PERMANENT ELECTRIC HIGH-TENSILE FENCE

I. MATERIALS

A. Wire

Use only new wire that meets the following minimum specifications:

- Class 3 galvanized
- 12.5 gauge
- 170,000 psi tensile strength

B. Line Posts and Stays

All line posts need to be at least 6-feet long.

1. Steel

- Only new "T" or "U" posts, constructed of high carbon steel, and weighing a minimum of 1.25 lbs/foot exclusive of anchor plate.
- Studded, notched, or punched for wire attachment.

2. Wood

- Acceptable species include black locust, red cedar, Osage orange, and Australian ironwood (eucalyptus). All bark must be removed. At least one-half the diameter of red cedar posts must be heartwood.

- All other wood posts must be treated with a minimum of 0.4 lbs/ft³ of chromate copper arsenate (CCA-Type A, B or C), or equivalent.
- Minimum 3-inch diameter (2½-inch diameter for Osage orange; 1½-inch for eucalyptus).

3. Other

- Fiberglass, rigid plastic, and polyvinylchloride solid round sucker rod of at least 5/8 inch in diameter.
- Fiberglass T-posts of at least 1-inch cross-section.
- Trees may be used for line posts in rocky or frequently flooded areas where holes cannot be dug or fences are difficult to maintain. Use low value trees for posts. Trees should be properly aligned, and have a diameter breast height of at least 4-inches.

4. Stays

- At least ⅜-inch diameter steel, fiberglass, or rigid plastic.
C. Corner, Brace, End, and Gate Posts

1. Wood
   - Acceptable species include black locust, red cedar, and Osage orange. All bark must be removed. At least one-half the diameter of red cedar posts must be heartwood.
   - All other wood posts must be treated with a minimum of 0.4 lbs/ft$^3$ of chromate copper arsenate (CCA-Type A, B or C), or equivalent.
   - Corner, brace, end, and gate posts must be at least 8′ X 5″.
   - Horizontal brace members must be at least 8′ X 4″.
   - Landscape timbers cannot be used for posts or brace members.

2. Steel
   - Minimum 3-inch diameter high-carbon steel pipe weighing at least 7 lbs/foot, is galvanized or coated with a rust-resistant metal paint. Pipe ends must have a water-tight cap.
   - Horizontal brace pipe can be 2-inch diameter high carbon steel that weighs at least 3.6 lbs/foot, is galvanized or coated with a rust-resistant metal paint.

D. Insulators, Fasteners, and Offset Brackets
   - With charged wires, insulators for steel and other conductive material posts must be high density polyethylene or high density polypropylene with ultraviolet stabilizer, or porcelain that withstands at least 10,000 volts.
   - For non-charged wires on wood posts, use staples that are at least 9 gauge, class 3 galvanized. Minimum length for softwoods is 1½-inch, and for hardwoods is 1-inch.
   - For non-charged wires, use manufactured clips, or minimum 14 gauge wire on steel line posts.
   - Offset brackets made of galvanized high tensile spring wire and an insulator of high-density polyethylene with ultraviolet stabilizer or porcelain that withstands at least 10,000 volts can be attached to standard barbed wire or woven wire fence to provide transmission line and/or to protect a standard fence.

E. Energizers

   Install electronic energizers or power fence controllers according to the manufacturer’s recommendations. Installation should meet the following minimum specifications:
   - 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.
   - A high impact weather resistant case.
• 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.

• 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.

II. CONSTRUCTION

(See Georgia Fence Drawings)

A. Corners, Braces, Ends, and Gates

1. Posts

• Set posts for all fence assemblies at least 36-inches deep, in holes with a diameter at least 2.5X the post diameter. The top of posts should be at least 2-inches above the top wire.

• Backfill wooden posts by thoroughly tamping soil around the post after every 4-inches of depth.

• Set steel pipe in concrete that extends 1-inch below the bottom of the pipe, and slightly above the soil surface.

2. Braces (See GA Fence Drawing Nos.1&2)

• Bracing is required at all end, corner, gate, and pull assemblies

• Single H-braces or floating angle braces are required for all end and gate assemblies. (See Figures 1.1 and 1.2)

• One and two wire interior fences do not require brace assemblies, but wire should be tied off at least every 1320-feet.

• Use double H-braces in deep sands, or where soil remains saturated more than 6 months during the year. (See Figures 2.1 and 2.2)

• Set the center line of all horizontal brace members 6 – 9-inches below the top of the post.

• Anchor horizontal brace members to brace posts with a minimum 3/8” galvanized pin or spike driven through the post that penetrates the horizontal member at least 4-inches.

• H-braces must have a tension member consisting of 2 complete loops of 9 gauge smooth single
strand, 12 gauge double strand, or 12.5 gauge high-tensile wire. One end of the loop is attached to the anchor (corner, end, or gate) post 4-inches above the soil surface, and the other end is attached to the brace post at the same height as the top of the horizontal brace member. Twist the loops to provide rigidity to the brace assembly, or use in-line strainers on high-tensile wire.

3. Corner and in-line pull assemblies
   - Use a single H-brace corner post assembly for any angle where fence alignment changes more than 20 degrees. (See Figure 1.3)
   - One and two wire interior fences do not require brace assemblies, but wire should be tied off at least every 1320-feet.
   - Corners where fence alignment changes 20 degrees or less will use a 5 inch diameter post installed 48-inches deep. Lean the corner post 2-4 inches toward the outside of the curve.
   - Use a double H-brace pull assembly with tension members at intervals not to exceed 1320-feet in straight line fence sections. Use braces at shorter distances in uneven terrain. (Typically, grade changes of > 15%). Terminate and tie off wire at the center anchor post of the pull assembly. If desired cut-off switches could be installed at these locations. (See Figure 2.3)

B. Line Posts

Maximum spacing on all line posts is 75-feet without stays, or 150-feet with stays placed every 50-feet between the posts.

1. Steel
   - Drive posts at least 20-inches into the ground. The top of the post must be at least 1-inch above the top wire.

2. Wood
   - Drive or bury wood posts at least 24-inches into the ground. The top of the post must be at least 2-inches above the top wire. If post holes are dug, backfill by tamping the soil around the post at every 4-inch depth.

3. Other
   - Drive fiberglass or other synthetic material line posts according to manufacturer’s recommendation, or at least 20-inches in the soil. The top of the post must be at least 1-inch above the top wire.
   - If trees are used instead of line posts they should be closely aligned with the fence, and be spaced at distances no greater than the line posts. Do not attach wires or insulators directly to trees. When trees are used, a treated or hardwood buffer board, or comparable non-conductive material should be installed.

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between the insulator or wire and the tree.

C. Wire and Spacing

A minimum of one wire in the fence will be electrified. The number of wires and spacing shall be designed to accomplish the desired result of the fence. Table 1 suggests wire spacing for various animals.

Table 1. Recommended Wire Spacing

<table>
<thead>
<tr>
<th>Animal Type</th>
<th>Wires</th>
<th>Spacing from ground (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>1</td>
<td>28-34</td>
</tr>
<tr>
<td>Cattle</td>
<td>2</td>
<td>18-28 to 34</td>
</tr>
<tr>
<td>Hogs</td>
<td>2</td>
<td>8-16</td>
</tr>
<tr>
<td>Cattle</td>
<td>3</td>
<td>18-30-42</td>
</tr>
<tr>
<td>Hogs</td>
<td>3</td>
<td>8-16-24</td>
</tr>
<tr>
<td>Horses</td>
<td>3</td>
<td>20-34-46</td>
</tr>
<tr>
<td>Cattle, Horses</td>
<td>4</td>
<td>12-22-32-42</td>
</tr>
<tr>
<td>Sheep, Goats</td>
<td>4</td>
<td>8-16-24-36</td>
</tr>
<tr>
<td>Cattle, Horses</td>
<td>5</td>
<td>8-16-24-34-44</td>
</tr>
<tr>
<td>Sheep, Goats</td>
<td>5</td>
<td>6-13-21-30-40</td>
</tr>
<tr>
<td>Deer/Predator Control</td>
<td>6-8</td>
<td>6-12-18-26-36-46-56-68</td>
</tr>
</tbody>
</table>

1. Perimeter Fence

• A minimum of four strands with the top wire at least 42-inches above the soil surface.

• Space the remaining wires to ensure control of the animals of interest. Typically, wires are spaced closer toward the bottom of the fence than at the top.

2. Interior Fence

• Interior fences can be constructed of one or more wires, with the fence height being two-thirds the shoulder height or nose height of the grazing animal.

• Space the wires to control the animal of interest with the top wire at least 2-inches below the top of wooden posts and at least 1-inch below the top of steel posts. Table 1 suggests wire spacing for various animals.

3. Fastening and Tension

• On perimeter fence, attach wires to the side of the post closest to the livestock, except on corners.

• Avoid driving staples in-line with the wood grain. When using slash cut staples, place the staple parallel to the grain then rotate in the direction away from the cut face.

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

• To monitor tension, install a tension spring in the second wire.

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from the top before applying tension to all the wires.

- Non-charged wires may be attached to steel posts by use of manufacturer's clips, or by two turns of 14 gauge galvanized smooth wire.

- Wire should be able to move freely between the fastener and the line posts.

- If stays are used, wires will be attached to stays in a manner that prevents stay slippage along the fence.

D. Ground

- All electric fences must be properly grounded. The energizer ground wire should be connected to a galvanized pipe or rod 1/2 inch or larger in diameter. Bury 3 feet of ground rod for each joule of energy output. Ground rods should be buried where soil remains moist for best results. Drive sufficient 6 ft. to 8 ft. rods into the ground at least 10 feet 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 separate ground with the same size and depth requirement.

- More ground rods may be needed for system to function properly.

- Do not use the grounding system for other existing applications, such as power poles, breaker boxes, and milk barns. Separate the fence grounding system from any other grounding system by at least 25 feet.

E. Lightning Protection

- Install external lightning arrestors.

- Place lightning arrestor grounding rods at least 65 feet from those of the energizer.

- Use at least one more ground rod on the arrestor than was used on the energizer. Attach the lightning arrestor to the wires of the fence. Install a lightning choke in the fence line immediately between the lightning arrestor and the energizer. The lightning arrestor ground must be better than the energizer ground for it to function properly, because lightning will seek the least resistant route to ground.
• A spark gap may be used in lieu of a lightning arrestor. A spark gap is a small gap between a hot wire and a ground wire. Set the gap slightly beyond the point that electricity normally sparks.

F. Surge or Spike Protector

• For protection of 110- or 220-volt energizers, install a surge protector between the energizer and power supply.

G. Insulated Wire

• To cross gates and areas where electrical shocks to humans and livestock should be prevented (e.g., working facilities, watering facilities), use insulated galvanized wire. For underground burial, use wire designed for burial. Placing buried wire inside plastic pipe helps to decrease the incidence of short-circuiting. Install so water does not stand in the conduit pipe. When overhead transmission is used, height should be sufficient for movement of livestock and/or equipment. Do not use insulated copper wire due to corrosion at the splice and lack of tensile strength.

H. 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.

• The number of wires shall be determined by the fence objective. Overhead or underground transmission lines will be used to carry electricity past the gate to the remainder of the fence.

I. Floodgates

• An electrified floodgate may be used instead of a non-electrified floodgate. The electrified floodgate is constructed by stretching an electrified wire across the drainage above high water flow level. Attach droppers of 12.5 gauge high tensile fence wire, galvanized cable, galvanized 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 floodgate controller. If flooding is expected to last for an extended period, switch the floodgate off.
TEMPORARY ELECTRIC FENCE

Use temporary fence to divide permanent pastures, not for perimeter fence.

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.

Install the number of wires at the appropriate spacing from the ground to control the animal of interest. See Table 1 for suggested spacing.

Use posts that are good insulators and easy to move. Space posts to maintain the appropriate fence height.

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.
NOTES:
- Steel posts can be used instead of wood line posts. See Georgia Fence Standard – Code 382 for specifications.
- Refer to Fence Standard – Code 382 for material and construction details.
- Drawings are not to scale.