

**NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATION**

**ELECTRIC FENCE
(Feet)**

CODE 382

MATERIALS SPECIFICATIONS

The work shall consist of furnishing **all new materials** and installing permanent and temporary electric fence, including gates, posts, braces, and fittings in accordance with **Conservation Practice Standard-Fence (382), SC 382- Material and Construction Specification-Tables 1-9, and as shown on the attached standard drawings.**

Variations of what is presented in this document may be approved if alternatives will meet or exceed current specifications. Sufficient documentation must be presented to the SC NRCS State Resource Conservationist.

CONSTRUCTION SPECIFICATIONS

Permanent Electric Fence:

Fence-Line Clearing

Prior to construction, the fence line shall be cleared of any obstruction that would hinder fence placement and operation. Clearing along stream banks will be held to a minimum except as required for stream crossings. The soil surface along the fence line shall be relatively smooth such that placement of the bottom wire does not exceed the specified maximum wire spacing from the soil surface.

Setting posts

All post shall be set and maintained in a vertical position or leaning slightly (1-2 inches off vertical) away from direction of wire tension.

Posts in curves should be set approximately 4 inches off vertical. Posts set with a driver have about 9 times the holding strength of handset posts. If hand set, holes should be at least 6 inches larger than the diameter of the posts and all backfilled material will be thoroughly tamped in layers no thicker than 4 inches. The post hole shall be filled to the ground surface.

Line Posts

Refer to [Table 1](#) Permanent fence selection criteria for line post and stay spacing and [Table 4](#) Post type, size, and depth specifications.

Spacing will vary depending on terrain and pressure from livestock.

Metal pipe used as posts must be capped to prevent bird mortality.

Installation shall ensure that adequate fence height is maintained based on its purpose.

Installing Curves

Installing curves in electric wire fences is permissible as long as the change in direction from one post to the next does not exceed 20 degrees. Posts on curves shall be 5 inch minimum top diameter for changes

up to 14 degrees and 6 inch minimum top diameter for changes up to 20 degrees. Posts on curves should be driven 48 inches deep with 4 inches of lean to the outside of the curve and spaced no closer than 4 foot apart. (In an 8-foot long section, 14 degrees is approximately 24 inches off straight line and 20 degrees is approximately 35 inches off the straight line).

Line Posts – Stream Crossing

Anchor posts are required on both sides of a stream crossing. For crossings less than 16 feet wide, standard line posts set on both sides will be adequate. For crossings wider than 16 feet, or when non-electrified heavy flood gate is used, a single H-brace assembly or other suitable brace shall be used.

- Where needed, flood gates will be attached below bottom wire and will be designed to allow water and debris to pass and still control livestock. Some type of hinged or breakaway floodgate works best.

Posts that are set in low areas or gullies may need to be weighted or anchored to prevent lifting out.

Stays or battens between line posts

Stays or wire spacers or battens may be used to maintain desired wire spacing between line posts; note that specifications for post spacing differs with and without stays (Table 1). Stays shall be secured sufficiently to remain in position along wire line.

Post Bracing

Refer to 382-Construction specifications [Tables 5 and 6](#), [Table 7](#), and [Table 8](#) for brace diameter, length, type, and spacing.

Corner braces are required at all points where the fence alignment has a change of 20 degrees or more and the pull is from two directions. (In an 8-foot long section, 20 degrees is approximately 35 inches off the straight line).

End braces are required where fence ends and on both sides of gate openings direction and has pull from only one direction.

In-line pull post assemblies are located in straight sections of the fence line and where there are sudden changes in elevations, such as at the bottom and top of slopes. Tie off all wires at in-line pull assemblies and start new wires for the next fence section. Posts that are set in low areas or gullies may need to be weighted or anchored to prevent lifting out.

Horizontal brace rails will be placed 4-6 inches below the top of the post.

The brace post and anchor posts should be fastened to the compression brace using galvanized screws, nails, or steel dowel pins (drilled through vertical post and into end of horizontal brace, 4 inches deep).

The longer the brace rail the stronger the brace. **A single H brace with a 10 foot brace rail is strong enough to take the place of a double 8 foot H brace.**

Diagonal floating brace assembly can be substituted for other brace types. The brace rail for the diagonal floating brace must be installed below the top wire and be at least 2.5 times the length of the height of the top wire. Brace blocks will have a minimum of 100 sq. inches of top surface area and can be made of a flat rock, solid concrete block, or a paving stone.

Adjoining Fences

A fence adjoining an existing fence must terminate in the adequate brace assembly.

Trees

Trees will only be used in situations where the use of posts is technically infeasible.

No more than 20% of posts shall be trees. Live trees used for corner, bracing, and line posts shall have a diameter breast height (DBH, 4.5 feet aboveground) equal to or greater than those prescribed for normal wooden posts.

Wire will not be fastened directly to trees. When using live trees, protection will be provided between the tree and wire (CCA treated 2 x 4's, fiberglass, or rigid plastic strip).

When using live trees as an end post, attach wire to a 3/8 inch lag eye bolt in the tree.

Tension of Brace (Guy) Wires

For guy wires use two complete loops of 12 1/2 gauge High tensile wire or barbed wire or one loop of 9 gauge wire.

For horizontal braces, brace wire will be double wrapped and stapled to the brace post a height of 4-6 inches above the brace member and to the anchor (pull) post at a point 4 inches above ground level.

Brace (Guy) wire will be tightened using a wire tightener or strainer.

Another suitable method is to use a twist stick of 18-24 inches approximately midway along the brace

Wire

Refer to [Table 1a](#) and [Table 1b](#) Fence Selection Criteria and [Table 3](#) Fence Wire Specifications.

Total height and spacing between wires will be determined on a site specific basis depending on the terrain and livestock species.

Use only new 12 1/2 gauge minimum, class 3 galvanized high tensile wire with 170,000 psi or greater tensile strength.

Insulators, Fasteners, and Tension

Energized wires attached to steel and other conductive material posts will have insulators constructed of high density polyethylene or high density poly propylene with ultra-violet stabilizer or porcelain that withstands at least 10,000 volts.

Non-energized wire will be attached to wood posts with 9 gauge steel minimum 1.5 inch staples driven diagonally across the grain of the wood and at a slight downward angle to allow free slippage of wire.

Non-energized wires may be attached to steel line posts by use of manufacturer's clips, or by 2 turns of 14 gauge galvanized steel wire. For all other types of posts, attach as specified by manufacturer.

Use in-line strainers on each wire to maintain at least 150 lbs. of tension.

To monitor tension, install a tension spring in the second wire from the top before applying tension to all wires.

Energizers

Install electronic energizers or power fence controllers according to the manufacturer's recommendations. Must be UL or CSA approved.

Installation shall meet the following minimum specifications:

- a. A high-power, low-impedance system with solid state circuitry capable of at least 5000 volt peak output and a short pulse that is less than 300 amps in intensity, finished within .0003 of a second, and a rate of 35-65 pulses per minute.
- b. A high impact weather resistant case.
- c. Be powered by either 12-volt battery capable of operating three weeks without recharging, solar cell, or household electric current of 110 or 220 volts. If the length of fence requires an energizer of more than 4 joules, a solar charger will be needed on the battery systems.

Install a surge protector between the energizer and power supply to protect 110-or220-volt energizers.

Voltage - The ideal voltage for control of all species is 2000 volts or more. The minimum voltages for livestock control are:

Cattle - 1600

Sheep/Hair Goats - 2000

Hogs/Horses/Meat Goats - 1200

Size - As a rule of thumb, the energizer should be capable of producing one joule of energy for each mile of planned fence when average energy loss to the system is expected. Each joule will typically provide enough power to fence 25 to 40 acres of pastureland.

Ground

All electric fences must be properly grounded. Connect the energizer ground wire to a galvanized pipe or rod ½" or larger in diameter. Bury 3' of ground rod for each joule of energy output. Bury ground rods to the depth necessary to reach moist soil at the driest time of the year for best results. Drive sufficient number of 6 to 8' rods into the ground at least 10' apart to provide the required amount of ground rod. Connect a continuous ground wire from the energizer to each rod or pipe with a galvanized steel or aluminum clamp. Copper rods with copper wire may be used if the energizer terminals are stainless steel or copper. If energizer terminals are not stainless steel or copper, do not use copper ground rods due to corrosion at the connection and subsequent loss of electrical continuity. Use copper clamps with copper wire and copper rods.

The ground wire(s) of the fence may be connected to the same ground as the energizer or to a separate ground with the same size and depth requirement.

Additional ground rods may be needed for system to function properly.

The grounding system shall not be connected to other existing applications, such as power poles, breaker boxes, and milk barns.

The fence grounding system shall be installed at least 25' away from any other grounding system.

Follow manufacturer's recommendations for grounding the system.

Lightening Protection

External lightning arrestors shall be installed.

Lightning arrestor grounding rods shall be at least 65' from those of the energizer.

Install at least one more ground rod on the arrestor than was used on the energizer.

Attach the lightning arrester to the wires of the fence.

Install a lightning choke in the fence line immediately between the lightning arrester and the energizer.

Surge or Spike Protector

Install a surge protector between the energizer and power supply to protect 110-or 220-volt-energizers.

Gates

Electrified gates may be constructed of a single straight wire, galvanized cable, or polytape with a spring-loaded insulated handle or an expandable, coiled, high tensile, 12.5 gauge wire attached to an insulated handle.

Insulated galvanized wire will be used when overhead or underground transmission is necessary to cross gates and areas where electrical shocks to humans and livestock should be prevented.

Floodgates can be constructed by stretching electrified wire across the drainage above high water flow level. Attach droppers of 12.5 gauge high tensile fence wire, or galvanized cables or chains, or equivalent to the electrified wire at a spacing of 6 inches.

Droppers should extend to within 10 inches above the average normal water level or to the normal recommended fence height above the stream bottom. Connect the floodgate to the electric fence with double insulated cable through a cut-off switch and flood gate controller.

TEMPORARY ELECTRIC FENCE :

Install the number of wires at the appropriate spacing from the ground to control the animal of interest. Refer to [Table 2](#) for suggested wire and post spacing.

One of the following can be used to create an acceptable temporary electric fence:

- UV-stabilized, high-density polyethylene twine with at least eight stainless steel or aluminum filaments.
- UV-stabilized, high-density polyethylene *tape* with at least five stainless steel or aluminum filaments.
- 12.5-gauge smooth galvanized steel or aluminum wire.
- Electrified net wire can be used for small livestock.

Use posts that are good insulators and easy to move. Space posts to maintain the appropriate fence height. On level ground post spacing will typically be 50'.

If the temporary fence is attached to a permanent electric fence, use an alligator-type clip for the connection.

Other criteria such as insulators, wire quality, and energizers will be the same as the permanent electric fence criteria.