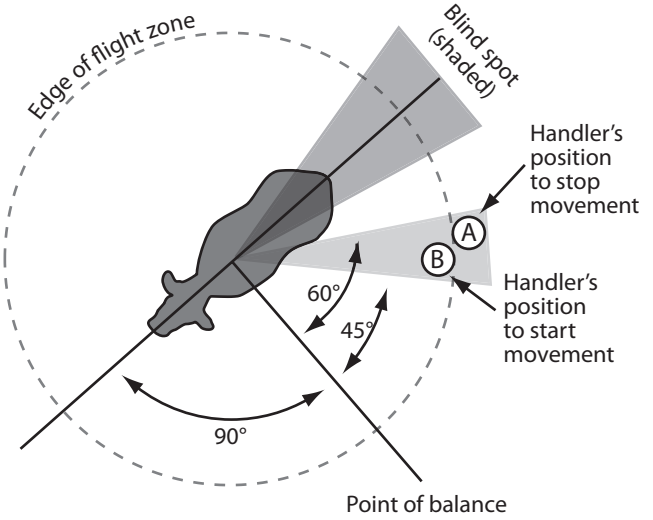
Calves that score 4 or 5 should not be kept for replacement breeding stock.

Proper Handling of Cattle

Cattle respond to the manner in which they are handled. Many people need to change their actions in handling cattle. We tend to be impatient and aggressive, and we generally want to "chase" cattle instead of handling them in a calm, quiet, easy manner.

When moving cattle in pastures or bringing them into the corral, the position and movement of the handler is very important. Cattle have a flight zone (see Figure 3-1)—the area around them that they do not like for people to enter. The size of the flight zone depends on how wild an animal is. This area can be very large in range cattle but might be only 5 or 10 feet in cattle accustomed to people.

Figure 3-1. Flight zone of cattle.



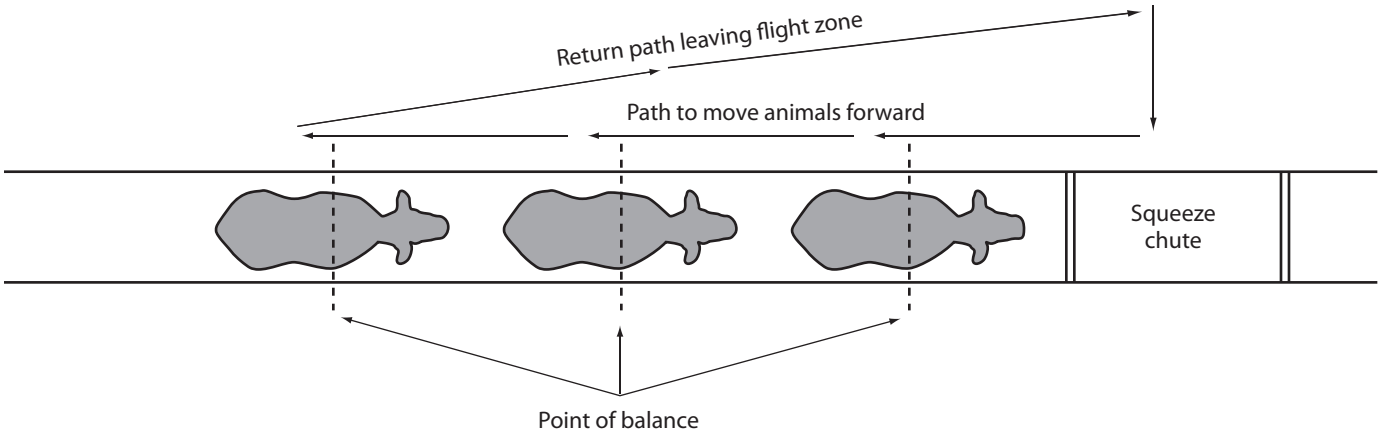
The animal moves away when a person penetrates its flight zone. You can use this behavior to your advantage when moving cattle. Approach an animal slowly from a 45° angle, and it will move away from you in an orderly manner when you enter its flight zone. If you move too rapidly or try to get too close, the animal will turn back or break and run away. The best place to be is on the edge of the flight zone. This causes the animal to move away slowly. If you want the animal to turn, move up to its shoulders (point of balance).

Handling facilities should be laid out so that cattle are "funneled" into the corral as they are moved from the pastures. Cattle move better when they think that they are returning to their pasture; therefore, the working area in the corral should be oriented so that they are turning back toward the pasture.

Work carefully when processing cattle. If you try to set a record for speed, you might end up unduly stressing or injuring your cattle. Cattle can be worked rapidly enough when they are handled skillfully and gently in a properly designed handling facility. Remember that animal health products, such as vaccines and implants, must be administered properly to be effective. Therefore, emphasize proper technique rather than speed.

Sorting cattle in a cow-calf operation is easier if you sort *cows* away from calves and work them after the calves. They will readily follow their calves. Use sorting paddles (instead of sticks) during this process.

Figure 3-2. The correct way to approach cattle.



Avoid any unnecessary noise. Clanging metal can also excite cattle. Rubber stops can be put under the tailgate of the squeeze chute. Parts that rattle should have gaskets put between them. There is no benefit to yelling at the cattle. Keep it quiet.

Approach cattle that balk in the chute during handling from the front (Figure 3-2) so that they will see you; then walk by them. They should move without any additional help. Cattle cannot see directly behind themselves, so approaching them from behind may cause them to balk.

Do not abuse cattle with electric prods or bruise them with sticks! Sorting paddles can be used effectively with little chance of abuse. Never use an electric prod in the genital or anal area, head, or udder of cattle!

Young animals that are intended for breeding replacements should have frequent exposure to people. Walk among them and hand-feed them after weaning, if possible. They should become docile and, at least, have a smaller flight zone.

Safety for the Cattle Handler

The proper handling of cattle should lead to more efficient cattle handling with less chance of injury to the handler or the cattle. Many injuries to the handler could be avoided by understanding animal behavior, being aware of environmental conditions, having proper facilities, and using safe handling techniques. In a survey on managing human risk in livestock handling, Kentucky researchers identified the following most critical safety action factors (1):

Animal Behavior

- Increase caution around bulls or cows with newborn calves.
- Understand and utilize the animal's flight zone.

Environmental Conditions

- Avoid handling cattle during extreme hot/humid or cold weather.
- Wear properly fitting clothing and protective footwear.

Handling Facilities and Equipment

- Construct sturdy and durable handling facilities.
- Lay out facilities to take advantage of animals' natural behavior.
- Use proper and adequate restraining devices (chutes, ropes, head gates).

Safe-Handling Techniques

- Be especially cautious around animals that are handled less frequently or are agitated.
- Do not trust or take animals for granted or become complacent with routine jobs.
- Match age, experience, and skill of the handler to the task at hand.

Humane Euthanasia of Cattle

Cattle owners and handlers share a moral obligation to ensure the welfare of the animals that are in their care. When disease or injury diminishes quality of life or creates pain and suffering with little chance of recovery, euthanasia is indicated. Commonly referred to as "putting an animal down," euthanasia is a Greek term that means "good death." Its goal is to cause no pain or distress to an animal.

The topic of euthanasia is unpleasant. However, it is one task that veterinarians and handlers should be prepared for. Euthanasia is indicated in the following circumstances:

- Fractures of the legs, hip, or spine that are not repairable and result in immobility or inability to stand.
- Emergency medical conditions that result in excruciating pain that cannot be relieved by treatment (e.g., trauma associated with highway accidents).
- Emaciation and/or debilitation from disease or injury that may result in the animal being too weak to be transported.
- Paralysis from disease or traumatic injuries that result in immobility.
- Advanced eye disease (e.g., lymphoma or cancer eye in cattle).
- Disease conditions for which cost of treatment is prohibitive.

- Disease conditions where no effective treatment is known (Johne's disease in ruminants), prognosis is poor, or time to expected recovery is unusually prolonged.
- Animals suspected of having bovine spongiform encephalitis (BSE) where there may be a threat to human health. (These animals should not be killed by gunshot or other methods that result in head trauma that might cause excessive damage or loss of brain tissue. Instead, suspect animals should be attended to by a veterinarian who can properly euthanize the animal and obtain brain tissue for diagnostic purposes.)

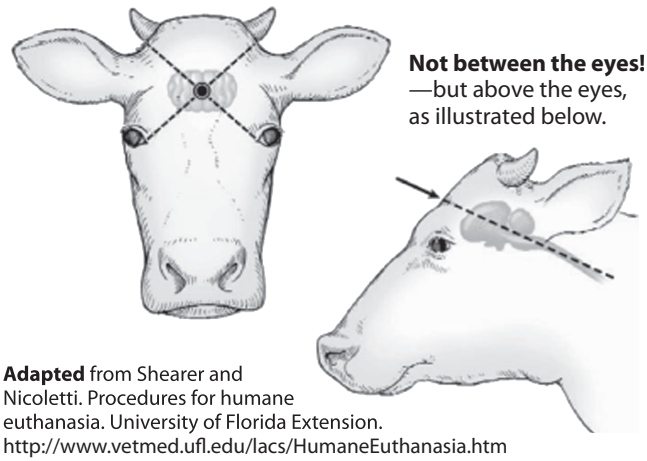
Adapted from Shearer and Nicoletti. Procedures for the humane euthanasia of sick, injured, and/or debilitated livestock. University of Florida Extension http://www.vetmed.ufl.edu/lacs/HumaneEuthanasia.htm

When conditions warrant euthanasia, the next consideration is method. Veterinarians can euthanize an animal with drugs that depress the central nervous system; this would probably be the preferred method. However, in many circumstances on the farm, gunshot is the only practical method of euthanasia. This procedure requires the selection of an appropriate firearm and bullet with sufficient velocity, energy, and size to pass through the skull and enter the brain. A .22-caliber hollow- or soft-point bullet is sufficient for young animals. However, larger adult animals require at least a .22-magnum solid-point bullet or preferably a 9-mm or .357-caliber bullet.

Proper placement is best achieved by holding the firearm within a few inches of the intended target. ***Do not*** *place the firearm against the head.* In cattle, the point of entry should be at the intersection of two imaginary lines, each drawn from the inside corner of the eye to the base of the opposite horn (or slightly above the opposite ear for polled cattle). As seen in Figure 3-3, this makes the point of entry in the center of the forehead above the center of the eyes—**not** between the eyes.

Euthanasia by the gunshot technique can result in involuntary movement and occasionally vocalization that may be misinterpreted as painful by an inexperienced person. Therefore, it is recommended that this procedure be performed out of the public view.

Figure 3-3. Proper technique for humane euthanasia of cattle.



Adapted from Shearer and Nicoletti. Procedures for humane euthanasia. University of Florida Extension. http://www.vetmed.ufl.edu/lacs/HumaneEuthanasia.htm

Proper Disposal of Dead Animals

Cattle that die of unknown causes should be taken to a disease diagnostic laboratory for a postmortem analysis to determine precautionary measures for good herd health. Some Kentucky counties may have dead animal pickup, or commercial companies may pick them up for a fee. When animals must be buried on the farm, they should be buried according to KRS 257.160: 4 feet deep with their body cavity vented (opened), covered with at least 2 inches of quick lime, and back-filled with dirt. Composting dead animals is another alternative that is cost effective, biosecure, and environmentally sound. It is regulated by 302 KAR 20:052 and can be used year round after a permit is issued by the state veterinarian.

Design and Construction of Handling Facilities

Cattle handling facilities are used to confine cattle safely and efficiently for close observation and to perform routine health and management procedures. Adequate facilities are an essential part of an efficient cattle operation for any producer who wants to improve marketing, cattle health, and production. A well-planned handling facility can help you save money by making easier practices such as preventive health management, pregnancy testing, implanting, controlling parasites, vaccinating, castrating, and dehorning.

The most obvious positive impact of improved cattle handling facilities would probably be on an operation's returns, including saved costs in labor. Most importantly, a good facility can prevent injuries to both workers and cattle. Safe handling also minimizes stress on cattle, which can reduce their weight and ability to fight disease and cause performance problems. Stress can also lead to bruising and injuries, which are quality defects.

The location of the facilities is critical. The most important points in selecting a site for handling facilities are: (1) easy access; (2) access to water and electricity; (3) good drainage; (4) security and biosecurity; (5) nearness to neighbors; and (6) future expansion.

Normally one-eighth to one-half acre of land is needed for siting working facilities. Trucks and stock trailers must have easy access to the facilities. An all-weather road is needed for accessibility under adverse weather conditions. A circular turning area is preferred to the backing of trucks and trailers, which may require a turning area of 130 to 150 feet in diameter. It is also desirable to locate facilities reasonably close to pastures for easy cattle movement.

It is important that cattle have access to water before and after they are worked through the facility. Electricity is needed when the facility is located inside a building, in case you need work or treat animals at night and want or need to track cattle performance and store data.

The site where you place the facilities must be well drained to avoid mud and sanitation problems caused by standing water. Avoid steep slopes (> 5%) to minimize problems of water pollution caused by manure runoff. The rough concrete floor in the squeeze chute area can be sloped (1 to 2%) toward an open drainage ditch or runoff storage pond outside the fences.

Locate your facility in as secure a place as possible in order to help prevent theft, vandalism, and accidental fire. Limit visitor access to control disease and to reduce interference with farm work. Cattle handling facilities are frequently located away from the farm manager's residence. If this poses a security problem, provide only one access road. Make access roads at remote sites visible from a public road or neighboring residence. You also need to think about good biosecurity management, reducing the chance of infectious diseases being introduced or spread on the farm.

Avoid sites that are directly next to neighbors' residences where odor, noise, dust, and flies might be objectionable when you are using the facilities intensively.

When planning a facility, always leave room for expansion, such as expanding the existing holding pen or adding pens.

Components

Components of a cattle handling facility include the holding pen, crowding pen, working chute, squeeze chute or head gate, loading chute, and scales. It is not necessary to use all of these parts in every system. Use only those that are needed and affordable. Table 3-1 gives the suggested dimensions for sizing facilities.

Holding Pen

Design holding pens to hold the maximum number of cattle to be worked at one time. For example, a producer with 30 cows needs a minimum of two pens to sort cows and calves. One pen would hold 30 cows and 30 calves and would be 1,020 square feet (20 square feet per cow and 14 square feet per calf [see Table 3-1]). A second holding pen measuring 600 square feet would hold cows after they are sorted away from the calves. Other pens and access alleys could be added for more flexibility.

A properly designed cattle handling facility makes many management procedures easier on both humans and animals.

Table 3-1. Corral and working facilities' dimensions for beef cattle.

	Recommended Dimensions		
Facility Component	**Up to 600 lb.**	**600 to 1,200 lb.**	**Over 1,200 lb.**
Holding Pen			
Space per head (sq. ft.)	14	17	20
Pen fence			
Height (in.)	60	60	60
Post spacing (ft.)	8	8	8
Post depth in ground (in.)	30	30	30
Crowding Pen[1]			
Space per head (sq. ft.)	6	10	12
Post spacing (ft.)	4 - 6	4 - 6	4 - 6
Solid wall height (in.)	45	50	50 - 60
Working Chute[2]			
Straight side (in.)	18	22	28
Fully tapered—width at 32-in. height (in.)	18	22	28
Fully tapered—width at bottom (in.)	15	16	18
Minimum length (ft.)	20	20	20
Maximum curve angle (degrees)	15	15	15
Length for 16-foot outside radius (ft.)	45	45	45
Solid wall height (in.)	45	50	50 - 60
Overall height—top rail (in.)	55	60	60 - 72
Chute fence			
Post spacing (ft.)	6	6	6
Post depth in ground (in.)	36	36	36
Holding Chute/Squeeze			
Height (in.)	45	50	50
Width			
Straight sides (in.)	18	22	28
V-shaped sides, width at bottom (in.)	6 - 8	8 - 12	14 - 16
Length—with head gate (ft.)	5	5 - 8	5 - 8
Loading Chute			
Width (in.)	26	26	26 - 30
Minimum length (ft.)	12	12	12
Maximum rise (in./ft.)	3.5	3.5	3.5
Radius of a curved chute (ft.)	12 - 17	12 - 17	12 - 17
Spacing of 1 x 2-in. hardwood cleats (in.)	8	8	8

[1] Crowding pen: It must be of either circular shape (1/4 or 1/2 circle) or funnel shape.

[2] Working chute: It should be curved or offset (offset angle at 30˚ maximum).

Access alleys should be at least 10 feet wide and laid out to provide a desired traffic flow. Fences should 5 to 6 feet high, depending on the breed, and built by setting 4- to 5-inch round wood posts 2.5 to 3 feet deep and 6 to 8 feet apart. Water, feeding area, and shade must be provided in at least one of the holding pens. This is especially important when sick animals are held in pens for a couple of days until they recover. At a minimum, provide 20 square feet of shed space per head for about 3% of the herd. For example, a facility for a 100-head herd should include 60 square feet of shade (100 x 0.03 x 20).

Crowding Pen

The crowding pen is the confining area that "funnels" cattle into the single-file working chute. A circular crowding pen with solid sides is effective because the only visible escape route is through the working chute. If the crowding area cannot be made circular, it should be funnel-shaped; it should be constructed with one straight side and the other side entering the chute at an angle of about 30 degrees. A solid crowding gate should be used to keep cattle from seeing through it. It is recommended that the pivot post be constructed out of a 3- to 4-inch steel pipe or 8-inch wood post embedded in 4 feet of concrete. Gate height can be adjustable. The crowding gate needs a self-locking gate latch for both convenience and safety.

Working Chute

The purpose of the working chute is to align cattle into single file for treatment. It starts from the crowding pen and leads to the head gate. Cattle often balk or back up when they see the squeeze chute. The best working chutes are curved or have at least a 15° bend in them. The working chute should be at least 20 feet long, regardless of the herd size. Sloping the sides of the chute reduces the ability of an animal to turn around. Common faults are making the chute too wide, which permits calves to turn around, and inadequate construction, which causes the sides of the chute to spread when subjected to intense pressure. Use the recommended width suggested in Table 3-1. One-way gates in working chutes allow cattle to move forward in the chute but automatically prevent them from backing up. If cattle are not of uniform size, use adjustable chains so you can vary the gate height.

Head Gate or Squeeze Chute

Located at the end of the working chute, the head gate and/or squeeze chute should hold the animal securely while it is being treated. The head gate should be sturdy, safe, easy to operate, and have a quiet action. It can be either manually or hydraulically operated. We recommended a *self-catching* and *full-opening* head gate for the small operations that are typical of Kentucky. Curved stanchions may offer more control of the animal's head, but they are more likely than the straight bar type to cause choking if animals go down. Many brands of commercial head gates are currently available. No matter what type of head gate you select, adjust it properly for the type of cattle being worked to prevent the animals or operator from being injured.

Loading Chute

Some producers consider a loading chute an essential part of their cattle handling systems. Those with fewer cattle may use "goose-neck" trailers for hauling and do not need a loading ramp. Cattle move better directly from the crowding pen to the loading chute, rather than moving through a long working chute. Desirable characteristics for a loading chute include curved approach, solid sides, telescoping side panels, self-aligning dock platform or bumper, and circular crowding area. It is also desirable to locate scales near the loading chute. The slope of a permanently installed cattle ramp should not exceed 20 degrees. The slope of a portable or adjustable chute should not exceed 25 degrees. Other specifications are given in Table 3-1.

Scales

Scales can be a valuable addition to handling facilities. They can help you obtain weaning weights and cow weights, evaluate gains, and test for performance. Single scales can have their own frame or cage for holding the animal or can be mounted in the form of load cells under a conventional squeeze. A single animal scale can also be positioned ahead of the squeeze and head gate. Electronic load cells are becoming popular among producers. Electronic scales are fast and easy to operate, but they require a power supply or batteries and have to be calibrated more often than either mechanical or hydraulic scales.

One handling facility layout will not fit all cow-calf operations. Determine the components you need, and design your layout to fit your particular type of operation, herd size, existing facilities, and materials available. Your objective is to have a facility that allows you to sort, restrain, process, and ship cattle as efficiently, safely, and economically as possible.

Adequate handling facilities need not be elaborate or expensive. Existing fence lines and buildings may be used in planning a facility. To save installation costs, many producers consider using materials other than wood or steel pipe. Materials such as used/recycled highway guard rails, cosmetic rejects from fiberglass or metal manufacturers (seconds), or grain bin sections may cost less than conventional materials but generally work best only in certain corral areas. In addition, surplus materials may not always be cost competitive with those made with wood or steel. Finally, alternative materials are often limited and available only at certain locations, while lumber or steel is generally both more plentiful and widely available. Always weigh the advantages and disadvantages of each material that may be used in a corral, including function, strength, and cost before making a final selection.

Figures 3-4, 3-5, and 3-6 show handling facilities of varying degrees of complexity, from simple facilities located in a barn corner or lot corner to a circular facility for 25 to 75 head.

Figure 3-4. Corral layout in a tobacco barn.

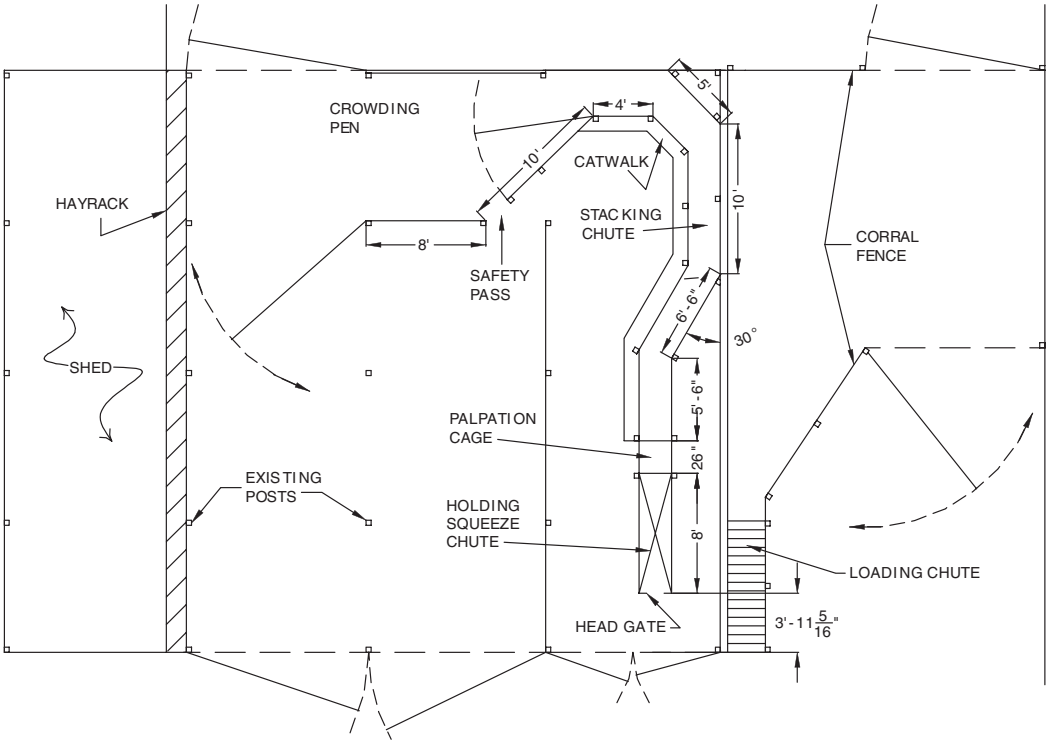


Figure 3-5. Corral layout at the University of Kentucky Research Center, Princeton, Kentucky.

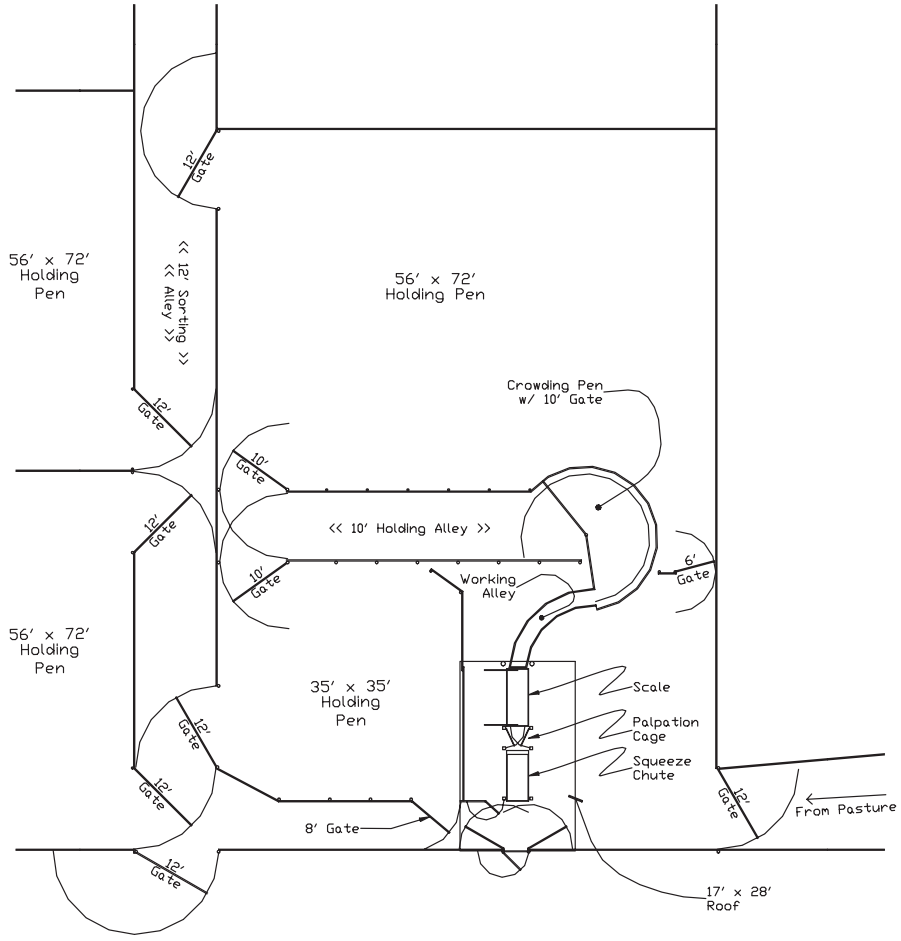
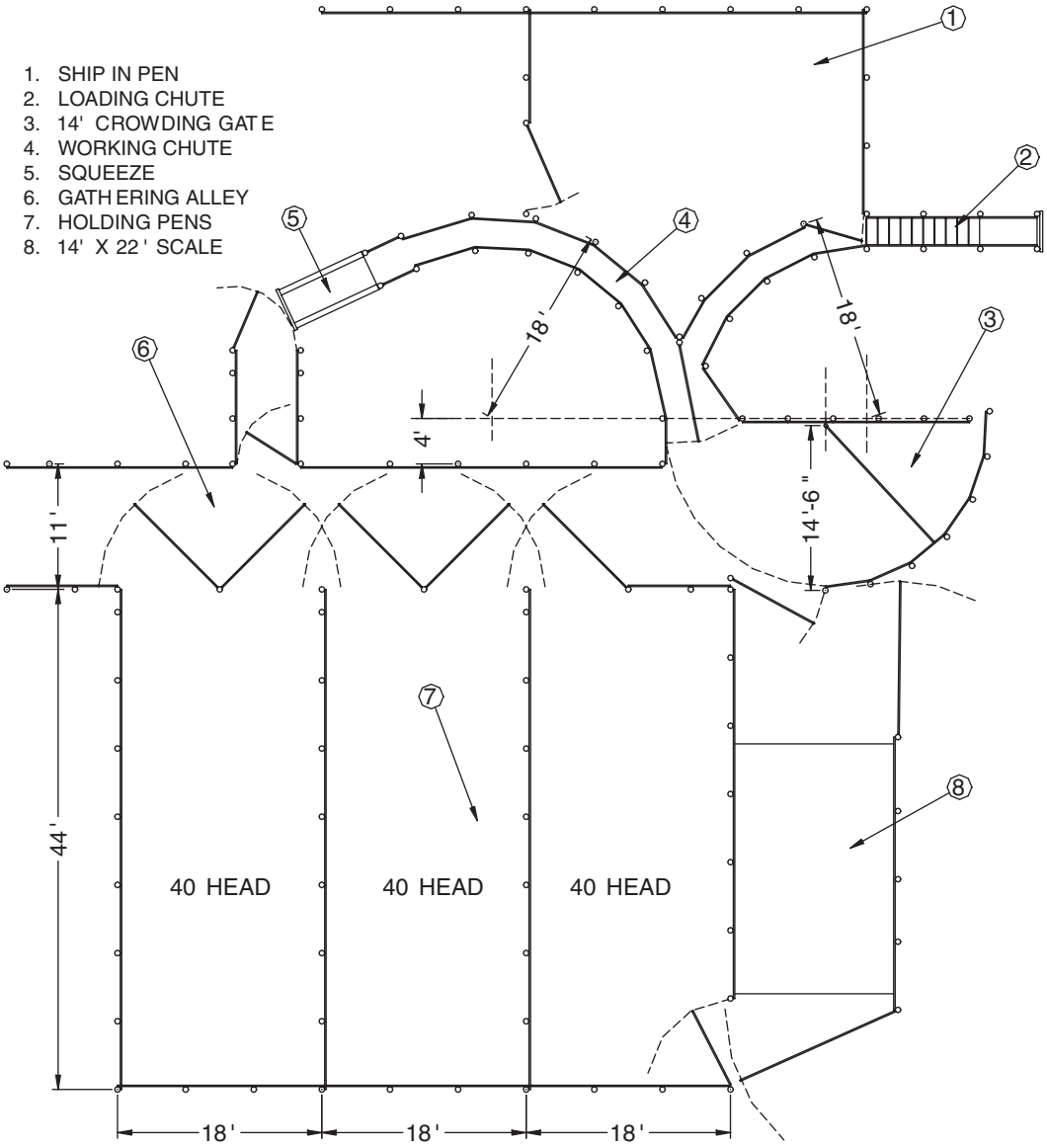


Figure 3-6. Corral layout with receiving/loading.



Planning and Constructing Fences

Before you build new fences, replace existing fences, or consider more cross fencing, you must first plan. Your first consideration is having a well-built, permanent boundary fence. This is important so that:

- you have a fixed property line between you and your neighbor or between you and the highway.
- you can confine your cattle to your own farm. Liability for losses due to cattle-auto accidents or crop damage to surrounding farms can justify a well-built fence.
- your neighbor's cattle are fenced off from your property, which can protect your crops and your breeding program.

When planning your pasture layout and fences, obtain copies of aerial photographs from your county Natural Resources Conservation Service office and sketch plans on them. Lay out the fences to follow contours of the topography, providing fields that are as large and as uniform as possible for major pasture divisions. Once you have laid out the fence lines, locate necessary lanes and gates.

Keep in mind the shape of pastures. Square pastures are the most efficient because they allow animals to obtain forage with minimum trampling damage and use the least amount of fence material for a given land area. They also can be subdivided with less trouble. A pie-shaped arrangement is sometimes used to give animals access to a central water source. In these cases, cattle tend to overgraze and trample the area closest to the water and graze less in the back of the pasture. A lane to water provides an alternative to the pie-shaped design and reduces the trampled area. Figures 3-7, 3-8, and 3-9 show how fences might be arranged on a farmstead (these diagrams are from Kentucky Cooperative Extension publication ID-74, *Planning Fencing Systems for Intensive Grazing Management*).

Temporary electric fences can be used to subdivide pastures into smaller units which make grazing management easier.

Figure 3-7. Farm with two pastures. Further subdivision will permit better grazing management.

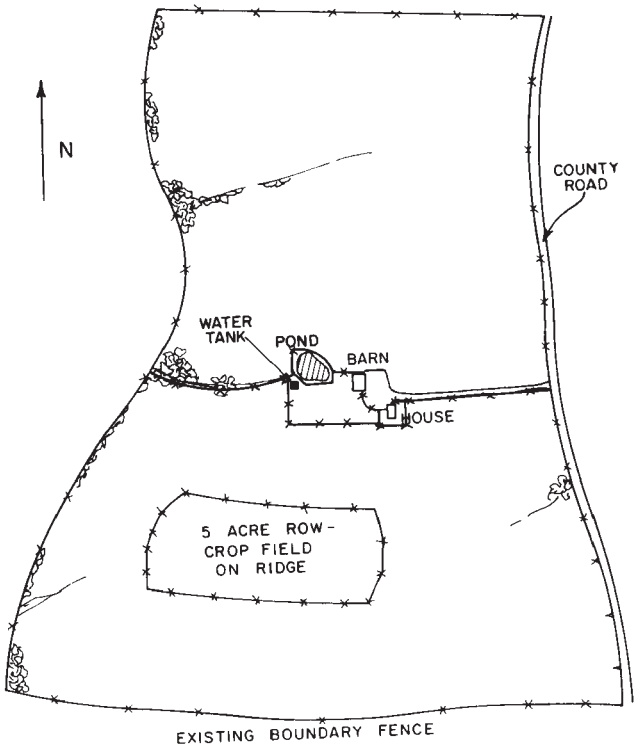


Figure 3-8. Subdivision to four paddocks using permanent (x-x-) and temporary (-) fence.

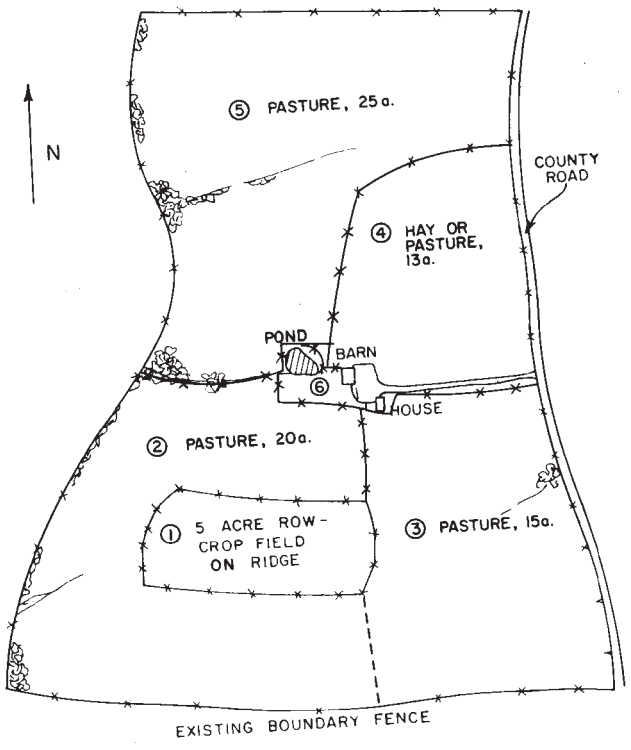
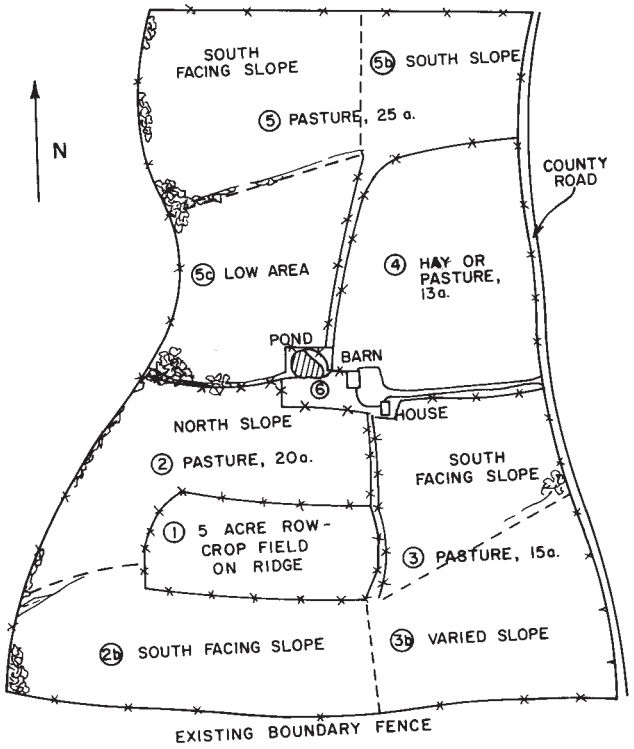


Figure 3-9. Subdivision to eight paddocks using portable fence.



Gate placement is important for animal movement. Locate the gate in the corner of the paddock so that when the first cows move out, the others, especially calves, follow rather than going along the inside of the fence (see Figure 3-10). Never locate a gate in the middle of a fence line with no way to "funnel" the cattle toward it.

Fence Types

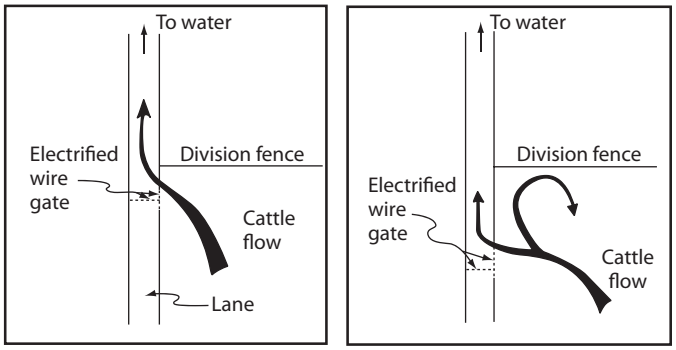
Fence types vary from physical barrier fences, such as woven wire, barbed wire, high tensile, and board fences, to psychological barriers, such as electric high or low tensile wire or portable polywire or polytape type fences. All of these types are used in Kentucky, and each has its advantages. Factors for selecting fence type include:

- affordability
- maintenance
- durability
- effectiveness on the livestock to be contained.

Woven Wire Fences

Woven wire fences are generally used for boundaries, lanes, and lots. A woven wire fence consists of a number of horizontal wires held apart by vertical wires called stays. The distance between horizontal line wires may vary from as close as 1½ inches at the bottom for small animals to as wide as 9 inches at the top for large animals. In general, the spacing between wires gets wider as the fence gets taller.

Figure 3-10. Gate placement is important to good animal movement.



Woven wire fencing is available in many combinations of wire sizes and spacings and varies in numbers of horizontal line wires and fence heights. The height of most woven wire fencing materials ranges from 26 to 48 inches. Select fence height based on the animals' sizes and jumping abilities. Stay wires should be spaced 6 inches apart for small animals and 12 inches for large animals.

The standard design number is listed on the tag to describe the wire. For instance, a design number 1047-12-11 indicates the wire has 10 horizontal wires and is 47 inches high, stays are spaced 12 inches apart, and stay and filler wires (wires between the top and bottom line wires) are 11-gauge wire. The top and bottom wires are generally two sizes larger. Standard woven wire fence heights are shown in Table 3-2; weights are shown in Table 3-3.

Barbed Wire Fences

Barbed wire fences are made of two or more strands of smooth, galvanized-coated steel wire twisted together with two or four barbs spaced every 4 to 5 inches. Standard barbed wire fences usually have three to five strands of barbed wire stretched between posts spaced 15 to 25 feet apart. Barbed wire is sold in 80-rod rolls (80 rods = 1,320 feet = ¼ mile).

Board Fences

Board fences are attractive, strong, and safe for animals. They are typically used as border fences around the farm or home or for crowding areas in cattle working facilities. Board fences consist of 1- to 2-inch thick, 4- to 6-inch wide boards nailed to wooden posts spaced 8 to 10 feet apart. For additional strength, stagger the joints on the posts. For example, using four 16-foot boards and posts spaced 8 feet apart, the top and third boards should continuously span a given post (with the post at the center of the boards), while the joints of the second and bottom boards should butt together on that same post. Do the reverse on the next post.

The price of lumber, nails, paint, and other materials, along with the labor required, makes the cost of these fences considerably higher than most permanent wire fences. Upkeep is also high, especially if untreated lumber is used.

High Tensile Fences

High tensile fences are an increasingly popular type of fence. First used in New Zealand and Australia, they offer several advantages over conventional fencing because they:

- are easier to construct
- last longer
- are less expensive to build than most conventional fences
- require less maintenance.

Table 3-2. Common woven wire fence heights.

Design No.	Horizontal Wires	Height (in.)
635	6	35
726	7	26
832	8	32
845	8	34
939	9	39
949	9	49
1047	10	47
1156	11	56

Table 3-3. Woven wire fence weights.

Weight	Gauge of Top and Bottom Wires	Gauge of Intermediate Line Wires
Light	11	14½
Medium	10	12½
Heavy	9	11
Extra heavy	9	9

High tensile fences are constructed mostly with 12½- or 14-gauge Class III wires that have tensile strengths from 170,000 to 200,000 or more pounds per square inch (psi) and breaking strengths of approximately 1,800 pounds. This fence can withstand more than 1,100 pounds of livestock pressure without losing its elasticity, yet it is flexible enough to bend, wrap, tie in knots, or clamp with crimping sleeves. Wires are held in tension along wood, fiberglass, insulated metal posts, or a combination of posts and battens or droppers. Tension in the wire is maintained by permanent in-line strainers. Adequate tension for 12½-gauge high tensile wire is 200 pounds, indicated by a tension indicator spring.

High tensile wire fences can be used with electricity to improve animal-holding capability and predator control. It is important to use treated wood posts and set them properly in the ground with adequate braces to withstand the pressure caused by the tightly stretched wire.

Cable Fences

Cable fences are used primarily for confinement areas, such as holding pens, feedlots, and corrals. These fences usually consist of 3/8-inch smooth steel wire cables stretched between anchor posts. The cables are normally made out of seven wires twisted together. Heavy-duty springs are placed at one end of each cable to absorb the shock on the wires caused by animals pressing against them. Cables are usually passed through holes in wooden or steel posts.

Any number of cables can be used; however, a six-cable fence is often used for large animals. The spacing between cables depends on the type of animals to be confined.

Electric Fences

Electric fences are widely and successfully used in Kentucky. If constructed properly and energized with a controller designed to match the application, they can be an effective, safe, and inexpensive means of providing temporary and permanent fencing.

Electric fencing does not need to be strong because it seldom comes under pressure, but it must be well designed and constructed to absorb the impact of animals. Adequate power for the length of fencing and type of animals to be confined is also essential. Electric fencing has a low installation cost, is inexpensive to operate, can be used to extend the life of old permanent fences, can be used for deer and predator control, and can be built for temporary or permanent use.

Various types of inexpensive, easily erected temporary electric fences are available. Probably the most popular are the polywire strands or ribbons—fine wires woven together with polyethylene fibers.

Polyethylene and steel braided wire (polywire) comes in various colors. Black is the most difficult for animals and people to see. Brighter colors, such as orange or white, are also available. Polytape, particularly the extra-wide type, is easier to see than polywire and works better for horses and in other cases where visibility is especially important. Some newer polywires and tapes incorporate more wires so that the resistance to current is lower, allowing longer runs of wire. A practical maximum for the lower wire density polywires is about 1,200 feet.

It is important to keep weeds and grass cut away from the fence, especially when using low impedance controllers. Polywires with stainless steel wires are more durable, but electric conductivity is lower. Aluminum conducts electricity better but tends to break more easily.

Aluminum, stainless steel, and high tensile wire also can be used. One advantage to using these type of wires is that they conduct electrical charges for longer distances than the small-diameter wires of polywire and polytapes. However, they are harder for the animals to see. To effectively train animals to stay within an electric fence, the animals need to see the wire as they feel the shock. Tying pieces of white cloth or brightly-colored plastic ribbon helps make these wires more visible.

An electric fence controller energizes the wire, and the moist earth completes the electrical circuit. Corners and end posts in temporary electric fences require minimal bracing. Line posts can be small and spaced far apart since the fence generally will be used for a short period of time.

Fencing Systems for Controlled Grazing

Table 3-4 provides a comparison of fence types to assist in making a selection that best fits your needs and budget. In Kentucky, the most economical fence type for controlled grazing fencing systems is often a combination of permanent electric smooth high tensile wire fence and temporary portable polywire (available on reels). An advantage of the reel is that it allows rapid set-up and take-down of the fence for temporary arrangements or for strip grazing. Portable fiberglass fence posts are often used with the portable braided wire, using one strand of wire for large animals and two strands for calves. Since it is electrified, high tensile wire for the permanent fence often can be installed using low-tension techniques. The following provides an overview of several types of fences and their appropriate place in a system.

For controlled grazing systems, the type of wire suggested for permanent boundary fence installations is New Zealand-type high tensile wire. This is 12½-gauge high tensile smooth wire that is heavily galvanized (Class III). Also, smaller diameter high tensile wires are now being used, particularly on interior division or paddock fences. These include 14½-gauge and 16-gauge thicknesses. The use of such wire has implications in energizer selection (since smaller wires have a greater resistance to current flow) and in allowable length of fencing to be energized.

For interior and temporary fences, a more flexible, low-tension wire is more popular. Small-diameter high tensile wire can be used, but many producers prefer a slightly softer grade of wire that is somewhat easier to work with when moving and handling the fence. An excellent alternative for very temporary installations is braided wire containing very fine gauge steel wires braided with polyethylene strands into a wire, ribbon, or tape. These wires work well for installations of up to 1,200 feet. Because of the lower cross-sectional area of the steel, energizer requirements differ from those of smooth high tensile wire. Some newer braided wires have more steel (thus less resistance), so they can be used in longer runs.

Wire spacing depends on the type of livestock being fenced. Table 3-5 presents suggested wire spacings for permanent or temporary electric fences.

Table 3-4. Comparison of common fences (1 post per 16').

Types		Strands	Wire Gauge	Height (in.)	Stay Spacing (in.)	Cost Index[1]	Fence Life (yrs.)[2]	Upkeep
Permanent materials	Barbed wire, 2-point	3	12½		4	132	33	high
		4	12½		4	143	33	high
		5	12½		4	154	33	high
		3	14		4	121	18	high
	Barbed wire, 4-point	3	12½		5	132	33	high
		4	12½		5	143	33	high
		5	12½		5	154	33	high
	Woven wire, light weight	top, bottom	11	26	6	154	19	high
		filler	14½	32	6	165	19	high
	Woven wire, medium weight	top, bottom	10	26	6	176	30	medium
		filler	12½	32	6	187	30	medium
		filler	12½	39	6	198	30	medium
		filler	12½	47	6	220	30	medium
	Woven wire, heavy weight	top, bottom	9	26	6	209	40	low
		filler	11	32	6	231	40	low
		filler	11	39	6	253	40	low
		filler	11	47	6	275	40	low
	High tensile wire	3	12½			44	30	medium
		4	12½			55	30	medium
		5	12½			66	30	medium
		8	12½			110	30	medium
Temporary materials	High tensile wire	2	12½			20-35	30	medium
		1	12½			15-25	30	medium
	Polywire					10-15	7-10	medium
	Aluminum wire		9			30-40	30	medium
			13			25-35	30	medium

[1] Labor costs are included, but the costs of electric controllers are not included.
[2] Fence life based on combination of post and wire life expectancy in a humid climate.
Source: Adapted from Buschermohle et al., University of Tennessee Extension Pub. EP-10-95.

Table 3-5. Suggested wire spacings for permanent or temporary electric fences.

	Distance from Ground (for Wire Number)				
Cattle Type	No. 1	No. 2	No. 3	No. 4	No. 5
Cows	30″				
Cows and calves	17″	38″			
Hard-to-hold cattle	17″	27″	38″		
Boundary fence	5″	10″	17″	27″	38″

Fence posts are available in many different types in Kentucky (Table 3-6). Always try to find the best post to meet the demands of the situation. For example, it is best to use good, treated posts for permanent boundary fences, while light fiberglass or steel posts are more suitable for temporary fences in a controlled grazing cell.

Often the least expensive option is to cut your own posts or purchase untreated wooden posts. They are highly variable in size, shape, and durability (Table 3-7). Osage orange posts have a life-span of 25 to 35 years; black locust or red cedar posts last 15 to 25 years. Other woods, such as oak, pine, and poplar, rot in just a few years unless they are pressure treated.

Wood posts come in a variety of sizes and lengths. The larger the top diameter, the stronger the post. Corners are the backbone of a fence. Whether you plan to install a woven wire, barbed wire, or high tensile wire fence, choose good corner posts. Corner and gate posts should have a diameter of at least 8 inches. Brace posts should be 5 inches or more in diameter. Line posts can be as small as 2½ inches, but larger diameter posts make the fence stronger and more durable.

Steel posts have several advantages. They weigh less, can be driven into the ground rather easily, will not rot, and are fireproof. They also help ground the fence against lightning when the soil is wet. They are more likely to be bent or forced out of line by livestock. A widely used method is to use wooden line posts every 50 to 75 feet to help keep steel posts from bending and improve the strength of the fence. Table 3-8 provides guidelines on post spacing for fences.

Fence construction includes setting posts, constructing braces, driving staples, and making splices. Corner and end-post assemblies are the foundation of the fence. The most common system is the horizontal brace or diagonal brace (Figure 3-11). Single-span assemblies may be used for fence lengths up to 10 rods (165 feet). Use double-span assemblies for 10 to 40 rods (165 to 660 feet). For more than 40 rods, use double-span construction plus braced line posts.

Table 3-6. Fence post characteristics.

Post Type	Bending Strength	Expected Life (yrs.)	Initial Cost	Fire Resistance	Maintenance
Steel-T, concrete	fair	25-30	medium	good	low
Steel rod, 3/8" dia.	poor	15-20	low	good	medium
Heavy-duty fiberglass-T	fair (flexible)	25-30	high	poor	low
Light-duty fiberglass-T	poor (flexible)	15-20	low	poor	medium
Pressure-treated wood	good	30-35	medium	poor	very low
Untreated wood	good	7-15	low	poor	high

Table 3-7. Life expectancy of wood posts.

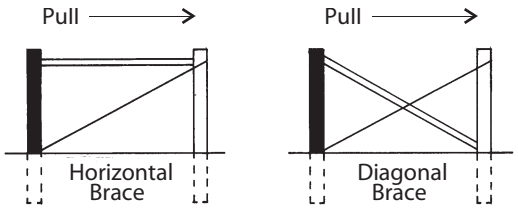
Kind	Untreated	Treated (pressure)	Treated (soak)
Osage o.	25-35 yrs.	—	—
R. cedar	15-25 yrs.	20-25 yrs.	20-25 yrs.
B. locust	15-25 yrs.	—	—
W. oak	5-10 yrs.	20-30 yrs.	15-30 yrs.
Hickory	2-6 yrs.	15-20 yrs.	10-15 yrs.
R. oak	2-6 yrs.	20-30 yrs.	20-30 yrs.
Y. poplar	2-6 yrs.	20-25 yrs.	15-25 yrs.
S. gum	3-6 yrs.	20-30 yrs.	20-30 yrs.
S. pine	3-7 yrs.	25-30 yrs.	15-20 yrs.

Table 3-8. Recommended post spacings.[1]

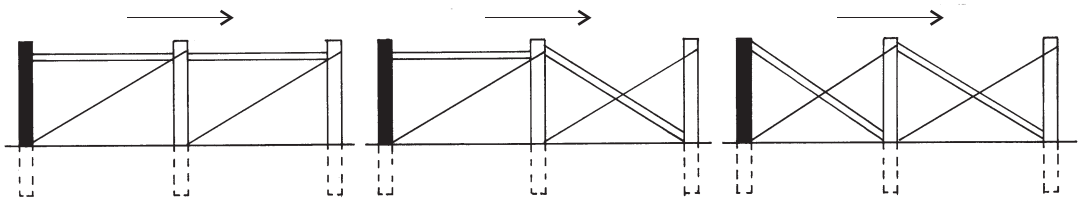
Fence	Spacing (feet)
Woven wire	14-16
Barbed wire	12-14
Electric[2]	20-75
High tensile[2]	16-60
Board	8
Corrals	6

[1] Driven posts are 1.7 times as strong as tamped posts.
[2] Depending on terrain, use of battens.

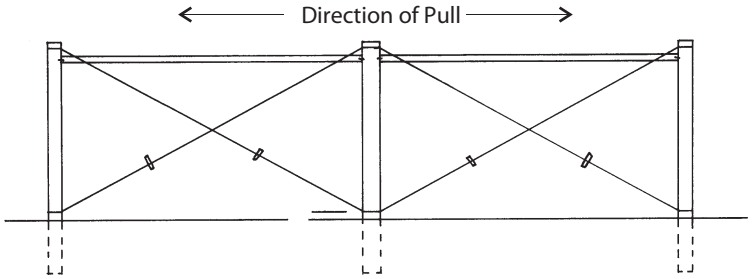
Figure 3-11. Corner and end-post assemblies for permanent wire fence.



Single-span brace assemblies of corner posts for short fences (up to 165 ft.)

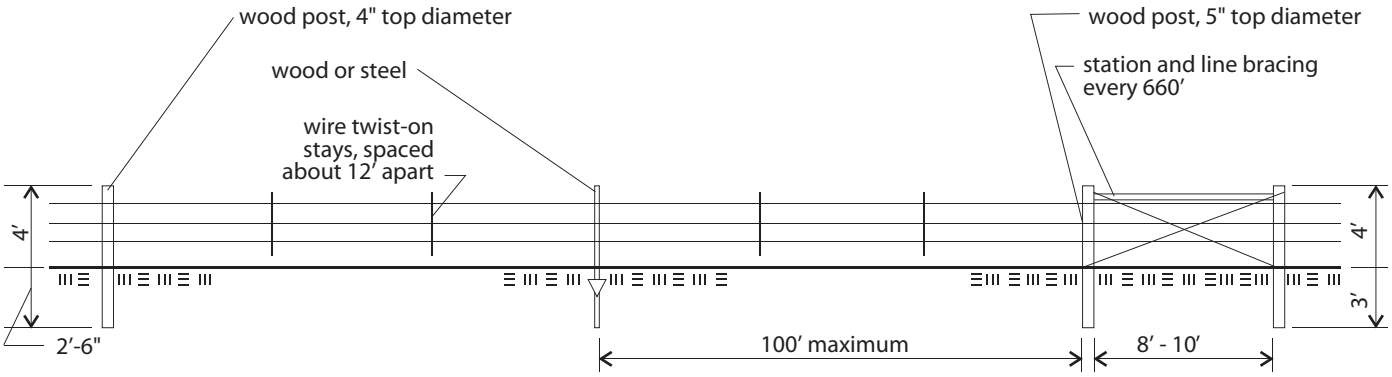


Double-span brace assemblies of corner posts for longer fences (165 - 660 ft.)



Pull posts for the middle of long fences (over 660 ft.)

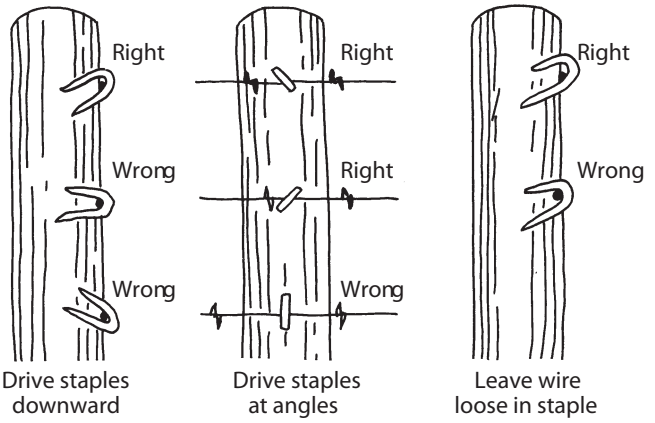
Figure 3-12. Suspension fence.



Suspension fences (shown in Figure 3-12) are long spans of barbed wire over level to rolling terrain. Moderately tensioned wire that moves freely between staples and posts is essential. Place line posts every 100 feet on level terrain and closer on rolling terrain. Put stays every 15 to 20 feet between posts.

Staple length, diameter, and type of post all affect the holding power. For treated posts, use 1¾-inch, 9-gauge galvanized staples with slash-cut points. Drive staples slightly off vertical so they straddle the wood grain and wires may move freely (Figure 3-13). String wire on the cattle side of the posts (unless appearance is important) and on the outside of curves.

Figure 3-13. Proper stapling for fence construction.



Feed Bunks and Feeding Facilities

Feeding facilities should be designed so that they are convenient to the animals and encourage feed intake. The size of feed bunk needed depends on the size of the cattle, whether they are all fed at one time, and whether they eat on both sides of the bunk. When selecting a feed bunk, consider drainage, manure buildup, and materials needed.

Enough space should be provided so that animals are not crowded, thereby reducing stress around the bunk or feeding area and improving intake. Table 3-9 gives feeder space requirements for various ages of cattle and feeding schemes. Proper opening spaces and throat heights for feed bunks are important to relieving stress and providing adequate access for cattle of varying sizes. Figure 3-14 illustrates a bunk design that has proven to be good for many producers. Table 3-10 indicates suggested throat heights and neck rail heights for feed bunks for various sized cattle. This design is most appropriate for covered bunks and bunks inside buildings. The feed area allows for ease of cleaning, and the height of the bunk allows the cattle to eat in a more natural grazing position. In facilities where cattle have access to both sides of a bunk, use a partition on both sides of the feed. Other design options, including elevated bunks or mangers, are available in MWP S-6, "Beef Housing and Equipment Handbook," and through the University of Kentucky Plan Service (2).

Many Kentucky cattle producers successfully feed cattle in bunks without any roof or covering. For summertime feeding, however, feeding under roof is strongly encouraged for high-producing animals. This reduces heat stress and encourages animals to use the bunk. For winter conditions, some type of windbreak is advised if the bunk is on a ridge top or open to northwest winds. Ideally, a feed bunk offering cattle access on both sides should be oriented north-south, so the surfaces on both sides of the bunk have an opportunity to dry out from exposure to the sun. For bunks located outside or in locations where manure is not scraped frequently,

Table 3-9. Feeder space requirements for cattle feeding facilities.

	Space Requirement (inches/animal)				
Feeding Program	Calves (400-800 lb.)	Finishing (800-1,200 lb.)	Bred heifers (800 lb.)	Cows (1,000 lb.)	Bulls (1,500 lb.)
Once-a-day	18-22	22-26	22-26	24-30	26-30
Twice-a-day	9-11	11-13	11-13	12-15	12-15
Self-fed grain	3-4	4-6	4-6	5-6	5-6
Self-fed roughage	9-10	10-11	11-12	12-13	13-14

Source: Midwest Plan Service, Beef Housing and Equipment Handbook, MWPS-6.

a step (4 to 6 inches high and 12 to 16 inches wide) may be desired to improve access and minimize the problem of cows defecating in the bunk. For bunks with feed-retaining walls on both sides, increase the depth and/or width for bulky feeds, such as silage. Table 3-11 provides guidelines for bunk widths and apron construction.

Table 3-10. Throat and neck rail heights for feed bunks.

Age (mo.)	Weight (lb.)	Throat Height (in.)	Neck Rail Height (in.)
6-8	360-490	14	28
9-12	490-650	15.5	30
13-15	650-780	17	34
16-24	780-1,200	19	41
Cows	1,200-1,500	21	48

Source: Bickert, 1990, NRAES-38.

Table 3-11. Suggested bunk widths and apron construction characteristics.

Bunk Width	Dimensions
a. Both sides feeding	
Calves	36″
Heifers	48-60″
Cows	48-60″
b. One side feeding	18″ bottom width
Bunk apron	
Width	10-12′
Slope	¾″-1″/ft.

Source: Midwest Plan Service, Beef Housing and Equipment Handbook, MWPS-6.

Pad Construction

Muddy conditions at livestock operations can have detrimental effects on both beef and dairy cattle performance. Animals spend considerable amounts of energy to move through mud, resulting in higher feed costs and reduced weight gain by livestock. Storage of hay on wet ground results in increased moisture levels on the bottom of the bale and substantial losses of both yield and forage quality. Producers frequently use crushed rock in feeding areas in an unsuccessful attempt to minimize mud.

One way to avoid muddy conditions is to build an all-weather surface for cattle and vehicle traffic. All-weather surfaces are generally built with concrete or asphalt and often with geotextile and gravel. Estimated concrete cost varies from $3,000 up to $15,000 for pads ranging between 2,000 and 11,000 square feet.

Geotextile and gravel pads constitute a much cheaper option as compared to concrete, but they require more maintenance and can potentially contribute to groundwater contamination if manure accumulates on the surface of pads. Nonetheless, such pads have been used with success in many dairy and beef facilities in several states. Producers have enthusiastically adopted these pads for heavy use areas, and cost share programs have enhanced the rapidness of adoption.

The original development of geotextiles focused largely on non-agricultural uses: subgrade, roadbed, parking lot construction and stabilization, soil reinforcement, erosion and sedimentation control, etc. Geotextile fabric applications in agriculture are designed to keep soil and gravel (or other earthen materials) separate. The fabric improves stability, load-bearing capacity, and drainage of the site. When properly designed and installed, the fabric can help distribute the loads from animal and vehicular traffic (Figure 3-15).

There are basically two type of geotextile fabric: woven and nonwoven, both made from either woven or spun polypropylene material. The main distinction between different styles of geotextile fabric is the type of yarn used. The Kentucky Natural Resources and Conservation Service practice standard specifies the minimum requirements for both woven and nonwoven geotextile (Table 3-12). The practice standard also specifies that a two-layer gravel base consisting of a coarse aggregate (No. 4; 6-inch layer) and a fine cover layer (dense grade aggregate, 2-inch layer) are placed on top of the geotextile fabric. The finer cover improves cow comfort and welfare, reduces the potential for foot injuries, and reduces damage from scraping the surface.

Figure 3-14. Modified post and railing feeding barrier design (from Bickert, 1990; NRAES-38).

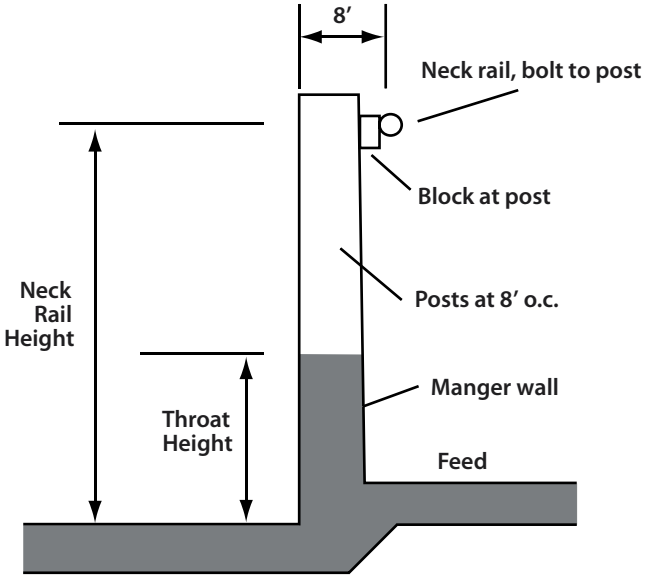


Figure 3-15. Geotextile functions.

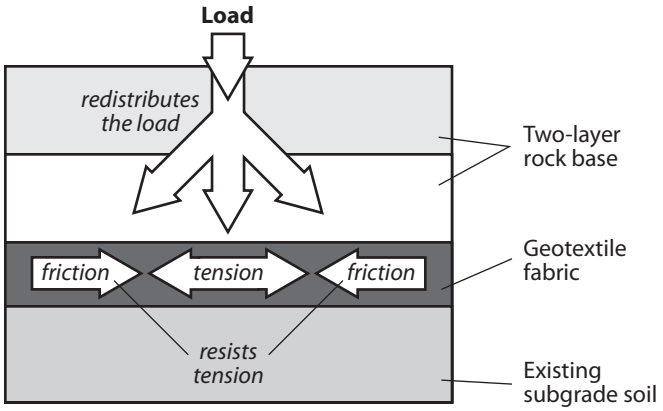


Figure 3-15 illustrates the recommended construction details for animal-use pads. Such surfaces cost less than $0.50 per square foot compared to an installed cost of $1.50 to $2.00 per square foot for concrete.

A 4- to 6-inch layer of No. 4 rock is suggested for the base material, which is placed above the filter fabric. A 2- to 3-inch cover of sifted lime or dense grade material allows for easier scraping of the surface and less loss of rock through the box spreader.

Special considerations may need to be made in areas where livestock manure is stored or deposited and the soil material underlying or adjacent to the geotextile fabric is permeable. Since the fabric improves drainage, there is potential for rapid movement of manure, nutrients, and bacteria into the surrounding soil and possibly into an adjacent water supply. If this is the case, two alternatives should be considered: (1) a layer of clay is placed on top soil before the geotextile pad is installed; and (2) a drainage tile is installed underneath the geotextile pad to collect polluted drainage water, which is then collected into a sump and pumped out or irrigated onto a grassed area.

Maintenance of geotextile and gravel pads includes periodical manure scraping and replenishment of the finer surface cover that can be removed to some extent during scraping operations.

Another option for pad construction is the use of coal combustion by-products. Research conducted at Ohio State University has shown that construction of livestock feeding pads using flue gas desulfurization (FGD) material can be an inexpensive and reliable alternative to concrete and asphalt. In the last five years more than 200 feeding and hay bale storage pads were constructed in Ohio, ranging in size from 1,500 to 15,000 square feet. More recently, Ohio State University has reported on the use of FGD material as low permeability liners for animal waste storage. Unfortunately, FGD material is not readily available from Kentucky power plants.

A more common coal combustion by-product that is readily available in Kentucky consists of a combination of bottom ash and fly ash. A variety of fly ash pads have been used successfully in feedyards in both western and southern parts of the country. The major constituents of these materials are silica, aluminum, iron, and calcium. While FGD material is self-cementing, fly ash is usually not. Therefore, either Portland cement or lime, or a combination of both, is added to fly ash to increase its strength. The optimal water content of the mixture should be between 20 and 30% in order to achieve maximum strength. Proper compaction and curing are crucial before animal and vehicle traffic is allowed on the pad. Permitting by the Kentucky Division of Wastes may be required for beneficial reuse of fly ash.

Table 3-12. Minimum requirements for woven and nonwoven geotextiles.

Parameter	Woven Geotextile	Nonwoven Geotextile
Grab tensile strength (psi)	200	150
Bursting strength (psi)	400	320
Elongation (%)	< 50	> 50
Puncture strength (psi)	90	80
UV light (% residual tensile strength)	70	70
Apparent opening size	#100	#40
Permittivity (1/sec.)	0.1	0.7

Pens for Weaning Calves

Improving management at weaning is vital for the success of a cow-calf operation. Besides calving, the most stressful period in the life of a calf is at weaning. This time period is vital to the cow-calf producer also. Weaning is the end of the production process for most operators and represents the majority of annual income. Minimizing the stress the calf faces helps ensure that the year's work was not wasted and the calf continues through the production process. Weaning is one of the primary factors affecting calf marketability.

Corral line fence for newly weaned calves needs to ensure good restraint and safety. A wide variety of materials are used in building corrals. Most typical would be post and rail or plank fence (2x6 planks). Fence visibility is important in weaning pens. Smooth wire and cable fences are not recommended unless at least one plank is attached to the fence at the calves' eye level.

Small pens are preferred over larger lots because large lots encourage fence walking and make it more difficult for calves to find feed and water. We recommend building pens narrow and not too deep to prevent calves from bunching up far away from the feed bunk. Provide at least 100 to 150 square feet per head in lots that provide good footing. Limit pens to 60 head per pen. The feed bunk and water source need to be easily accessible and recognizable.

Depending on calf size, 18 to 26 inches of bunk space per calf should be provided when starting calves and for calves limit-fed or fed just once a day. Started calves being fed twice a day to appetite should have 8 to 11 inches of bunk per calf. Generally, 10 inches of bunk per calf is required for self-fed roughage. Feed bunks should be located to encourage calves to eat and provide convenience in feed delivery. Considerations include drainage and wind protection. Calves prefer to eat downwind. Drainage should be away from bunks. Preference (depending on site) is generally for bunks or for the bunk line to be oriented north to south for sun exposure and minimizing frozen manure pack buildup in the winter. Temporarily placing portable bunks against and perpendicular to the fence line is an excellent technique to achieve the goal of bunk-breaking calves. Fence-line feeding may use pre-cast concrete bunks, wood plank bunks, or through-the-fence feeding on the ground or a concrete slab. Generally, bunk height for calves should be less than 30 inches from the ground. Bunk design should minimize areas for accumulation of waste and spilled feed, which contributes to odor, fly, and rodent problems.

Having water available at all times is one of the most important considerations in setting up weaning pens. Weaning calves will consume less than 5 gallons per head per day during cold weather and up to 15 gallons per head per day in hot and humid summer conditions. It is recommended that 1 foot of tank be provided for every 20 head or one waterer or drinking bowl space provided for every

25 to 30 head in the lot. Water depths of 6 to 8 inches are preferred. Use deeper tanks where supply capacity is limited. Waterers or tanks placed in the fence line allow new arrivals to quickly find the water as they travel the fence line acquainting themselves with the pen. However, waterers located in the pen provide more opportunity for timid animals to drink. Let waterers run over for the first two days after calves are moved into pens. Consider float-operated waterers for a fresh supply of water. Of the many waterer choices commercially available, considerations in addition to cost include durability, ease of cleaning, energy cost, and protection from freezing. Frost-free and heavily insulated nonheated waterers are commercially available.

Provide shelter and/or shade if you anticipate extreme weather conditions. We recommend 20 to 40 square feet of shelter/shade per head.

Lot for Mature Bulls

In order to have a controlled calving season that provides for a uniform calf crop and ease of management, bulls must be confined away from the cow herd. Bull performance and working life are also affected by management. Good bull management ensures (1) bull fertility at the start of the breeding season, (2) good health, (3) sound feet, (4) proper feeding, and (5) minimal risk of injuries to handlers, bulls, and animals to be bred.

Keeping a bull in a small area for too long can lead to lameness and breeding difficulties. Graze bulls outside during the summer. Have a bull pasture that is somewhat isolated, and make sure the bulls are protected from extreme weather. When bulls are kept in a lot, you should provide ample room for exercise (1,200 to 1,500 square feet per bull). Provide 30 to 36 inches of feeder space for each bull. Two-strand electric fences can control bulls trained to recognize an electric fence before being turned out. Provide a more durable fence (with 2½-inch pipe rails or 2x6 planks) in areas near the farmstead and places where the possibility of bulls getting out can cause a dangerous situation. Use 14-inch-wide wall or fence openings or vertical steel posts across the corner of the pen as safety passes.

Water bowls must be anchored firmly (preferably bricked up below) to prevent damage to or by the bull. Provide at least 27 gallons of water per bull per day during hot and humid weather. Water depths of 6 to 8 inches are preferred. Use deeper tanks where supply capacity is limited. As with weaning pens, consider float-operated waterers for a fresh supply of water.

Seasonal Watering Systems for Controlled Grazing

The economic benefits of controlling how and where your cattle graze are well documented. Increased forage utilization, greater stocking rates, greater legume persistence, reduced hay feeding, and more uniform nutrient recycling are just some of the many benefits producers can take advantage of when practicing some form of controlled grazing. However, one of the greatest challenges to implementing a controlled grazing system is the delivery of stock water to the grazing animal.

Water Affects Cattle Performance and Behavior

Water is probably the most important, yet often overlooked, nutrient that cattle require. Ruminant nutritionists have known for quite some time that water intake drives dry matter intake. In other words, when water intake is limited, dry matter intake decreases and, as a result, performance or gain declines. Research has also shown that when water was available in the paddock near the grazing animal, average daily gains were higher.

The location of water not only affects performance but also the social and grazing behavior of the herd. Studies at the University of Missouri have shown that when cattle must travel more than 800 feet to water, they tend to move as a herd and spend more time loafing at the water point. Conversely, when water was less than 800 feet away, cattle tended to go to water in smaller groups and spent less time at the water point (3). They also found that grazing and nutrient distribution was more variable when cattle were forced to travel farther to water. Forage utilization ranged from 50% closer to the water point (200 feet) to less than 20% farther from the water point (1,100 feet).

Using Lanes for Water Access

The use of lanes leading to a central permanent water point has in some cases been a viable solution to water access for controlled grazing systems. Lanes have a distinct advantage when it comes to moving or sorting cattle for treatment or artificial breeding. But the continued use of lanes can lead to erosion and affect nutrient recycling. Missouri research has also shown that when lanes were used for water access, 13% of manure was deposited in the lane and not on the pasture (4). Since cattle excrete approximately 80% of the N, P, and K they consume, any practical means of encouraging this return of nutrients to the growing pasture should be explored.

The Seasonal Water System Concept—Move the Cattle and Move the Water

Building permanent water points in every paddock is a costly proposition and restricts paddock design changes. A low-cost option for delivering water to grazing cattle is the use of small lightweight portable tubs with full flow valves, which have evolved over the last 15 years. These tubs combined with quick coupler fittings, borrowed from the irrigation industry, have revolutionized water delivery in controlled grazing systems. The quick couplers work much like a hydraulic coupler on a tractor. Water from the pipeline only flows into the tub when the hose leading to the tub is plugged into the coupler. So by strategically locating quick couplers along the pipeline, water can be accessed anywhere it is needed. Logically, couplers should be located where they can serve multiple paddocks; however, at $16 a piece, the added flexibility of including extra couplers in the system is money well spent. The concept is very simple. When you move the cattle to the next paddock or pasture, you simply uncouple the tub, dump the water, and move the tub to the quick coupler in the next paddock. You move the cattle, and you move the water with them.

Pipe and Design Options

There are basically two options of pipe to use in a seasonal water system: conventional PVC, which must be buried, and high-density, UV-stabilized polyethylene pipe, which can be used in aboveground applications. The cheapest and simplest short-term option is an aboveground application using the high-density pipe. For most small operations in Kentucky, one day of rolling out pipe and attaching couplers is all that is needed to have water in every paddock. However, this type of system does have some obvious drawbacks. The pipe is exposed to weather, field work, and mowers and, although the pipe is very flexible and can be driven over, it must be protected anywhere it will be crossed repeatedly, such as gateways. Also, some systems must be drained at the end of each grazing season to prevent bursts from winter freezing.

One great advantage of an aboveground system is flexibility. Any changes in paddock design can easily be accommodated by simply dragging the waterline to a new location. Also, location of couplers can be changed to reduce water areas around the water point.

Over the long haul, a belowground system is probably the best option, especially on land you own. Water from belowground systems will be cooler, and PVC pipe, which is slightly cheaper than the high-density pipe, can be used. The longer life of a belowground waterline should more than offset the extra cost of burying the line. Access to quick couplers in a belowground installation can be accomplished by using 6-inch PVC pipe or plastic water meter housing. If using PVC as an access tube, a 6-inch PVC cap (which may be costly) or an old disk blade will serve as a cover when not in use.

Keys to Making It Work

There are several rules to follow to ensure success with small portable tanks:

1. **Keep water within 800 feet of the grazing animal.** This will discourage herd movement and loafing time at the water point.
2. **Protect the tank and coupler.** Never allow cattle to have full access to the tub. This can be accomplished by locating the tub slightly under a polywire fence.
3. **Maintain a minimum flow rate of 6 gallons per minute.** A properly placed 60-gallon tub allows three cows to drink at one time. Since cattle can drink approximately 2 gallons per minute, a 6-gallon flow rate will allow the tank to recharge as the cattle drink. Pipe size, pressure, and elevation all affect flow rate. Seek help from your county Extension agent or local Natural Resources Conservation Service office before purchasing pipe.
4. **Do not provide shade at the water point.** Shade + water = mud and waste. Anything that encourages cattle to loaf in one area means fewer nutrients are being recycled on the growing pasture.

Stock Water for Winter Grazing

One of the great resources we have in Kentucky is our fescue forage base, which, when Mother Nature cooperates, can provide a tremendous amount of low-cost winter grazing. Obviously, seasonal systems with exposed tubs are not an option for winter stock water. However, the beauty of the seasonal system is that it is not needed during the winter anyway. Cattle water intake during the winter is approximately half of summer intake. Additionally, cattle are not as attracted to the water source as they are during the summer and are willing to graze farther from water. The 800-feet rule can be broken at this time of the year. So strip grazing stockpiled fescue, beginning at the permanent winter water source, becomes a simple and effective strategy. Take notice of where cattle spend their time during winter grazing. It is usually out on pasture next to the strip graze fence. Therefore, this is where most of the dung pads will be found, providing yet another advantage to strip grazing.

How Much Does the Seasonal System Cost?

The cost of a seasonal system will vary according to materials, size, and type of system. A conservative estimate for an aboveground system is about $20 per acre for a 50- to 75-acre farm. If you figure the system will last at least 10 years, the cost is about $2 per acre per year. Belowground systems carry a higher initial cost but should last at the very least three times as long. Cost-share programs may be available in many areas to improve your facilities and take your grazing program to the next level.

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