

**NATURAL RESOURCES CONSERVATION SERVICE
NEW JERSEY
CONSERVATION PRACTICE STANDARD**

FENCE

(Ft.)

CODE 382

DEFINITION

A constructed barrier to animals or people.

PURPOSE

This practice facilitates the accomplishment of conservation objectives by providing a means to control movement of animals and people, including vehicles.

CONDITIONS WHERE PRACTICE APPLIES

This practice may be applied on any area where management of animal or human movement is needed.

CRITERIA

General Criteria Applicable to All Purposes

Fencing materials, type and design of fence installed shall be of a high quality and durability. The type and design of fence installed will meet the management objectives and site challenges. Based on need, fences may be permanent, portable, or temporary.

Fences shall be positioned to facilitate management requirements. Ingress/egress features such as gates and cattle guards shall be planned. The fence design and installation should have the life expectancy appropriate for management objectives and shall follow all federal, state and local laws and regulations.

Height, size, spacing and type of materials used will provide the desired control, life expectancy, and management of animals and people of concern.

Manufacturer's guidelines shall be adhered to during installation and meet the minimum construction specifications of each type of fence to ensure proper component assembly.

CONSIDERATIONS

Consider livestock management, handling, watering, and feeding when locating fences.

Consider the purpose for which the fence is to be used, as well as the habits and type of livestock and wildlife.

Consider the design and location of the fence, and whether it may adversely affect wildlife movement. Avoid clearing of vegetation during the nesting season for migratory birds.

Fences across gullies, canyons or streams may require special bracing, designs or approaches.

Fence construction requiring the removal of existing unusable fence should provide for the proper disposal of scrap materials to prevent harm to animals, people and equipment.

Consider installing fencing only in locations that will allow flexibility to facilitate land management activities such as nutrient application, pest control, forage harvest and other appropriate practices.

Consider installing fences in locations that will facilitate maintenance, avoiding when possible highly irregular terrain and/or water crossings.

Consider soil erosion potential when planning and constructing a fence on steep slopes.

Follow all manufacturer's safety precautions for handling and installing fencing materials. Place warning signs on electric fences every 150 to 200 feet, or wherever the public is expected to encounter the fence.

Wire should be attached to the side of the posts that will receive the greatest pressure from animals. Wire will be placed on the outside of posts on curves.

Consider installing fence across slopes to improve grazing distribution, rainfall infiltration, and reduce soil erosion.

PLANS AND SPECIFICATIONS

Plans and specifications are to be prepared for specific sites based on this standard.

Plans and specifications for installing fences shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve all of its intended purposes.

The following specifications will be documented in the fencing design, conservation plan or supporting narrative:

- Type of fence
- Strands of fence
- Type and size of fence posts
- Spacing of fence posts
- Length of fence
- Operations and maintenance practices

OPERATION AND MAINTENANCE

Regular inspection of fences should be part of an ongoing maintenance program. Inspection of fences after storm events is necessary to insure the continued proper function of the fence. Maintenance and repairs will be performed as needed to facilitate the intended operation of the installed fence. Periodically check and repair bare, eroding areas along sloping fencelines.

Electric fences need to be regularly checked to determine the voltage on the fence. Clear brush and other debris from fence lines to reduce voltage loss.

Remove and properly discard all broken fencing material and hardware. All necessary precautions should be taken to ensure the safety of construction and maintenance crews.

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TABLE 1: Critical Confinement/Exclusion Livestock Fences: Recommendations for Fence Type, Height and Strand Spacing ^{1/}

Type of Livestock	Type of Fence				
	Non-Electric High Tensile Smooth Wire	Woven Wire	Barbed Wire	Wooden Board	Electric High Tensile Smooth Wire
Horses and Foals	<p>Minimum of 6 strands - spaced at 10, 20, 30, 40, 50, and 60 inches above the ground. To increase visibility of the fence, substitute one or more strands of vinyl coated wire or high tensile vinyl tape for the smooth wire.</p> <p>See note 3, below.</p>	<p>Minimum of 48 inches high - 5 horizontal wires woven, plus at least one additional electrified smooth wire at the top. Alternatively, a wooden rail (board) plus an electrified smooth wire may be added at the top of the woven wire to prevent horses from stretching the fence.</p>	<p>Not recommended.</p>	<p>Minimum of 3 and a maximum of 4 boards. Boards spaced on 16-inch centers, bottom board at approximately 16 inches above the ground.</p> <p>3-board fence - top board at 48 inches above the ground</p> <p>4-board fence – top board at 64 inches above the ground.</p>	<p>Horses only (no foals) - Minimum of 3 strands - spaced at 30, 40 and 50 inches above the ground.</p> <p>With Foals - Minimum of 5 strands - spaced at 10, 20, 30, 40, and 50 inches above the ground.</p> <p>To increase fence visibility, substitute one or more strands of vinyl coated wire or high tensile vinyl tape for the smooth wire.</p> <p>See note 3, below.</p>
Beef – Steers, Cows and Calves	<p>Minimum of 6 strands - spaced at 10, 18, 26, 36, and 46 inches above the ground.</p>	<p>Minimum of 48 inches high - 5 horizontal wires woven, plus at least one additional wire (either barbed or electrified smooth) at the top. Put the first additional wire, if barbed, no more than 3 inches above the top of the woven wire.</p>	<p>Minimum of 3 strands - spaced at 10 to 17 inches, 20 to 27 inches, and 32 to 38 inches above the ground.</p>	<p>Not recommended.</p>	<p>Minimum of 3 strands (all electrified) – spaced at 18, 30, and 42 inches above the ground.</p> <p>Or a minimum of 4 strands (only 2 electrified) - spaced at 10, 22, 34, and 46 inches above the ground.</p>
Dairy Cows and Heifers	<p>Minimum of 6 strands - spaced at 10, 18, 26, 36, and 46 inches above the ground.</p>	<p>Minimum of 48 inches high - 5 horizontal wires woven plus at least one additional wire (either barbed or electrified smooth) at the top. Put the first additional wire, if barbed, no more than 3 inches above the top of the woven wire.</p>	<p>Minimum of 3 strands - spaced at 10 to 17 inches, 20 to 27 inches, and 32 to 38 inches above the ground.</p>	<p>Not recommended.</p>	<p>Dairy Cows only - Minimum 2 strands (2 electrified), spaced at 20 and 34 inches above the ground.</p> <p>With Heifers – Minimum of 3 strands (2 electrified), spaced at 18, 30, and 42 inches above the ground.</p>

TABLE 1: Critical Confinement/Exclusion Livestock Fences: Recommendations for Fence Type, Height and Strand Spacing ^{1/}

Type of Livestock	Type of Fence				
	Non-Electric High Tensile Smooth Wire	Woven Wire	Barbed Wire	Wooden Board	Electric High Tensile Smooth Wire
Goats and Kids	See Note 2, below.	Minimum of 40 inches high - 5 horizontal wires woven, plus at least one additional wire (either barbed or electrified smooth) at the top. Put the first additional wire, if barbed, no more than 3 inches above the top of the woven wire.	Minimum of 4 strands - spaced at 10, 16, 22, and 36 inches above the ground.	Not recommended.	Minimum of 5 strands (at least 2 electrified) - spaced at 6, 12, 20, 28 and 36 inches above the ground. Or a minimum of 4 strands, if all are electrified.
Sheep and Lambs	See Note 2, below.	Minimum of 40 inches high - 5 horizontal wires woven, plus at least one additional wire (either barbed or electrified smooth) at the top. Put the first additional wire, if barbed, no more than 3 inches above the top of the woven wire.	Minimum of 4 strands - spaced at 10, 16, 22, and 36 inches above the ground.	Not recommended.	Minimum of 5 strands (at least 2 electrified) - spaced at 6, 12, 20, 28 and 36 inches above the ground. Or a minimum of 4 strands, if all are electrified.
Hogs	Not recommended.	Minimum of 35 inches high - 5 horizontal wires woven, plus one additional wire (either barbed or electrified smooth) at the bottom.	Not recommended.	Not recommended.	Minimum of 5 strands (at least 2 electrified) - spaced at 6, 12, 20, 28 and 36 inches above the ground.

TABLE 1 NOTES:

- ^{1/} Based on the type of livestock, use the information in this table only as a guide to determine the number of strands and spacing. Adjustments to the number of strands and spacing may be made based on the fence manufacturer's recommendations and landowner preference for critical confinement/exclusion fences.
- ^{2/} Non-electric high tensile fence is not recommended for these animals unless: (a) there are electric fences elsewhere on the farm and, as a result, the animals are trained to avoid wire fences, or (b) the fence will be used for non-critical confinement/exclusion.
- ^{3/} High tensile fencing is not recommended unless (a) measures are taken to increase visibility, or (b) special considerations deem this fence type to be the only fencing option.

TABLE 2: Non-Critical Confinement/Exclusion Livestock Fence: Recommendations for the Number of Strands and Spacing (Electric Fence)	
Type of Livestock	Recommended Number of Strands and Spacing ^{1/}
Mature Horses	Minimum of 1 strand – spaced at 28 to 34 inches above the ground.
Horses and Foals	Minimum of 2 strands – spaced at 17 to 22 inches, and 32 to 38 inches above the ground.
Cows and Calves	Minimum of 2 strands – spaced at 17 to 22 inches, and 32 to 38 inches above the ground.
Mature Beef and Dairy Cattle	Minimum of 1 strand – spaced at 28 to 34 inches above the ground. For hard to hold animals, use: Minimum of 3 strands – spaced at 10 to 17 inches, 20 to 27 inches, and 32 to 38 inches above the ground.
Goats and Kids	Minimum of 2 strands – spaced at 14 inches and 30 inches above the ground. For kids, an additional wire may be needed and the bottom wire should be set at 10 inches above the ground.
Sheep and Lambs	Minimum of 2 strands – spaced at 14 inches and 30 inches above the ground. Minimum of 3 strands for lambs – spaced at 8, 20 and 32 inches above the ground.
Hogs	Minimum of 2 strands – spaced at 10 inches and 18 inches above the ground for sows and growing-finishing pigs, or spaced at 6 inches and 18 inches above the ground for nursing pigs.

TABLE 2 NOTE:

^{1/} Electric fence materials for non-critical confinement may consist of high tensile smooth wire, electroplastic twine (polywire), electrified ribbon, or other materials as specified by the manufacturer. Based on the type of livestock, use the information in this table as a guide to determine the number of strands and spacing. Adjustments to the number of strands and spacing may be made based on the fence manufacturer's recommendations and landowner preference for non-critical confinement/exclusion fences.

**TABLE 3: Non-Electric High Tensile Smooth Wire, Woven Wire, and Barbed Wire Fences
for Critical Confinement/Exclusion**

Non-electric high tensile smooth wire, woven wire, and barbed wire fences are suitable for applications where a high level of confinement is needed, such as near roads and on property lines.

Wire – All wire shall be new ASTM Class 3 galvanized or aluminum-coated material. For optimum strength of fencing, attach the wire to the side of the fence that will receive the greatest pressure from animals. Place wire on the outside of posts on curves and corners.

The type of wire, number of wires, spacing, and minimum height of fence is based on the type of livestock to be confined. See Table 1 for details.

Fence wire shall consist of one of the following materials:

- 1. High tensile smooth** – Wires shall be 12½-gauge minimum with at least 180,000 PSI tensile strength and at least 1,300 pounds breaking strength.

Wire shall be tight enough that it does not sag. Tension shall be set with in-line wire strainers and/or tension indicator springs.

Tension springs are recommended for use in the top one to two strands in areas where the fence is near trees or where animal pressure will be heavy. Tension springs may also be used for all strands.

Wrap and twist wires or use crimping sleeves on end and gate posts.

In flood prone areas, use no more than six strands of non-electrified high tensile wire. There is a greater possibility of flood damage if more strands are used.

- 2. Woven wire** – Woven wire shall have a minimum 12½-gauge top and bottom wire with minimum 12½-gauge wire in between. High tensile woven wire may be used.

Install the fencing so that the bottom wire is at ground level to exclude predators. If predators are not a concern, the bottom wire can be installed at 3 inches above ground level to facilitate maintenance. Add at least one additional wire (either barbed or electrified smooth) above the top of the woven wire. The first additional wire, if barbed, shall be no more than 3 inches above the top of the woven wire. This reduces the possibility that livestock will put their heads through the gap and push down on the woven wire fence.

Woven wire is not recommended for use in flood prone areas.

- 3. Barbed wire** – Standard barbed wire shall be double-strand, a minimum 12½-gauge with 4-point barbs spaced no more than 6 inches apart, or 15½-gauge for high tensile barbed wire.

Barbed wire may be used in flood prone areas, but it is more subject to flood damage than high tensile smooth wire fence.

Barbed wire shall not be used for horses.

TABLE 3: Non-Electric High Tensile Smooth Wire, Woven Wire, and Barbed Wire Fences for Critical Confinement/Exclusion

Line Posts – Shall be either wooden or steel, and shall meet the following criteria for type of material, size, and spacing:

- 1. Wooden posts** – Shall be well seasoned or kiln-dried to minimize warping. Use untreated durable posts of species such as red cedar, black locust or osage-orange with bark removed, or non-durable wood that is preservative pressure treated. Do not use red pine.

Wooden posts shall be at least 4 inches in diameter, or 4 inches square.

Wooden line posts must be of sufficient length to hold up the fence fabric while allowing the post to be set in the ground to a minimum depth of 2½ feet. When set in depressions or low places, line posts shall be anchored in the ground or set at an angle to prevent lifting.

Where posts cannot be set to the specified depth, they must be set in concrete to secure them. Set posts in a hole that is at least 12 inches deep, with a diameter that is at least three times the diameter of the post. (For example, a 4-inch diameter post shall have a minimum 12-inch diameter hole filled and set with concrete.) Concrete shall be of a Portland type mix and sloped at the top to provide positive drainage away from the post. Fence wire shall not be attached to posts until at least 5 days after setting the posts in concrete. Other methods for securing posts at less than the required depth may be used with prior approval from NRCS.

- 2. Steel posts** – Shall be studded or punched "T", "U", or "Y" shaped with anchor plates, with a minimum weight of 1.3 lbs. per foot (excluding the anchor plate). Posts shall be either galvanized or painted. Galvanized posts shall be hot-dipped with at least 2 ounces of zinc coating per square foot. Painted posts shall be clean of loose scale with one or more coats of weather resistant paint applied.

Steel line posts shall be at least 5 feet long, and driven into the ground to the top of the anchor plate.

Where extra strength and support for the fence is needed, use a wooden post instead of steel for every third or fourth line post.

- 3. Spacing** – For non-electric high tensile fencing, line posts shall be spaced a maximum of 16 feet apart on center. When battens are used, the maximum line post spacing is 30 feet on center with battens installed at 10 and 20 feet. For conventional woven wire fences, the maximum line post spacing is 10 feet. If high tensile woven wire is used, the maximum line post spacing shall be 20 feet or as based on the manufacturer's recommendation. For barbed wire fences, the maximum line post spacing is 16 feet.

Line posts must be placed closer together on curves to prevent wire tension from moving the posts. Mark the location of the fence line by placing small stakes every 16 feet around the curve. Determine where the curve is greatest, and then start figuring post spacing. The sharper the curve, the closer the posts need to be.

To determine line post spacing for high tensile and barbed wire fences, select three stakes at the point of maximum curvature. String a line from the first to the third stake. Measure the distance from the center stake to the string and space the posts as shown below. Lean posts outward on the curve approximately 2 inches off vertical at the top. Posts will straighten as the wire is tightened.

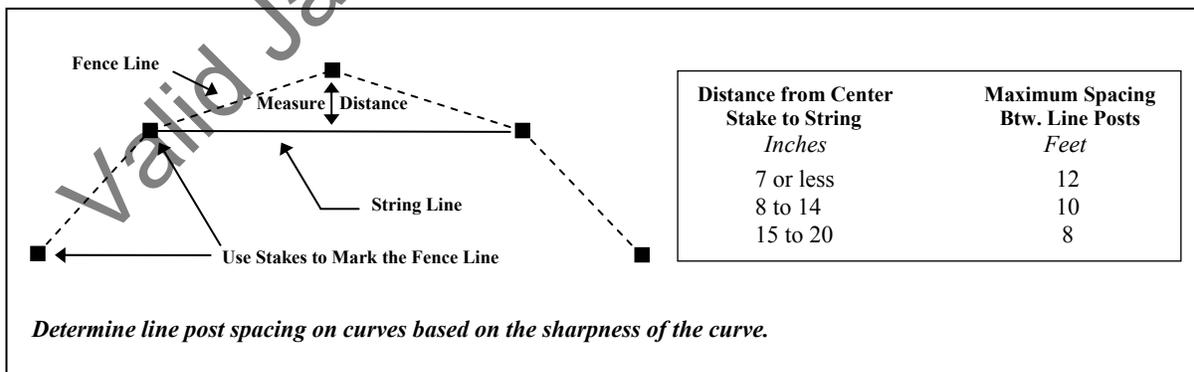


TABLE 3: Non-Electric High Tensile Smooth Wire, Woven Wire, and Barbed Wire Fences for Critical Confinement/Exclusion

Battens – If battens are used, distances between line posts in high tensile fences can be increased (see Spacing, previous page). Battens shall be 1¼-inch x 1¼-inch x 3½ feet long, self-insulating pressure treated softwood, slotted hardwood, light duty fiberglass, or other NRCS approved material. Standard "T", "U", or "Y" shaped steel posts with anchor plates may be used in place of battens.

Spacing between battens shall be 10 feet maximum for non-electric high tensile wire.

Corner, End, Gate and Brace Posts – Shall be meet the following criteria for type of material and size:

1. **Wooden posts** – Shall be well seasoned or kiln-dried to minimize warping. Use untreated durable posts of species such as red cedar, black locust or osage-orange with bark removed, or non-durable wood that is preservative pressure treated. Do not use red pine.

2. **Size** – Corner, end, and gate posts shall be at least 6 inches in diameter, or 6 inches square. Brace posts shall be at least 5 inches in diameter.

Posts shall be of sufficient length to hold up the fence fabric while allowing the post to be set in the ground to a minimum depth of 3½ feet. Where posts cannot be set to the specified depth, they must be set in concrete to secure them. Set posts in a hole that is at least 24 inches deep, with a diameter that is at least three times the diameter of the post. (For example, a 6-inch diameter post shall have a minimum 18-inch diameter hole filled and set with concrete.) Concrete shall be of a Portland type mix and sloped at the top to provide positive drainage away from the post. Fence wire shall not be attached to posts until at least 5 days after setting the posts in concrete. Other methods for securing posts at less than the required depth may be used with prior approval from NRCS.

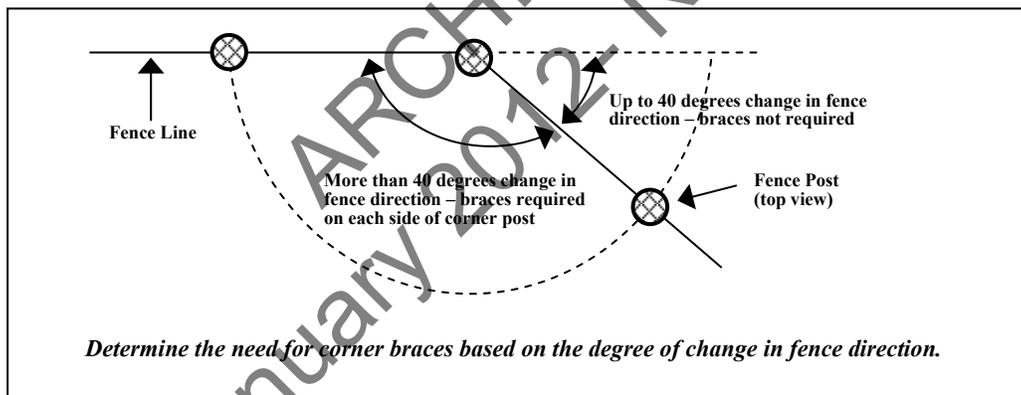
3. **Spacing** – Brace posts shall be set a minimum of 7 and a maximum of 10 feet from each corner, end, or gate post. Brace assemblies shall be installed as described in the next section of this table.

Brace Assemblies – **Single span or double span brace assemblies** are required at all corners, ends, and gates, and where the fence alignment changes direction by more than 40 degrees (see diagram, next page). **Line brace assemblies** shall also be installed at appropriate intervals in a run of fence and at all sharp breaks in grade. A **run** is the distance between a corner, end, or gate post and the next corner, end, or gate post. Types and maximum intervals for bracing shall be as shown below.

Type of Fence	Run of Fence between Corner, End, and/or Gate Posts	Type of Brace Assembly Needed at Corner, End, and/or Gate Posts	Line Brace Assembly Interval in the Run of Fence
High-tensile non-electric	Less than 700 feet.	Single span brace.	Line braces are not required at fixed intervals for this run of fence. Use as needed at top and bottom of hills.
	700 to 1,300 feet.	Double span brace.	Line braces are not required at fixed intervals for this run of fence. Use as needed at top and bottom of hills.
	More than 1,300 feet.	Depends on the spacing of line braces used in the run of fence. Use a single span brace if the distance to the line brace is less than 700 feet. Use a double span brace if the distance to the line brace is 700 to 1,300 feet.	At least one every 1,300 feet in the run of the fence, and as needed on the tops and bottoms of hills.

TABLE 3: Non-Electric High Tensile Smooth Wire, Woven Wire, and Barbed Wire Fences for Critical Confinement/Exclusion

Type of Fence	Run of Fence between Corner, End, and/or Gate Posts	Type of Brace Assembly Needed at Corner, End, and/or Gate Posts	Line Brace Assembly Interval in the Run of Fence
Woven wire or barbed wire	Less than 300 feet.	Single span brace.	Line braces are not required at fixed intervals for this run of fence. Use as needed at top and bottom of hills.
	300 to 700 feet.	Double span brace.	Line braces are not required at fixed intervals for this run of fence. Use as needed at top and bottom of hills.
	More than 700 feet.	Depends on the spacing of line braces used in the run of fence. Use a single span brace if the distance to the line brace is less than 300 feet. Use a double span brace if the distance to the line brace is 300 to 700 feet.	At least one every 700 feet in the run of the fence, and as needed on the tops and bottoms of hills.



Horizontal brace rails shall consist of one of the following materials:

- Galvanized steel pipe** – Minimum 7 feet long, 2-inch diameter, with minimum wall thickness as specified for a water supply pipe;
- Wooden post** – Minimum 7 feet long, 4-inch square or 3½-inch diameter round.

Brace post pins shall be steel rods a minimum of 3/8-inch x 9-inch and 3/8-inch x 4-inch.

Brace wires shall consist of 12½ gauge or stronger, galvanized, high tensile wire, double wrapped with a 1½-inch x 2-inch x 2-foot twist stick. A double wire with a tightener may also be used. Brace wires shall be tightened to secure the brace and post assemblies.

If a wide stream or gully is to be crossed, the fence section shall be terminated on one bank with a brace assembly and a new section started on the other bank.

TABLE 3: Non-Electric High Tensile Smooth Wire, Woven Wire, and Barbed Wire Fences for Critical Confinement/Exclusion

Fasteners – For wood posts, use minimum 9-gauge galvanized wire staples to attach wire to the posts. Staples shall be a minimum of 1¼ inches long for softwood and a minimum of 1 inch long for hardwood such as black locust. Staples shall be driven diagonally across the wood grain to avoid splitting. For high tensile fencing material, the staples shall not be driven into the posts (including line, corner, end, gate and brace posts) so deeply that the wire will not move when tightened or with expansion and contraction.

For steel line posts, attach wires by wrapping with 12½ to 14-gauge galvanized wire or by use of the manufacturer's specially designed clips.

Grounding Rods – Non-electrified metal fences shall be grounded at least every 1,000 feet to protect livestock from lightning strikes. Fences built with metal posts set in earth will provide sufficient lightning protection, and do not require additional grounding.

TABLE 4: Wooden Board Fence for Critical Confinement/Exclusion

Board fences are suitable for applications where a high level of confinement or exclusion is needed, such as near roads and on property lines.

Wooden boards (horizontal rails) and posts shall be well seasoned or kiln-dried to minimize warping. Use untreated durable wood of such species as red cedar, black locust, oak, or osage-orange, or a non-durable wood that is preservative pressure treated. For optimum strength of fencing, attach the boards to the side of the fence that will receive the greatest pressure from animals. Where appearance is important, the boards may be placed on the outside of the fence.

The number of boards, board spacing, and minimum height of fence is based on the type of livestock to be confined. See Table 1 for details.

Posts – Shall meet the following criteria for size, installation, and spacing:

- Size** – Line posts shall be at least 4 inches in diameter or 4 inches square, be of sufficient length to support the height of the fence, and be firmly set or driven in the ground a minimum of 2½ feet.

Corner, gate and end posts shall be at least 6 inches in diameter or 6 inches square, be of sufficient length to support the height of the fence, and be firmly set or driven in the ground a minimum of 3 feet.

Where posts cannot be set to the specified depth, they must be set in concrete to secure them. Set posts in a hole that is at least 24 inches deep, with a diameter that is at least three times the diameter of the post. (For example, a 6-inch diameter post shall have a minimum 18-inch diameter hole filled and set with concrete.) Concrete shall be of a Portland type mix and sloped at the top to provide positive drainage away from the post. Fence rails shall not be attached to posts until at least 5 days after setting the posts in concrete. Other methods for securing posts at less than the required depth may be used with prior NRCS approval.

- Spacing** – Posts shall be spaced a maximum of 8 feet on center to accommodate rail lengths of a maximum of 16 feet.

Rails – The rails (horizontal boards) shall be a nominal minimum of 1-inch thick x 6 inches wide.. Board lengths of 16 feet are preferred so as to stagger the unions when placed on posts on 8-foot centers.

Nails – Each board shall be attached to the post with a minimum of two 12d (3 1/4-inch) galvanized nails. For better holding power, use ring-shank or screw-shank instead of common nails. Two 3-inch decking screws may be used instead of nails.

TABLE 5: Chain Link Fence for Critical Confinement/Exclusion

Chain link fences are suitable for applications where a high level of confinement or exclusion is needed, such as near roads and on property lines, or adjacent to hazardous areas.

Chain Link Wire Fabric – Shall be a minimum 5 feet high, 9-gauge wire with a minimum tensile strength of 1,290 lbs. Chain link fence fabric shall conform to the requirements of ASTM A 392, "Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric," 2-inch woven mesh, and 9-gauge galvanized steel wire. Zinc coating shall be Class 2 (i.e., 2 ounces of zinc coating per square foot).

Steel Pipes – Posts and fence framework shall conform to the requirements of ASTM F 669, "Specification for Strength Requirements of Metal Posts and Rails for Industrial Chain Link Fence," Group 1A (Schedule 40); ASTM F 1043 "Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework," Group 1A; and ASTM F 1083, "Standard Specification for Pipe, Steel, Hot Dipped Zinc Coated (Galvanized) Welded, for Fence Structures," as applicable. Coatings shall be Type A galvanized for both internal and external surfaces.

1. **Top rail and gate frames** – Shall be a minimum 1 5/8-inch Outside Diameter standard (Schedule 40) steel pipe;
2. **Line posts** – Shall be a minimum 2-inch Outside Diameter standard (Schedule 40) steel pipe, be of sufficient length to support the height of the fence, and be set in concrete to a minimum depth of 12 inches;
3. **Corner, gate, and end posts** – Shall be a minimum 2 3/8-inch Outside Diameter standard (Schedule 40) steel pipe, be of sufficient length to support the height of the fence, and be set in concrete to a minimum depth of 12 inches and a width at least 3 times the diameter of the pipe.

Fittings and Gates – Fence fittings shall conform to the requirements of ASTM F 626, "Standard Specification for Fence Fittings." Fittings shall be galvanized steel. Wire ties and clips shall be 9-gauge.

Gates, gate posts and gate accessories shall conform to the requirements of ASTM F 900, "Standard Specification for Industrial and Commercial Swing Gates." Coating shall be the same as selected for adjoining fence and framework.

Installation – Unless otherwise specified by the manufacturer, line posts shall be set at intervals not exceeding 10 feet, as measured from center to center of each post.

All posts shall be capped immediately after installation.

Chain link fabric is generally installed on the outside of the fence post. The fabric shall not be attached to posts until at least 3 days after the posts are set in concrete walls, or at least 5 days after posts are set in the ground with concrete backfill. The fabric shall be stretched taut and securely fastened, using 9-gauge tie clips, to posts at intervals not exceeding 15 inches and to top rails or tension wires at intervals not exceeding 2 feet. Care shall be taken to equalize the tension on each side of each post.

Gate frames shall be fabricated and hung so that they sag no more than 1% of the gate width.

TABLE 6: Electric High Tensile for Critical Confinement/Exclusion Fences and Non-Critical Confinement/Exclusion (or Divisional) Fences

Electric high tensile fencing is suitable for applications where a high level of confinement is needed, such as near roads and on property lines. It may also be used for interior or divisional fences to divide large pasture acreage into manageable units, to divide the paddocks of intensive grazing systems, or for other non-critical applications.

Wire – All wire shall be ASTM Class 3 galvanized, 12 ½ gauge minimum and at least 140,000 PSI tensile strength and at least 1,000 pounds breaking strength for critical confinement and 17 gauge minimum for non-critical confinement. For optimum strength of fencing, attach the wire to the side of the fence that will receive the greatest pressure from animals. Place wire on the outside of posts on curves and corners.

Wire shall be tight enough that it does not sag. Tension shall be set with in-line wire strainers and/or tension indicator springs.

Tension springs are recommended for use in the top one to two strands in areas where the fence is near trees or where animal pressure will be heavy. Tension springs may also be used for all strands.

Wrap and twist wires or use crimping sleeves on end and gate posts. At self-insulating corner posts, wrap and twist a separate wire to form an 18 to 20-inch loop to support fence strands or a wrap-around insulator may be used. Wire clips used to hold wire in batten slots should allow the wire to slide freely.

The number of wires and spacing is based on the type of livestock to be confined and the purpose and location of the fence. See Tables 1 and 2 for details. In flood prone areas, use no more than six strands of high tensile wire. There is a greater possibility of flood damage if more strands are used.

Line Posts – Shall be either wooden or steel, and shall meet the following criteria for type of material, size, and spacing:

1. **Wooden posts** – Shall be well seasoned or kiln-dried to minimize warping. Use untreated durable posts of species such as red cedar, black locust or osage-orange with bark removed, or non-durable wood that is preservative pressure treated. Do not use red pine. Wooden posts shall be at least 4 inches in diameter, or 4 inches square.

Wooden line posts must be of sufficient length to hold up the fence fabric while allowing the post to be set in the ground to a minimum depth of 2½ feet. When set in depressions or low places, line posts shall be anchored in the ground or set at an angle to prevent lifting.

Where posts cannot be set to the specified depth, they must be set in concrete to secure them. Set posts in a hole that is at least 24 inches deep, with a diameter that is at least three times the diameter of the post. (For example, a 4-inch diameter post shall have a minimum 12-inch diameter hole filled and set with concrete.) Concrete shall be of a Portland type mix and sloped at the top to provide positive drainage away from the post. Fence wire shall not be attached to posts until at least 5 days after setting the posts in concrete. Other methods for securing a post at less than the required depth may be used with prior approval from NRCS.

2. **Steel posts** – Shall be studded or punched "T", "U", or "Y" shaped with anchor plates, with a minimum weight of 1.3 lbs. per foot (excluding the anchor plate). Posts shall be either galvanized or painted. Galvanized posts shall be hot-dipped with at least 2 ounces of zinc coating per square foot. Painted posts shall be clean of loose scale with one or more coats of weather resistant paint applied.

Steel line posts shall be at least 5 feet long, and driven into the ground to the top of the anchor plate.

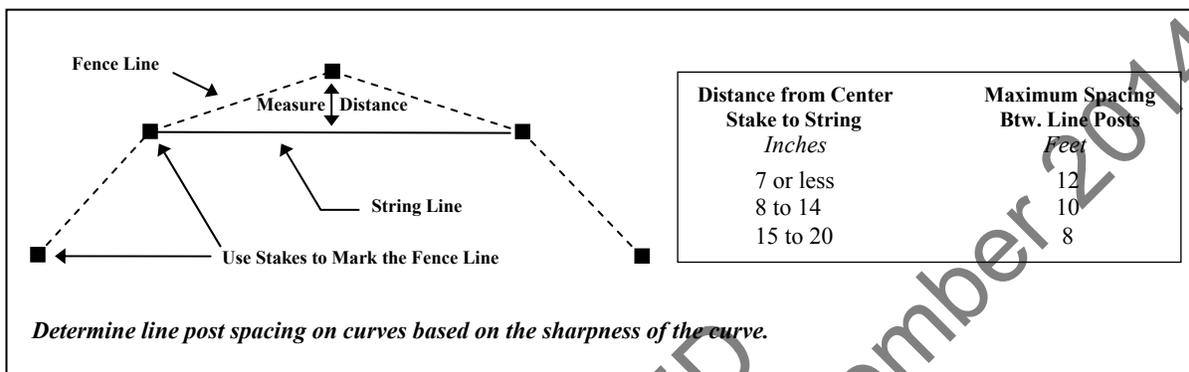
Where extra strength and support for the fence is needed, use a wooden post instead of steel for every third or fourth line post.

3. **Spacing** – Line posts shall be spaced a maximum of 60 feet apart, on center, on smooth, level terrain, or maximum of 90 feet with battens installed at 30 and 60 feet. Reduce the spacing between posts on uneven ground or rolling terrain, and to maintain spacing of the bottom wire above the ground.

TABLE 6: Electric High Tensile for Critical Confinement/Exclusion Fences and Non-Critical Confinement/Exclusion (or Divisional) Fences

Line posts must be placed closer together on curves to prevent wire tension from moving the posts. Mark the location of the fence line by placing small stakes every 16 feet around the curve. Determine where the curve is greatest, and then start figuring post spacing. The sharper the curve, the closer the posts need to be.

Select three stakes at the point of maximum curvature. String a line from the first to the third stake. Measure the distance from the center stake to the string and space the posts as shown below. Lean posts outward on the curve approximately 2 inches off vertical at the top. Posts will straighten as the wire is tightened.



Battens – If battens are used, distances between line posts can be increased by 30 feet. Battens shall be 1¼-inch x 1¼-inch x 3½ feet long, self-insulating pressure treated softwood, slotted hardwood, light duty fiberglass, or other NRCS approved material. .

Spacing between battens will be 30 feet maximum.

For a one-strand fence, use 4-foot (minimum height) wood or insulated steel posts instead of battens.

Corner, End, Gate and Brace Posts – Shall be meet the following criteria for type of material and size:

- 1. Wooden posts** – Shall be well seasoned or kiln-dried to minimize warping. Use untreated durable posts of species such as red cedar, black locust or osage-orange with bark removed, or non-durable wood that is preservative pressure treated. Do not use red pine.
- 2. Size** – Corner, end, and gate posts shall be at least 6 inches in diameter, or 6 inches square. Brace posts shall be at least 5 inches in diameter.

Posts shall be of sufficient length to hold up the fence wires while allowing the post to be set in the ground to a minimum depth of 3½ feet. Where posts cannot be set to the specified depth, they must be set in concrete to secure them. Set posts in a hole that is at least 24 inches deep, with a diameter that is at least three times the diameter of the post. (For example, a 6-inch diameter post shall have a minimum 18-inch diameter hole filled and set with concrete.) Concrete shall be of a Portland type mix and sloped at the top to provide positive drainage away from the post. Fence wire shall not be attached to posts until at least 5 days after setting the posts in concrete. Other methods for securing posts at less than the required depth may be used with prior approval from NRCS.

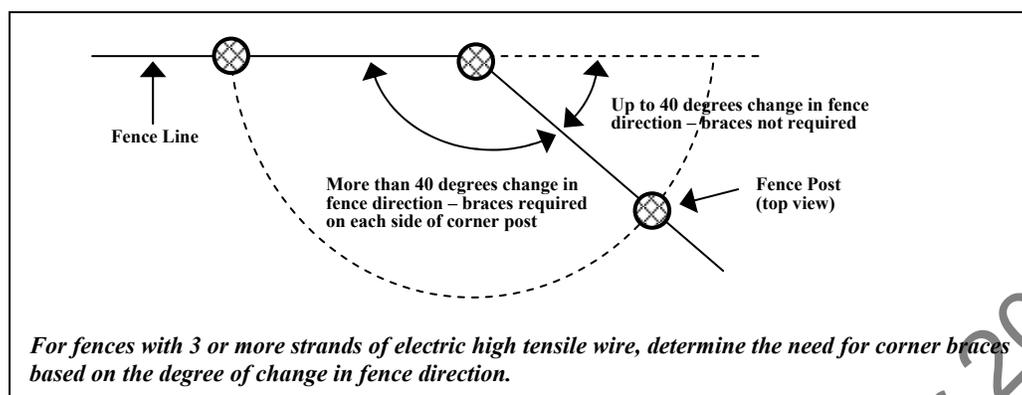
- 3. Spacing** – Brace posts shall be set a minimum of 7 and a maximum of 10 feet from each corner, end, or gate post. Brace assemblies shall be installed as described in the next section of this table.

TABLE 6: Electric High Tensile for Critical Confinement/Exclusion Fences and Non-Critical Confinement/Exclusion (or Divisional) Fences

Brace Assemblies – For fences with 3 or more strands of high tensile wire, **single span or double span brace assemblies** are required at all corners, ends, and gates, and where the fence alignment changes direction by more than 40 degrees (see diagram, next page). **Line brace assemblies** shall also be installed at appropriate intervals in a run of fence and at all sharp breaks in grade. A *run* is the distance between a corner, end, or gate post and the next corner, end, or gate post. Types and maximum intervals for bracing shall be as shown below. For fences with fewer than 3 strands, braces are not required if alternatives to braces (such as closer line post spacing and angled end posts) will provide sufficient support for the fence.

Type of Fence	Run of Fence between Corner, End, and/or Gate Posts	Type of Brace Assembly Needed at Corner, End, and/or Gate Posts	Line Brace Assembly Interval in the Run of Fence
High-tensile electric, <i>5 or more strands</i> .	Less than 700 feet.	Single span brace.	Line braces are not required at fixed intervals for this run of fence. Use as needed at top and bottom of hills.
	700 to 1,300 feet.	Double span brace.	Line braces are not required at fixed intervals for this run of fence. Use as needed at top and bottom of hills.
	More than 1,300 feet.	Depends on the spacing of line braces used in the run of fence. Use a single span brace if the distance to the line brace is less than 700 feet. Use a double span brace if the distance to the line brace is 700 to 1,300 feet.	At least one every 1,300 feet in the run of the fence, and as needed on the tops and bottoms of hills.
High-tensile electric, <i>3 or 4 strands</i> .	Less than 1,300 feet.	Single span brace.	Line braces are not required at fixed intervals for this run of fence. Use as needed at top and bottom of hills.
	1,300 to 1,700 feet.	Double span brace.	Line braces are not required at fixed intervals for this run of fence. Use as needed at top and bottom of hills.
	More than 1,700 feet.	Depends on the spacing of line braces used in the run of fence. Use a single span brace if the distance to the line brace is less than 1,300 feet. Use a double span brace if the distance to the line brace is 1,300 to 1,700 feet.	At least one every 1,700 feet in the run of the fence, and as needed on the tops and bottoms of hills.

TABLE 6: Electric High Tensile for Critical Confinement/Exclusion Fences and Non-Critical Confinement/Exclusion (or Divisional) Fences



Horizontal brace rails shall consist of one of the following materials:

1. **Galvanized steel pipe** – Minimum 7 feet long, 2-inch diameter, with minimum wall thickness as specified for a water supply pipe;
2. **Wooden post** – Minimum 7 feet long, 4-inch square or 3½-inch diameter round.

Brace post pins shall be steel rods a minimum of 3/8-inch x 9-inch and 3/8-inch x 4-inch.

Brace wires shall consist of 12½ gauge or stronger, galvanized, high tensile wire, double wrapped with a 1½-inch x 2-inch x 2-foot twist stick. A double wire with a tightener may also be used. Brace wires shall be tightened to secure the brace assemblies.

If a wide stream or gully is to be crossed, the fence section shall be terminated on one bank with a brace assembly and a new section started on the other bank.

Fasteners – For wood posts, use minimum 9-gauge galvanized wire staples to attach wire to the posts. Staples shall be a minimum of 1¼ inches long for softwood and a minimum of 1 inch long for hardwood such as black locust. Staples shall be driven diagonally across the wood grain to avoid splitting. Staples shall not be driven into the post so deeply (including line, corner, end, gate and brace post) that the wire will not move when tightened or with expansion and contraction.

For steel line posts, attach wires by wrapping with 12½ to 14-gauge galvanized wire or by use of the manufacturer's specially designed clips.

All electrified wires must be properly insulated as specified by the fence manufacturer.

Electrical Fence Charger – The electric fence charger (energizer) must have adequate voltage to effectively electrify the system and maintain output to control the type of animals, based on the manufacturer's recommendations.

The charger shall be low impedance, UL approved or equivalent, and shall include all of the safety features that are required by the manufacturer.

Insulators – If needed, these shall be UV stabilized (plastic) high density polypropylene Type W or type S, high strain end and corner tube insulator, or high strain porcelain corner Type O. Insulators shall be strong enough to support long spans of wire and must allow the wire to slide freely. Insulators shall be used on all posts that are not self-insulating. Do not use aluminum nails or screws on treated posts.

Grounding Rods – Rods shall meet or exceed the requirements of the manufacturer of the electrical fence charger, and shall be installed as per the manufacturer's recommendations.

**TABLE 7: Electroplastic Twine (Polywire) and Electrified Ribbon
for Non-Critical Confinement/Exclusion (or Interior) Fences**

Electrified twine and/or ribbon type fencing may be used as interior (cross) fencing to divide large pasture acreage into manageable units, to divide the paddocks of intensive grazing systems or similar applications. Electrified twine (polywire) or ribbon type fencing shall not be used in applications where a high level of confinement is needed.

Wire – Shall consist of new materials free of manufacturing or other defects. Polywire shall have a minimum of seven stainless steel strands running through the fabric.

The number of wires and spacing is based on the type of animal to be confined. See Table 2 for details.

Line Posts – Shall be manufactured fiberglass, plastic, or other suitable material as approved by NRCS. Posts shall be at least 4 feet long, set deep enough in the ground to withstand livestock. "Step-in" posts designed for this purpose may be used.

Line posts shall be installed on a spacing as specified by the manufacturer to control specific livestock. Closer spacing shall be used as topographic conditions indicate.

Corner and End Posts – When posts are needed at the end or corner of a cross fence, they may be untreated durable wood (red cedar or black locust), or pressure treated softwood with a diameter sufficient to anchor the wire. Posts must be long enough to allow them to be set at least 1½ feet in the ground.

Fasteners – The fence shall be fastened and insulated from line and end posts by using supplies provided by the manufacturer of the fence material.

Electrical Fence Charger – The electric fence charger (energizer) must have adequate voltage to effectively electrify the system and maintain output to control the type of animals, based on the manufacturer's recommendations.

The charger shall be low impedance, UL approved or equivalent, and shall include all of the safety features that are required by the manufacturer.

Grounding Rods – Rods shall meet or exceed the requirements of the manufacturer of the electrical fence charger, and shall be installed as per the manufacturer's recommendations.

TABLE 8: Summary of Fence Types and Selected Materials ^{1/}

Type of Fence	Fence Materials and Installation Requirements							
	Wire Quality	Line Post Type	Line Post Size	Line Post Spacing	Corner, End, Gate, and Brace Post Type	Corner, End, & Gate Post Size	Brace Post Size	Brace Intervals
Non-Electric High Tensile Smooth Wire	ASTM Class 3 galvanized, min. 12½-gauge, 180,000 PSI, 1,300 lbs. breaking strength.	Untreated durable wood (e.g., red cedar, black locust) with bark removed, or Non-durable wood that is preservative pressure treated or Heavy duty steel "T", "U", or "Y" posts, galvanized or painted, with anchor plates.	<u>Wooden posts:</u> min. 4 inches diameter or 4 inches square. Set in ground to min. depth of 2½ feet. (See Note 2 at the end of this table.) <u>Steel posts:</u> min. 5 feet long. Drive into the ground to the top of the anchor plate.	Max. 30 feet apart on center if spacers or battens are used at 10-foot intervals. Otherwise, max. spacing at 16 feet apart, on center.	Untreated durable wood (e.g., red cedar, black locust) with bark removed, or Non-durable wood that is preservative pressure treated	Min. 6 inches diameter or 6 inches square Set in ground to min. depth of 3½ feet. (See Note 2 at the end of this table.)	Min. 5 inches diameter. Set in ground to min. depth of 3½ feet. (See Note 2 at the end of this table.)	<u>Single span braces:</u> use when the run of fence is less than 700 feet between corner, end, and/or gate posts. <u>Double span braces:</u> use when the run of fence is 700-1,300 feet between corner, end, and/or gate posts. Use <u>line braces</u> at tops and bottoms of hills, and to divide fence lengths where runs of fence are more than 1,300 feet long.
Woven Wire	ASTM Class 3 galvanized, min. 12½-gauge top and bottom wire with 12½-gauge wire in between.	Same as above.	Same as above.	Max. 10 feet apart, on center, for standard wire. Max 20 feet apart, on center, if high tensile wire.	Same as above.	Same as above.	Same as above.	<u>Single span braces:</u> use when the run of fence is less than 300 feet between corner, end, and/or gate posts. <u>Double span braces:</u> use when the run of fence is 300-700 feet between corner, end, and/or gate posts. Use <u>line braces</u> at tops and bottoms of hills, and to divide fence lengths where runs of fence are more than 700 feet long.

TABLE 8: Summary of Fence Types and Selected Materials ^{1/}

Type of Fence	Fence Materials and Installation Requirements							
	Wire Quality	Line Post Type	Line Post Size	Line Post Spacing	Corner, End, Gate, and Brace Post Type	Corner, End, & Gate Post Size	Brace Post Size	Brace Intervals
Barbed Wire	ASTM Class 3 galvanized, double-strand, min. 12½-gauge with 4-point barbs spaced no more than 6 inches apart, or 15½-gauge for high tensile.	Untreated durable wood (e.g., red cedar, black locust) with bark removed, or Non-durable wood that is preservative pressure treated or Heavy duty steel "T", "U", or "Y" posts, galvanized or painted, with anchor plates.	Wooden posts: min. 4 inches diameter or 4 inches square. Set in ground to min. depth of 2½ feet. (See Note 2 at the end of this table.) Steel posts: min. 5 feet long. Drive into the ground to the top of the anchor plate.	Max. 16 feet apart, on center.	Untreated durable wood (e.g., red cedar, black locust) with bark removed, or Non-durable wood that is preservative pressure treated	Min. 6 inches diameter or 6 inches square Set in ground to min. depth of 3½ feet. (See Note 2 at the end of this table.)	Min. 5 inches diameter. Set in ground to min. depth of 3½ feet. (See Note 2 at the end of this table.)	<u>Single span braces:</u> use when the run of fence is less than 300 feet between corner, end, and/or gate posts. <u>Double span braces:</u> use when the run of fence is 300-700 feet between corner, end, and/or gate posts. Use <u>line braces</u> at tops and bottoms of hills, and to divide fence lengths where runs of fence are more than 700 feet long.
Wooden Board	Wood rails – use well seasoned or kiln-dried wood to minimize warping. Rails are min. 1-inch thick x 6 inches wide, and at least 8 feet long.	Untreated durable wood (e.g., red cedar, black locust) with bark removed, or Non-durable wood that is preservative pressure treated, or Heavy duty steel "T", "U", or "Y" posts, galvanized or painted, with anchor plates.	Wooden posts min. 4 inches diameter or 4 inches square. Length sufficient to support desired height of fence and be set in the ground a min. of 2½ feet deep. (See Note 2 at the end of this table.)	Max. 8 feet apart, on center.	Untreated durable wood (e.g., red cedar, black locust) with bark removed, or Non-durable wood that is preservative pressure treated	Wooden posts min. 6 inches diameter or 6 inches square. Length sufficient to support desired height of fence and be set in ground to min. depth of 3 feet. (See Note 2 at the end of this table.)	Not applicable.	Not applicable.

TABLE 8: Summary of Fence Types and Selected Materials ^{1/}

Type of Fence	Fence Materials and Installation Requirements							
	Wire Quality	Line Post Type	Line Post Size	Line Post Spacing	Corner, End, Gate, and Brace Post Type	Corner, End, & Gate Post Size	Brace Post Size	Brace Intervals
Chain Link	Min. 9-gauge galvanized wire with 2 ounces of zinc coating per sq. ft. Minimum tensile strength of 1,290 lbs., 2-inch woven mesh.	Steel post, galvanized with 2 ounces of zinc coating per sq. ft., or painted.	Min. 2-inch Outside Diameter standard (Schedule 40) steel pipe. Length sufficient to support desired height of fence and be set in concrete a min. of 12 inches deep.	Max. 10 feet apart, on center.	Steel post, galvanized with 2 ounces of zinc coating per sq. ft., or painted.	Min. 2 3/8-inch Outside Diameter standard (Schedule 40) steel pipe. Length sufficient to support the height of the fence and be set in concrete a min. of 12 inches deep.	Not applicable.	Not applicable.
Electric High Tensile Smooth Wire <i>(5 strands or more)</i>	ASTM Class 3 galvanized, min. 12½-gauge 140,000 PSI, 1,000 lbs. breaking strength.	Untreated durable wood (e.g., red cedar, black locust) with bark removed, or Non-durable wood that is preservative pressure treated, or Heavy duty steel "T", "U", or "Y" posts, galvanized or painted, with anchor plates.	<u>Wooden posts:</u> min. 4 inches diameter or 4 inches square. Set in ground to min. depth of 2½ feet. (See Note 2, below.) <u>Steel posts:</u> min. 5 feet long. Drive into the ground to the top of the anchor plate.	Max. 60 feet apart, on center, or Max. 90 feet apart, on center, with battens installed at 30 and 60 feet.	Untreated durable wood (e.g., red cedar, black locust) with bark removed, or Non-durable wood that is preservative pressure treated	Min. 8 feet long, min. 6 inches diameter or 6 inches square. Set in ground to min. depth of 3½ feet. (See Note 2, below.)	Min. 8 feet long, min. 5 inches diameter. Set in ground to min. depth of 3½ feet. (See Note 2, below.)	<u>Single span braces:</u> use when the run of fence is less than 700 feet between corner, end, and/or gate posts. <u>Double span braces:</u> use when the run of fence is 700-1,300 feet between corner, end, and/or gate posts. Use <u>line braces</u> at tops and bottoms of hills, and to divide fence lengths where runs of fence are more than 1,300 feet long.

TABLE 8: Summary of Fence Types and Selected Materials ^{1/}

Type of Fence	Fence Materials and Installation Requirements							
	Wire Quality	Line Post Type	Line Post Size	Line Post Spacing	Corner, End, Gate, and Brace Post Type	Corner, End, & Gate Post Size	Brace Post Size	Brace Intervals
Electric High Tensile Smooth Wire <i>(4 strands or fewer)</i>	ASTM Class 3 galvanized, min. 12½-gauge 140,000 PSI, 1,000 lbs. breaking strength.	Untreated durable wood (e.g., red cedar, black locust) with bark removed, or Non-durable wood that is preservative pressure treated or Heavy duty steel "T", "U", or "Y" posts, galvanized or painted, with anchor plates.	<u>Wooden posts:</u> min. 4 inches diameter or 4 inches square. Set in ground to min. depth of 2½ feet. (See Note 2, below.) <u>Steel posts:</u> min. 5 feet long. Drive into the ground to the top of the anchor plate.	Max. 60 feet apart, on center, or Max. 90 feet apart, on center, with battens installed at 30 and 60 feet.	Untreated durable wood (e.g., red cedar, black locust) with bark removed, or Non-durable wood that is preservative pressure treated	Min. 8 feet long, min. 6 inches diameter or 6 inches square. Set in ground to min. depth of 3½ feet. (See Note 2, below.)	Min. 8 feet long, min. 5 inches diameter. Set in ground to min. depth of 3½ feet. (See Note 2, below.)	<i>3 or 4 strand fences:</i> <u>Single span braces:</u> use when the run of fence is less than 1,300 feet between corner, end, and/or gate posts. <u>Double span braces:</u> use when the run of fence is 1,300-1,700 feet between corner, end, and/or gate posts. Use <u>line braces</u> at tops and bottoms of hills, and to divide fence lengths where runs of fence are more than 1,700 feet long.

TABLE 8 NOTES:

- ^{1/} This table briefly summarizes some of the major components and installation requirements for each fence type. Refer to Tables 1 – 7 for more detailed criteria.
- ^{2/} Where posts cannot be set to the specified depth, they must be set in concrete to secure them. Set posts in a hole that is at least 12 inches deep, with a diameter that is at least three times the diameter of the post. (For example, a 4-inch diameter post shall have a minimum 12-inch diameter hole filled and set with concrete.) Concrete shall be of a Portland type mix and sloped at the top to provide positive drainage away from the post.