



University of Tennessee, Knoxville  
**TRACE: Tennessee Research and Creative  
Exchange**

---

Animals/Livestock

UT Extension Publications

---

5-2001

## **PB1541-Planning and Building Fences on the Farm**

The University of Tennessee Agricultural Extension Service

Follow this and additional works at: [https://trace.tennessee.edu/utk\\_agexani](https://trace.tennessee.edu/utk_agexani)



Part of the [Animal Sciences Commons](#)

---

### **Recommended Citation**

"PB1541-Planning and Building Fences on the Farm," The University of Tennessee Agricultural Extension Service, PB1541 -2.5M-5/01(Rep) E12-4315-00-02-01, [https://trace.tennessee.edu/utk\\_agexani/9](https://trace.tennessee.edu/utk_agexani/9)

The publications in this collection represent the historical publishing record of the UT Agricultural Experiment Station and do not necessarily reflect current scientific knowledge or recommendations. Current information about UT Ag Research can be found at the [UT Ag Research website](#).

This General - Construction is brought to you for free and open access by the UT Extension Publications at TRACE: Tennessee Research and Creative Exchange. It has been accepted for inclusion in Animals/Livestock by an authorized administrator of TRACE: Tennessee Research and Creative Exchange. For more information, please contact [trace@utk.edu](mailto:trace@utk.edu).



---

Planning & Building  
**FENCES**  
on the Farm

---

# Contents

<b>Purpose of the Fence .....</b>	<b>4</b>
Cattle.....	4
Sheep .....	4
Horses.....	4
Swine .....	5
<b>Planning The Fence .....</b>	<b>5</b>
Locating Permanent Fences.....	5
Locating Temporary Fences .....	5
<b>Selecting The Proper Fence.....</b>	<b>6</b>
Woven Wire Fences.....	6
Barbed Wire Fences .....	6
Board Fences.....	7
High-Tensile Fences.....	7
Cable Fences .....	7
Electric Fences .....	9
Comparing Fences .....	9
<b>Fencing Materials and Equipment .....</b>	<b>10</b>
Fence Posts.....	10
Wire.....	10
Staples.....	11
Gates .....	11
Electric Fence Controllers .....	11
Grounding .....	12
Lightning Protection.....	12
Precautions .....	13
<b>Construction .....</b>	<b>13</b>
Choosing the Fence Line.....	13
Corner, End and Line Brace Assemblies .....	14
Setting Fence Posts .....	15
Running Wire .....	15
Tensioning Wire .....	17
<b>Repair and Maintenance .....</b>	<b>17</b>
<b>References .....</b>	<b>18</b>

# Planning and Building Fences on the Farm

*Michael J. Buschermohle, Professor, Agricultural Engineering*  
*James B. Wills, Professor, Agricultural and Biosystems Engineering*  
*W. Warren Gill, Professor, Animal Science*  
*Clyde D. Lane, Professor, Animal Science*

Many innovations have occurred in the fencing industry in recent years, giving producers an array of options for fences to confine and protect livestock. Whether used as permanent, periphery boundaries, temporary pasture dividers or to encircle a house, fences need careful planning and construction for efficient usefulness, long life and low maintenance.

Several decisions must be made when installing fencing. First, what is the fence to be used for? For example, is it going to be a boundary fence or a cross-fence to divide a pasture? Is the fence for sheep, cattle, horses or something else? What type of fence is best suited and where should the fence be constructed for maximum effectiveness?

Other considerations include the type, spacing and setting of posts, gate location and construction, brace post assembly and installation of stock gaps or cattle guards. This publication is designed to help in planning a new or renovated fencing system.

## Purpose of the Fence

The first consideration in deciding the best fence is the purpose for which it will be used.

Livestock protection and confinement are the main reasons for considering fencing, but the fencing needs for various types (species, age, breed, production system) of livestock vary widely. Following are some of the livestock types and situations with special requirements:

### Cattle

Most types of fence can be used with cattle, so most cattle producers assess factors such as expense, ease of construction and expected life of the fence when considering fencing strategy. In the past, woven wire and barbed wire were the most common fence types; however, high-tensile fencing is rapidly gaining popularity in Tennessee. Fence height for perimeter cattle fences should be a minimum of 54 inches.

When bulls are penned separately from cows, special attention must be paid to construction. Heavy posts with thick-gauge wire or cables are required, or electric fence may be effectively used.

Fences for handling facilities must be strong enough to withstand heavy usage, tall enough (60 inches minimum) to prevent escape, and clearly visible. Treated wood or heavy wire panel fences are preferred.

### Sheep

Fences for sheep do not have to be as tall as for cattle, but sheep have other special requirements. Predator control is more important. Electric fences are particularly useful for discouraging predators such as dogs and coyotes. Barbed wire is not as effective with sheep, as the barbs tend to become covered with wool.

### Horses

Visibility is a necessary characteristic in fencing for horses. Barbed wire should be avoided because there are many opportunities for horses to tear their hide on the barbs. High-tensile wire fences poses a threat to horses because they may become entangled in the strands. The chance of

this can be decreased if high-tensile fences are made more visible by placing posts closer together, or hanging ribbons or something else from the wire. Board fences are ideal for horses. Woven wire also works well, particularly with a single board at the top so the horses can easily see the fence.

### **Swine**

Swine require strong fences that are built close to the ground to prevent them from escaping by rooting underneath the fence. Barbed wire along the ground helps prevent rooting. Fences need to be no higher than 54 inches.

As with cattle-working pens, fences around swine confinement units are likely to receive heavy usage. Use heavy materials and sturdy construction for long life and functionality.

## **Planning The Fence**

Fencing is a costly investment. The location and arrangement may affect production efficiency, so it makes good sense to plan before you build. This is true whether you are installing a fence around the farm or a pasture for the first time, or replacing an old, worn-out fence. Evaluate existing fences. If they are in good shape, you may want to plan new fences around them. If they are old and falling down, it may be cheaper in the long run to replace them.

Pay attention to water resources when planning your fence arrangement. Wise placement of fences can result in being able to use the same water source in two, three or even three or more pastures. Fencing cattle away from ponds and using freeze-proof overflow tanks can improve water quality and prevent disease problems associated with cows standing in the ponds during the summer. This also prevents injury and death due to cattle breaking through frozen ponds in the winter. Plans and information about these types of watering systems may be found at your local Extension office or through the Soil Conservation Service.

### **Locating Permanent Fences**

Permanent fences should be well constructed using high quality materials so they will last a

long time with minimum repairs. A well-constructed permanent fence that surrounds the farm is essential. It establishes a fixed property line between you and your neighbors and prevents losses due to livestock getting killed on the highway or having to pay your neighbors for livestock damage to their crops. Take care to properly locate the property line when building boundary fences to avoid costly mistakes.

Consider permanent fencing around pastures which will be used year after year and around cropland. These fences will probably never be moved, so it makes sense to build a well-constructed, low maintenance fence that will last a long time. A permanent fence is also a good idea for a lane that gives livestock access to water.

### **Locating Temporary Fences**

Movable fences are considered temporary fences. They are normally used for a short period of time, then removed and used in some other location or stored until needed. They are easy to build and take down. They cost less than permanent fences, but they are not as effective and usually will not last more than one to three years. They do not take the place of permanent fences, but can be very beneficial in some instances.

Temporary fences are well suited for controlled grazing situations because pastures can be divided into a substantial number of individual cells with minimal labor and cost. They can be moved from year to year until you decide the field layout that best fits your production scheme.

### **Locating Lanes and Gates**

A lane is needed to connect livestock buildings, working facilities and water with every field that eventually may be pastured. Keep in mind that a permanent pasture located between other fields can serve as a lane.

To keep gullies from forming on rolling land, plan the lane to follow a terrace or natural ridge. If a well-drained location is not possible, use movable fences which can be relocated every few years. Wherever possible, locate gates and passageways for livestock and equipment in the corner of each field closest to farm buildings. If you have fields on opposite sides of a road, locate gates opposite each other so livestock can go directly across.

# Selecting The Proper Fence

There are many types of fences to meet various fencing needs. Since fencing usually represents a rather large investment on most farms, it is especially important to select a fence that is affordable, easy to maintain, durable and, most importantly, keeps livestock in. The kinds of fences commonly used in Tennessee include woven wire, barbed wire, high-tensile, board, electric or a combination of any of these.

## Woven Wire Fences

Woven wire fences consist of a number of horizontal lines of smooth wire held apart by vertical wires called stays. The distance or spacing between horizontal line wires may vary from as close as 1 1/2 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.

Woven wire is available in many combinations of wire sizes and spacings, as well as a number of horizontal line wires and fence heights. The height of most woven wire fencing materials ranges from 26 to 48 inches. The fence height should be selected based upon the animals size and their jumping ability. Stay wires should be spaced 6 inches apart for small animals and 12 inches for large animals.

The standard design numbers listed on the tag 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 sizes are shown in Table 1.

Design #	Horizontal Wires	Height (in.)
635	6	35
726	7	26
832	8	32
845	8	45
939	9	39
949	9	49
1047	10	47
1156	11	56

Table 1. Common Woven Wire Fencing Material

## 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. They are generally classified as either a standard or suspension barbed wire fence.

Standard barbed wire fences usually have three to five strands of barbed wire stretched between posts that are spaced between 15 to 25 feet apart (Figure 1).

The suspension fence has 4 to 6 strands of wire stretched taut so there is no more than 3

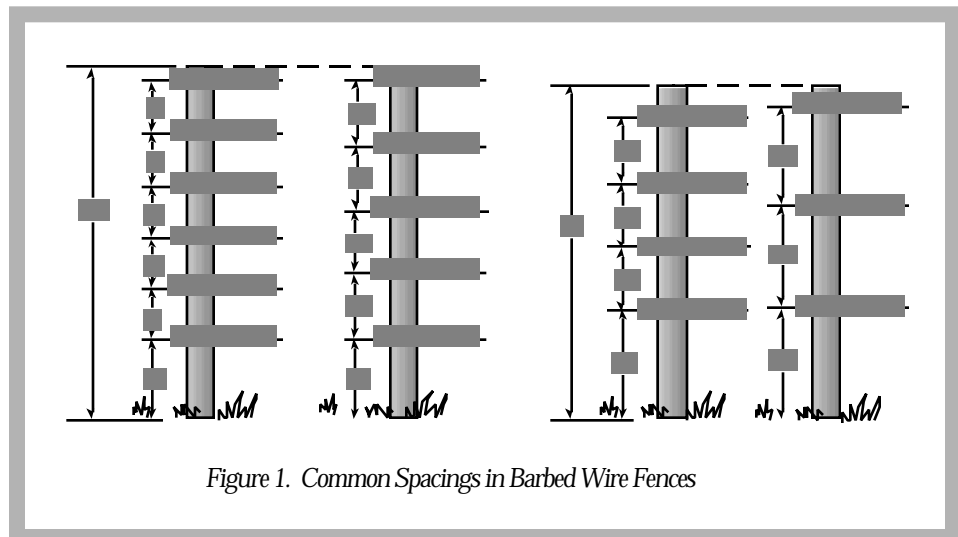


Figure 1. Common Spacings in Barbed Wire Fences

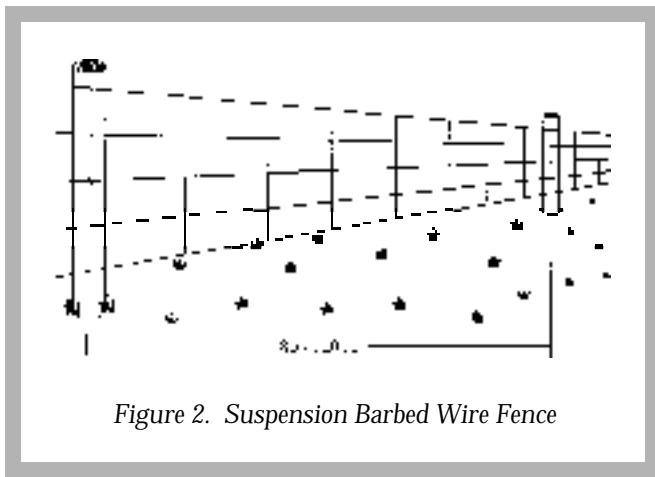


Figure 2. Suspension Barbed Wire Fence

inches of sag between posts (Figure 2). Depending upon the topography, line posts are generally spaced between 80 to 120 feet apart. The wires are held apart by twisted wire stays spaced 16 feet apart. Wind or animals hitting the fence cause it to sway back and forth. This swaying motion keeps animals away from the fence and discourages them from fighting through it. To allow the fence to sway, the stays must not touch the ground or the effectiveness of the suspension fence will be reduced.

### Board Fences

Board fences are very attractive, quite strong and are safe for animals. They are typically used as border fences around the farm or the home. 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. They can be built to any height, however, heights of 4 to 5 feet are most common.

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

An increasingly popular type of fence is high-tensile wire fence. First used in New Zealand and Australia, high-tensile wire fences offer several advantages over conventional fencing:

- easier to construct
- last longer
- cost less to build than most conventional fences
- require less maintenance

High-tensile fences are constructed mostly with 12 1/2 or 14 gauge Class 3 wires which have tensile strengths from 170,000 to 200,000 or more pounds per square inch (psi) and breaking strengths of approximately 1,800 pounds (Figure 3). 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 12 1/2 gauge high-tensile wire is 200 pounds. A tension indicator spring is used to indicate wire tension.

High-tensile wire fences should 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.

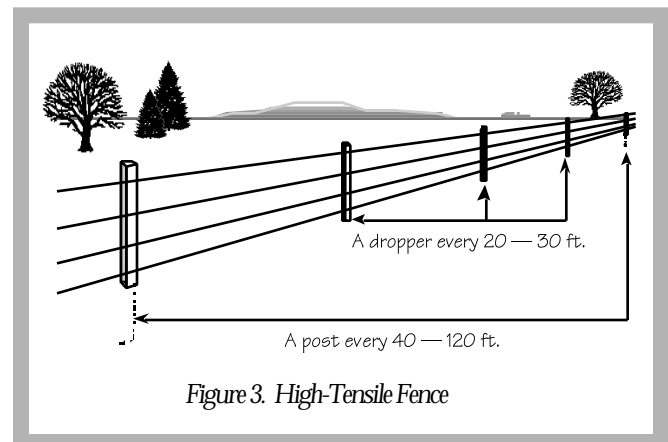


Figure 3. High-Tensile Fence

### Cable Fences

Because of their expense, cable fences are used primarily for confinement areas, such as holding pens, feed lots 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.

There is no limit as to the number of cables

Permanent Types	Height (in) Spacing(in)	Cost Index <sup>1</sup> (Materials Only)	Approx. Life (Humid Climate) (Years?) <sup>2</sup>	Maintenance	
<b>Barbed Wire</b> <b>2 point, 4-in spacing</b> 3 strands, 12 ½ gage 4 strands, 12 ½ gage 5 strands, 12 ½ gage 3 strands, 14 gage <b>4-point, 5-in spacing</b> 3 strands, 12 ½ gage 4 strands, 12 ½ gage 5 strands, 12 ½ gage	1 post per 16'	12	33	High	
		13	33	High	
		14	33	High	
		11	19	High	
		12	33	High	
		13	33	High	
<b>Suspension Fencing</b> <b>4-point, 5-in spacing</b> 4 strands, 12 ½ gage 6 strands, 12 ½ gage	Posts 100' apart	8	33	Medium	
		10	33	Medium	
<b>Woven Wire</b> <b>Light Weight</b> Top and bottom Wire: 11 gage Filler Wire: 14 ½ gage	Stay Height (in) Spacing (in)	26      6	14	19	High
		32      6	15	19	High
<b>Medium Weight</b> Top and bottom Wire: 10 gage Filler Wire: 12 ½ gage	26	6	16	30	Medium
	32	6	17	30	Medium
	39	6	18	30	Medium
	47	6	20	30	Medium
<b>Heavy Weight</b> Top and bottom Wire: 9 gage Filler Wire: 11 gage	26	6	19	40	Low
	32	6	21	40	Low
	39	6	23	40	Low
	47	6	25	40	Low
<b>High Tensile: 12 ½ gage</b> 3 strands 4 strands 5 strands 8 strands			4 <sup>3</sup>	30	Medium
			5 <sup>3</sup>	30	Medium
			6 <sup>3</sup>	30	Medium
			10 <sup>3</sup>	30	Medium
<b>Temporary</b>					
<b>Barbed Wire: 12 ½ gage</b> 1 strand 2 strands			4	30	Medium
			5	30	Medium
<b>Aluminum Wire</b> 9 gage 13 gage			6 <sup>3</sup>	30	Medium
			5 <sup>3</sup>	30	Medium

<sup>1</sup>Cost index figures are to show relative cost, no actual cost. For example, fence with an index of 25 costs about twice as much per foot as fence with an index of 12.

<sup>2</sup>Fence life based on combination of post and wire life expectancy.

<sup>3</sup>Costs of electric controller not included.

Table 2. Comparison of Common Fences



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

### Electric Fences

Electric fences are widely and successfully used in Tennessee. They can be an effective, safe and inexpensive means of providing both temporary and permanent fencing if they are constructed properly and energized with a properly sized controller.

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. It is also essential that there is adequate power for the length of fencing and the type of animals to be confined. Several advantages of electric fencing are low cost, inexpensive to operate, can be used to extend the life of old permanent fences or they can be used for deer and predator control. They 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 which are fine wires woven together with polyethylene fibers.

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. The polytape, particularly the extra-wide type, is easier to see than polywire. This type works better for horses. It is very important

to keep weeds and grass cut away from the fence, especially when using low impedance controllers. If grass and weeds are allowed to touch most polywires, the charge produced from low impedance controllers can cause the small-diameter wires to burn in two. Polywires with stainless steel wires are more durable, but electric conductivity is lower. Aluminum conducts electricity better, but it breaks more easily.

Aluminum, stainless steel and high-tensile wire can also be used. One advantage to using these type of wires is they conduct electrical charges for longer distances than the small-diameter wires of the polywire and polytapes. However, they are harder for the animal 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 will help make these wires more visible.

An electric fence controller is used to energize the wire. The moist earth is used for completing 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 will generally be used for a short period of time.

### Comparing Fences

As previously stated, when selecting a fence, the things to consider are what the fence is to be used for, how easy it is to build, what it costs to build and maintain and how long it is supposed to last. Table 2 gives some general comparisons

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. Fence Post Characteristics

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 4. Life Expectancy of Wood Posts

Fence	Spacing (feet)
Woven Wire	14 - 16
Barbed Wire	12 - 14
Suspension	100
Electric	40 - 75
High Tensile	40 -60
Board	8
Corrals	6

\* Driven posts are 1.7 times as strong as tamped posts

Table 5. Recommended Post Spacings\*

you can use to help select the type of fence that best fits your need and budget.

## Fencing Materials and Equipment

### Fence Posts

There are many types of posts available in Tennessee (Table 3). 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 peripheral fences, while light fiberglass or steel posts would be more suitable for constructing 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 4). Osage orange posts have a lifespan of 25 to 35 years, black locust or red cedar posts will last for 15 to 25 years. Other woods such as oak, pine and poplar will rot in just a few years unless they are pressure treated.

Wood posts come in an array 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, the first step is to 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 2 1/2 inches, but larger diameter posts will make the fence stronger and more durable.

Steel posts have several advantages. They weigh less, can be driven into the ground rather easily, won't 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.

All posts must be long enough to accommodate the height of the fence and depth of setting. To get the correct fence post length, add together the depth of setting, the height of the top wire and 6 extra inches. Recommended post spacings for various fences are shown in Table 5.

### Wire

Wire is covered with zinc, commonly called galvanizing, to protect it from rusting. The length of time before fence wire begins to rust depends on the thickness of the galvanized coating. The more ounces of zinc per square foot of wire means

more years of service before rusting starts (Table 6).

Fence manufacturers and the American Society for Testing Materials have established “classes” of zinc coatings for fence wire. Class 1 has the lightest coating of zinc and Class 3 has the heaviest. Because of competition, many local fencing supply dealers only stock wire with Class 1 coating. Fencing materials with Class 3 coating may have to be specially ordered. Galvanizing delays rusting. The more galvanizing on the wire, the longer it will be before rust starts to appear.

Once steel wire starts to show rust, it isn’t long before the whole fence is rusted. It usually takes from one to three years from the time rust first appears until all the wire is rusty. The durability of the fence then depends on how fast rust weakens the wire. Rusting slowly reduces the diameter of the wire. As the diameter of the wire gets smaller, its strength is reduced.

### Staples

Selecting the appropriate staple is just as important to the overall strength and longevity of the fence as selecting the right wire. Staple pull-out is a common fencing problem when using pressure-treated softwood posts. The lubricating action of the preservative, combined with the soft nature of the wood, makes it easy for staples to loosen and fall out over time. To avoid this pulling-out action, use 1 3/4-inch or 2-inch long, 8- or 9-gauge, hot-dipped, galvanized staples with cut points and barbs. If you are using untreated hardwood posts, shorter staples can be used because they cannot be pulled out of hardwood very easily.

### Gates

Always place gates in logical places so livestock will move through easily. Avoid putting gates in the middle of a straight fence. It is best to put them in corners. Build or buy sturdy gate materials, especially hardware items such as hinges and closures.

Stock gaps or cattle guards are useful for high traffic areas. Cattle guards can be made of various

	Climatic Conditions			
	Dry		Humid	
	Class 1	Class 3	Class 1	Class 3
Wire Size	Years until rust appears on the wire			
9	15	30	8	13
11	11	30	6	13
12 1/2	11	30	6	13
14 1/2	7	23	5	10

Table 6. Approximate Protection Given Wire by Class 1 and Class 3 Galvanizing

materials, including heavy pipes, railroad rails and wooden beams.

### Electric Fence Controllers

Most producers will agree that touching an electric fence is very unpleasant. The experience for animals are no different. When animals come in contact with an electric fence, the shock they receive affects their nervous system. The severity, or the amount of shock the animal feels, depends on the voltage and amperage as well as the duration of the shock. It takes a minimum shock of 700 volts to effectively control short-haired breeds of cattle, pigs and horses, and around 2000 volts for long-haired cattle, sheep and goats. The controller, often referred to as the charger or energizer, that delivers this shock is the heart of any electric fence and must be selected carefully. There are two types of controllers currently on the market: high- and low-impedance controllers.

Electric fence controllers of years ago, and some brands today, put out relatively high voltage with low amperage. These are known as high-impedance controllers. Because of their high voltage and low current output, there is no staying power of the charge. The first weed or blade of grass to touch the fence will drain the power to the extent that little or no shock is felt by the animal, after even a short distance of fencing.

Low-impedance controllers have the capacity to power long distances of single or multi-wire fence. These controllers put out a lower-voltage,

higher-amperage charge. Their pulse is extremely short compared to high-impedance controllers. Since the pulse length is short, the conductive capacity of the wire isn't saturated. Consequently, there is less impedance or resistance to current flow, resulting in more livestock-influencing energy delivered over miles of fence that weeds and grass won't short out.

If all the fields you plan to fence are not near a 120-volt power source, you have no choice but to use a battery-operated controller. They do an excellent job of confining animals and are very popular controllers because they can be used at any location without connection to a 120-volt power source. These controllers operate on either a 12, 24 or 36 volt (1, 2 or 3 batteries) system. The batteries can be disconnected from the controller and recharged every two to six weeks depending on the type of charger and the amount used. With a solar energy collector kit, the battery can be recharged daily for the life of the battery. Deep cycle, marine and RV type-batteries are best suited for battery-operated controllers. Batteries designed for use in automobiles will not last as long as deep-cycle batteries.

If your fields are near where they can be served by a 120-volt controller, it is probably your best selection. There is no problem of changing or recharging batteries and they cost less than the battery-operated controllers equipped with solar kits. Cost of operation is reasonable, averaging around 50 cents a month.

For good animal control, it is important to match the capacity of the controller to the fence you want to charge. Most manufacturers indicate the strength of the controller by the number of miles it will power. A good rule of thumb for sizing controllers is to determine the number of miles of electrified wire in the fence and add 25 percent to offset any power drain caused by grass and weeds touching the fence. For example, if you have a 5-mile long, 6-strand high-tensile fence and four of the wires are electrified, you would need a controller rated at a minimum of 25 miles ( $4 \times 5 = 20 + 25\% = 25$ ).

## Grounding

Grounding is very important when using electric fence controllers, especially with the low-impedance types. A minimum of three, 6-foot long galvanized ground rods driven in the ground 6 feet apart and tied together with a #12 gauge

copper wire are required for the smaller units (Figure 4). If rocky ground prevents the rods from being driven into the ground, it is recommended the rods be laid end to end in a deep trench and tied together with the copper wire. More powerful units may require a minimum of eight rods. Check manufacturer's recommendations for proper grounding procedures. Make sure ground rods are at least 50 feet from any utility company ground rod, underground telephone or power cable. Firmly attach the ground wire to each rod with ground clamps.

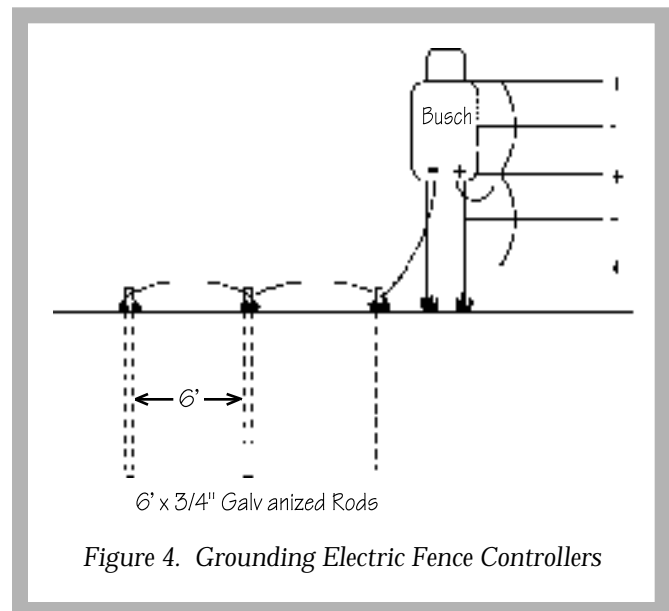


Figure 4. Grounding Electric Fence Controllers

## Lightning Protection

Lightning strikes are a major problem with electric fences. It is rather common for lightning to hit a wire fence directly or indirectly through a tree or building near the fence, and then travel as far as two miles on the fence before it is grounded. Whenever possible, disconnect the charger from the fence line during a thunderstorm.

The best and least destructive way to protect electric fence controllers is to provide a quick path to ground for the lightning charge. Lightning arrestors and chokes offer some protection against lightning strikes, although they do not guarantee complete protection and will not protect the controller from a direct strike (Figure 5). The choke blocks the extremely high voltage lightning strike from getting to the charger by making it

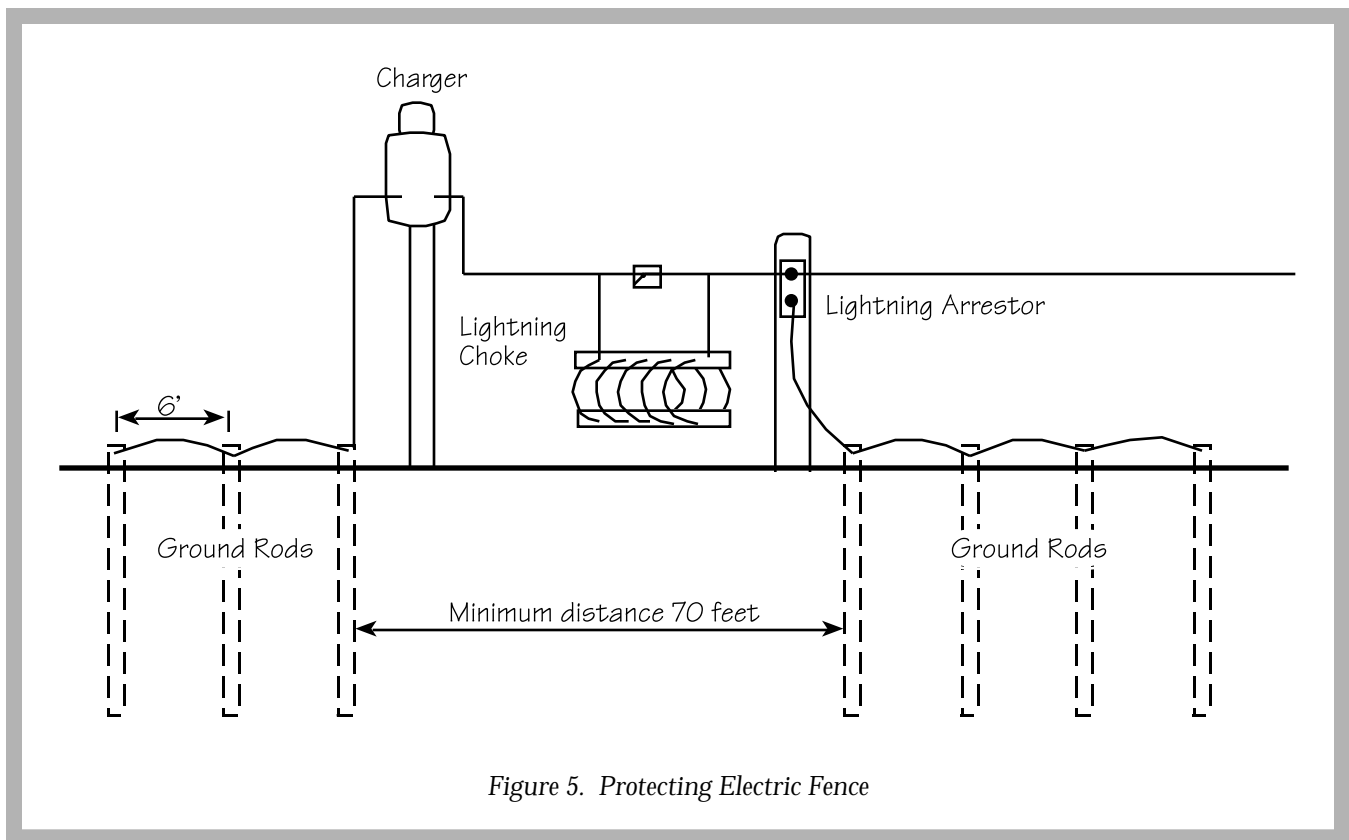


Figure 5. Protecting Electric Fence

jump the carbon discs inside the lightning arrestor, then disperses the charge to ground. Lightning always finds the quickest and easiest way to earth. Thus, earth/grounding system of the lightning arrestor must be as good as, or better than, the grounding system of the controller. In bad lightning areas, grounding the top wire of the fence has helped protect the controller.

### Precautions

- Never use home-made electric fence controllers. Numerous deaths to both humans and animals have occurred from the use of home-made controllers.
- Do not tamper with or attempt to repair the controller. Repairs should be made only by an authorized service agency or the manufacturer.
- Use only one controller on any one continuous fence.
- Never charge a battery on a battery-type controller with the charger connected to the fence.
- Never attach your electric fence wire to a utility pole. Leaks from high voltage current

down a wet pole can be very dangerous.

- Fasten yellow signs with *Electric Fence* painted on both sides to the fence at distances no more than 200 feet apart.

## Construction

Building a fence requires good materials, proper construction techniques and good common judgment. Every fencing job presents slightly different problems. The following steps are typically followed in constructing a high-tensile wire fence. Detailed instructions are provided by most distributors of high-tensile wire fence products. Many of the same techniques apply to the construction of barbed wire and woven wire fences.

### Choosing the Fence Line

First, carefully plan your fencing arrangement. Check property lines closely and arrange cross-fences to take maximum advantage of your situation. The fence line should, if possible, avoid rough, stony, broken, steep areas. With electrified high-tensile fencing it is easier to zig zag a little rather than go straight over places which may

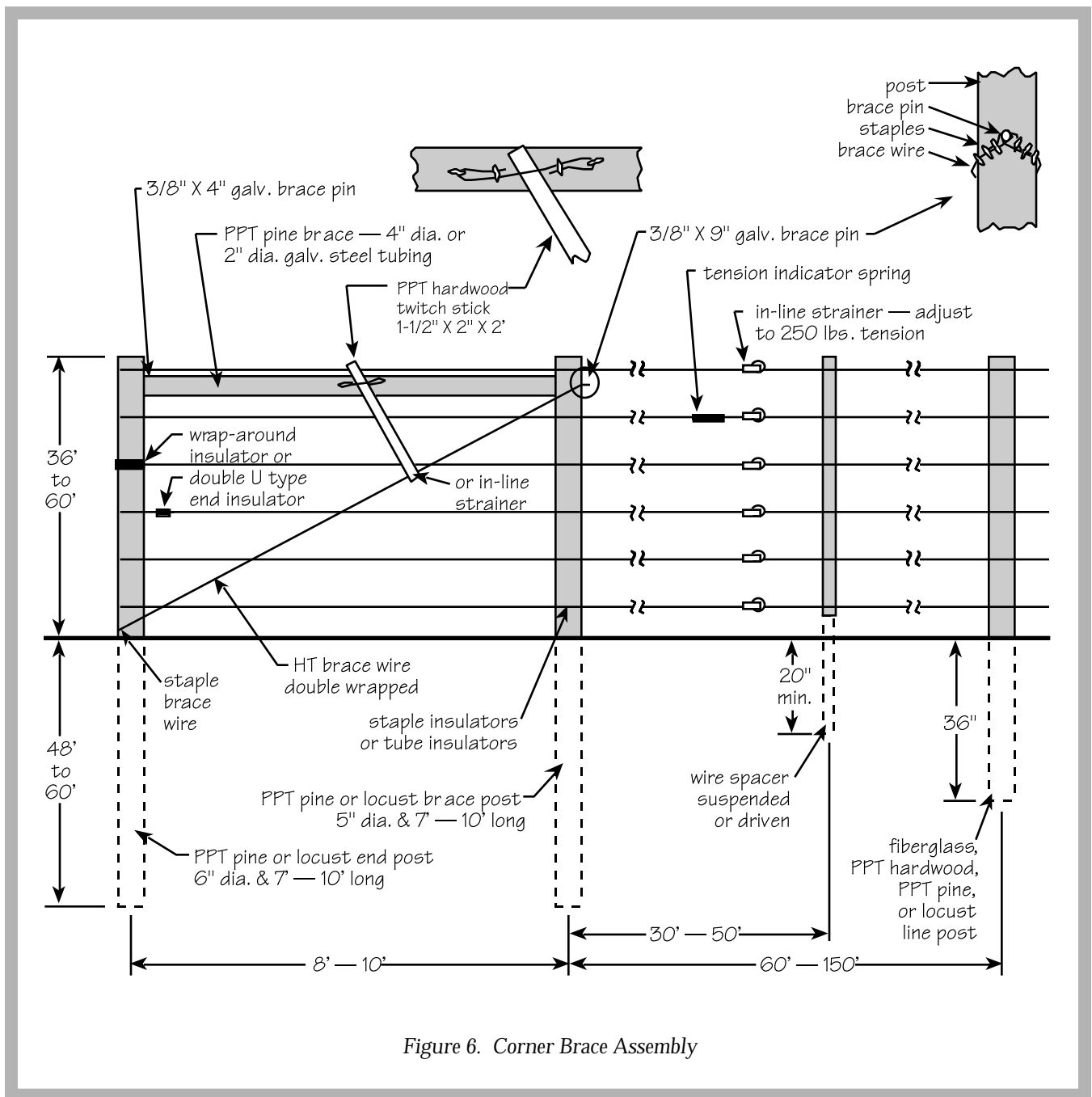


Figure 6. Corner Brace Assembly

need leveling or more posts and tie downs, and possibly more maintenance in the future.

In some situations it is advisable to level the area first. Where this is done, re-grass the area to prevent erosion and/or weed growth. Animals standing on grass get a greater electrical shock than when standing on bare soil.

### Corner, End and Line Brace Assemblies

Corner-post and end-post assemblies are the backbone of the fence. A properly tensioned high-tensile fence puts a tremendous pull on these

assemblies. Both corner and end assemblies must be strong enough to withstand this force. The key is to build them right and put them in deep. Some producers have literally ripped their corner- and/or end-assemblies out of the ground while tightening the wires because the posts were set in the ground too shallow (Figure 6).

A corner post will need a brace assembly for each fence leading to it. When the fence is more than 200 feet long, it is best to use a double span assembly (Figure 7). The double span assembly is more than twice as strong as a single span. Set the

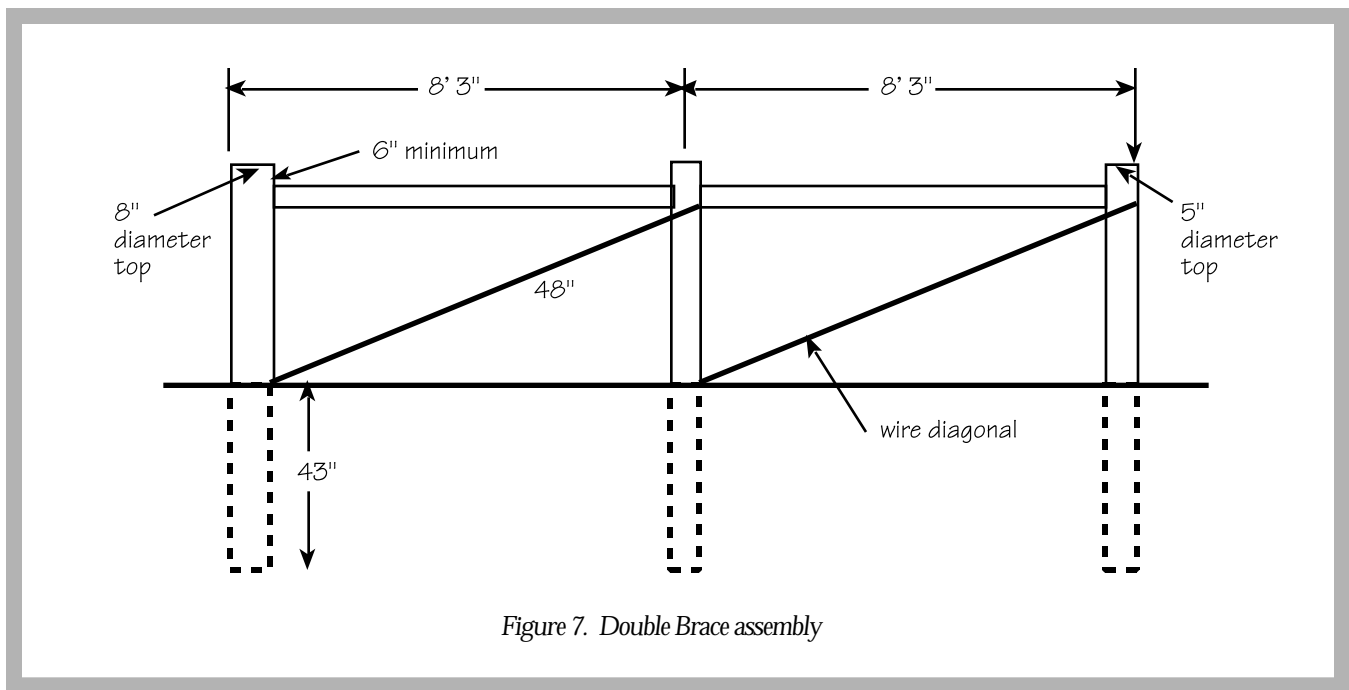


Figure 7. Double Brace assembly

corner posts leaning back from the direction of the fence approximately five degrees. Brace wire should pull in the opposite direction than the fence is pulling.

When a fence is more than 650 feet between corner posts, use braced line post assemblies every 650 feet in the fence line. A braced line assembly is the same as a single span braced corner, except a second diagonal brace wire is used to take fence pull in the opposite direction. In some situations, such as where adequate post depth cannot be achieved, additional bracing may be required to maintain tension.

### Setting Fence Posts

Wooden fence posts can be driven in the ground or tamped into place. A driven post is 1.7 times as strong as a tamped post. Posts larger than 4 inches may need to be sharpened to a dull point or driven in an auger-drilled pilot hole when using a post driver. For uniform depth, mark the digging tool or a steel post to the desired depth. You can drive the post in the ground with a manual post-hole driver or a tractor type.

Another method for setting posts is to dig the hole larger than the post diameter, place the post in the hole and then repack the soil around it. Center the post in the hole before tamping. This makes tamping easier and gives the tightest soil-pack around the post. Replace small amounts of soil and tamp. Plumb the post while tamping to

see that it is in proper alignment.

The distance between line posts depends primarily on topography. On extremely flat land, line posts are generally spaced from 10 to 16 feet apart if the fence is not electrified, to as much as 150 feet apart for an electrified fence. Battens or spacers are installed in all dips or at a maximum of 30 feet apart for five strands and 50 feet for two to three strands. Line posts are moved closer and closer together as the terrain goes from flat to hilly.

### Running Wire

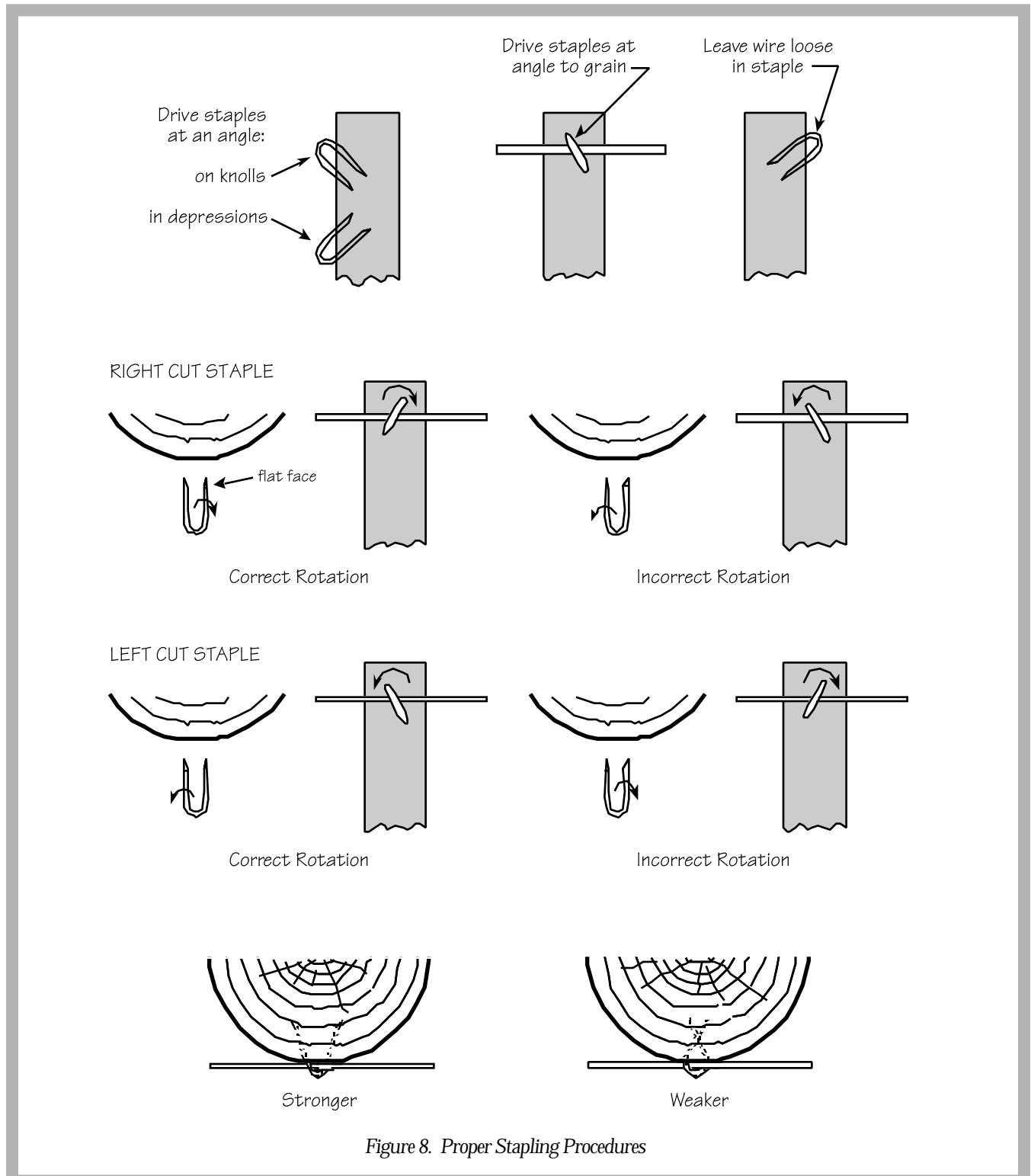
High-tensile wire is packaged in various size coils. Wires can be run from the coil one wire at a time using a payout spinner, or several at a time using a multi-wire fencer. When walking from the far corner post to the first one, make sure the wires are in a straight line. If the fence is on flat land this is easy, but if it is over gently rolling terrain, the wire can be straightened by lifting it and letting it drop on its own until it falls onto the same position. Where the fence line is on very uneven ground, getting the first wire straight is not so easy and may have to be done by driving in two pegs or sighting posts where each can be seen at the same time as the corner posts. Then sight over the guide posts and move them until they are all in line with the two end posts.

Run the bottom wire out first and tension it sufficiently as a guide for setting line posts. Wires

are secured to corner, end or gate posts with crimping sleeves or appropriate knots. Secure the bottom wire to each line post as it is driven to assist in determining the next post position.

Eight to 10 wires are recommended for non-electric high-tensile wire fences for cattle. Three to five wires are all that are necessary if the fence

is electrified. String the wires on the inside of the posts or on the outside of curves. Drive staples slightly off the vertical so they straddle the wood grain, as shown in Figure 8. When driving staples into posts, rotate the staples around 25 degrees from the flat surface of the point. Rotating spreads the legs, which helps give the staple greater holding

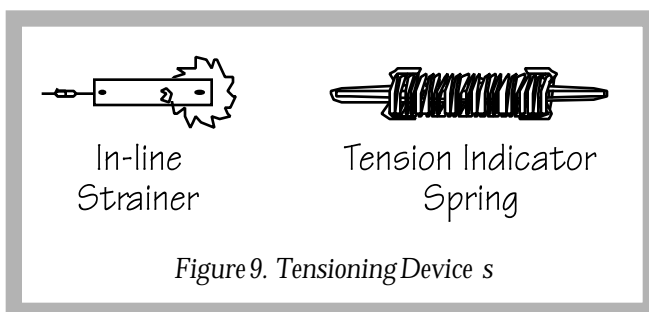




power. Drive staples at an upward angle into posts in dips, and at downward angles into posts on rises. **Do not drive staples in too deeply.** The wire must be allowed to slide through the staples for adjusting tension. All energized wires must be insulated from posts and battens. If using the fence for predator control, it is important to alternate at least two or three “hot” wires with the remaining wires. These are used as a ground so predators receive a severe shock when attempting to squeeze between the hot and ground wires. Always plainly label electric fences to avoid danger to people.

### Tensioning Wire

As a safety precaution, always wear heavy gloves and eye protection when tensioning wire. Tension each wire to 200 pounds with a ratchet in-line strainer or tightener. Excessive tension not only damages the wire but may lift the fence out of the ground in gullies. The ratchet also permits seasonal adjustment for temperature changes, if necessary. Use a tension indicator spring to obtain the proper wire tension on each wire (Figure 9). Then, tighten all other wires by feel to match the tension on the wire with a spring. On runs shorter than 600 feet, the in-line strainer and tension spring can be located anywhere along the fence, usually near one of the ends. However, on long runs, it is recommended to place them in the center of the fence so that the wire pulls in from both sides. On long straight runs of more than 600 feet, place them at the friction center which is at the center point between the two corners or ends. On long runs with a straight section on one end and several bends on the other, the friction center will be in the bends section rather than in the straight section.



## Repair and Maintenance

Properly-built and well-maintained fences will give you the most trouble-free service for your money. A maintenance program is a must. Include some of the following tips in your regular maintenance program:

- Keep the fence wires properly stretched. Fences will naturally loosen over time or with seasonal changes. If tighteners are placed in the fence, check at least twice per year. Other fences may be tightened by resetting or by putting several small kinks or creases in the wire using pliers, a hammer or special tool designed for this purpose. Splice broken wires when necessary.
- Repair or replace anchor post assemblies whenever they show signs of weakness. Refasten loose wires to posts.
- Old woven wire and barbed wire fences which have deteriorated enough to need replacement can be restored to last for many more years by running an electrified wire on one or both sides of the fence through offset brackets attached to the old fence. These offset brackets are made of galvanized high-tensile wire and are easily attached to the existing fence. They should be attached at two-thirds the height of the animals to be controlled, next to posts where they will be held more securely than sagging on old wires in the center between two posts.
- Use herbicides or manual clearing to keep weeds and vines from covering fences. Grass and weeds touching the wire can ground it and make the fence ineffective for controlling livestock. An inexpensive fence tester should be secured and used frequently to assure proper functioning of the fence.
- A carpenter’s apron is very handy for holding nails, staples and small tools, and a good pair of gloves prevents hand injury and helps in gripping wire. Specialized fencing pliers are an excellent investment for anyone who builds or maintains fences.

## **References**

- Planning Fences. 1980. American Association of Vocational Instruction Materials.
- Kay, F. W. 1990. Fences for the Farm. University of Georgia Cooperative Extension Service Publication.
- 9th International Power Fence Manual. 1990. Gallagher Power Fence Inc.
- Selders, A. W., J. B. McAninch. 1987. High-Tensile Wire Fencing. NRAES-11. Northeast Regional Agricultural Engineering Service.

Visit the Agricultural Extension Service Web site at:  
<http://www.utextension.utk.edu/>

*PB1541 -2.5M-5/01(Rep) E12-4315-00-02-01*

The Agricultural Extension Service offers its programs to all eligible persons regardless of race, color, national origin, sex, age, disability, religion or veteran status and is an Equal Opportunity Employer.

COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS

The University of Tennessee Institute of Agriculture, U.S. Department of Agriculture,  
and county governments cooperating in furtherance of Acts of May 8 and June 30, 1914.

Agricultural Extension Service  
Charles L. Norman, Dean