

# Fence

## Electric Fence

### Conservation Practice Job Sheet

RI-382(c)



#### Definition

A constructed barrier to livestock, wildlife, or people.

#### Purpose

This job sheet is provided as a component of a resource conservation plan. This practice may be applied to contain and control livestock and wildlife movement, facilitate a prescribed grazing system, protect sensitive areas from grazing livestock, and to eliminate access to unsafe areas.

#### Conditions where Practice Applies

This practice may be used on any area where a fence is needed to control access, movement

and containment of livestock and wildlife and where people safety and movement is of concern.

Conservation plan maps showing the approximate fence location, complementary conservation practices, grazing schedule, other relevant information, and additional specifications may be included.

#### General Criteria and Specifications

All fence construction shall comply with federal, state and local fencing codes. Practice Lifespan is 20 years.

#### Fence line clearing

Fence lines will be cleared of brush and trees; gullies and steep banks may require grading. Clearing along stream banks will be held to a minimum and no vegetation may be removed within the buffer area, except as required for stream crossings.

Fencing materials shall be of a quality and durability that meets the intended management objectives. Construction shall be performed in a manner that meets the intended management objective. Wire and hardware will be new, galvanized material.

#### Energizers

Energizers for permanent electric fencing must be UL or CSA approved and manufactured for the purpose of agricultural fencing. It is recommended that the energizer have a fence charge meter. Use only one charger per fence.

Ground rods shall be 6 to 8 feet long x 1/2"-5/8" galvanized steel rod or galvanized pipe set 10 feet apart, and driven to no more than 6" above ground. The number of ground rods needed is based on a minimum of 3 feet of ground rod per joule of energizer output capacity. However, in dryer soils, more rods are advisable.

A properly grounded lightning arrester and a “lightning choke” shall be installed to protect the energizer from lightning striking. A voltage spike protector is also recommended.

#### Gates

Only new materials may be used for gates. All non-electrified gates must be substantial enough to withstand expected pressures from livestock and wildlife.

Electrified perimeter fence gates may consist of a pair of 12-½ gauge straight or coiled wires installed to be non-electrified when opened.

12-½ gauge overhead or insulated underground transmission lines will be used to carry electricity across all gate openings (including electrified gates) to charge the remainder of the fence.

### **Permanent Fence Installation with 3 or More Strands of HT Wire**

#### Line post (Wood)

Line post may be placed 50 feet or less apart with stays placed at 25 foot spacing or line post may be placed 30 feet apart without stays.

#### Suitable line posts: (Wood)

3½” in diameter wooden posts of black locust, red cedar (mostly heartwood), redwood, and pressure treated pine or other wood of equal life and strength. Pressure treatment shall meet the requirements for ground contact. All wooden line posts shall be set at least 30” into the ground.

#### Suitable Stays: (Wood or fiberglass)

Stays (Battens): Fiberglass stays shall be ½” in diameter. Wood stays shall be 1½” x 1½” of non-conductive wood. Stay length shall be sufficient to support all fence wires while maintaining correct wire spacing. All stays shall be non-metallic, and shall be secured to wires to maintain stay spacing. Stays will be placed every 25 feet if posts are 50 feet apart.

#### Brace post

Posts shall be set and maintained in a vertical position. All wooden brace posts are to be 6” min. diameter and set three feet into the ground. Horizontal brace rails are to be 4” min. diameter by 8 feet long and be installed 8”- 12” below the top of the vertical brace post.

Corners and braces: Refer to drawings on pages 8 through 10 for fence brace configurations and spacing.

Single H braces: Single H Brace corners and end braces may only be installed at the ends of straight fence spans of 660 feet or less.

Double H braces: All corners, fence line ends and gate openings require Double H Brace assemblies, except that Single H Braces may be substituted in straight fence spans of 660 feet or less.

Double H brace pull assemblies: In-Line Double H Brace Pull Assemblies are required as wire-pull breaks in straight fence spans longer than 1320 feet. Spans between braces should be shorter over undulating or soft ground. Pull assemblies should be evenly spaced along the fence span. Fence wires must terminate from the farthest brace post in each direction as shown on the drawings.

Gates: Each gate must be hung from an opposing brace assembly.

Adjoining fences: A fence adjoining an existing fence must terminate in a brace assembly as required above.

Corners: A bend in the fence tighter than 20 degrees is considered a corner and not a “straight” pull brace. (In an 8-foot long brace section, 20 degrees is approx. 3 feet off the straight line. Refer to drawings). The above H brace rules apply to corners considering each wire-pull direction from the corner post. Combination single and double H corners are permitted.

If hand set, all backfilled material shall be thoroughly tamped in 4” layers. Post holes shall be at least 6” larger than the diameter or side dimension of the posts. Synthetic posts are to be installed as specified by the manufacturer.

If concrete backfill is used, the concrete must be pre-mixed and worked into place up to the ground surface. No stress shall be applied to posts set in concrete for at least 24 hours after the concrete has set.

#### Wire

Fence wire shall be 12-½ gauge, 130,000 PSI tensile strength minimum, with Class 3 galvanizing meeting ASTM A854. At least 2 wires will be “hot”.

Underground and other insulated wires shall be 12-½ gauge galvanized wire with bonded, high-density, ultra-violet stabilized polyethylene or polypropylene insulation. Do not use aluminum wire.

**Y kg'lor horses**, conductive polymer coated high tensile wire, electrified rope-type or other safety fencing may be used if approved by an NRCS Resource Conservationist. Such fencing materials can usually be used with the wood post and bracing methods in this job sheet, and must be installed according to manufacturer’s instructions as approved. All strands should be electrified.

#### Wire tension

In-line wire tensioners (strainers) will be used on each pull of each wire. Each fence wire shall be maintained at a tension of 200 pounds for large livestock. This is the tension required to compress the tensioning springs. For smaller animals, use 300 pounds for sheep and hair goats, and 400 pounds where wild animal pressure is likely. Use galvanized fence springs on the wires where there is a threat from trees or excessive animal pressure.

#### Attaching fencing to post

Wires will be attached to line posts by a method that allows them to slip. Stays will be attached to wires in a manner that prevents stay slippage along the fence. Splicing of high tensile wire will be accomplished by double-crimped sleeves or “figure 8 knots”. High tensile wire is tied off using donut insulators and secured using the “thread through method” (a half hitch and 3 wraps) or with double-crimped sleeves.

The recommended method of suspending fence wires from corner posts is with ceramic donut-type insulators. A length of high tensile wire is fastened around the groove in the insulator, then looped around the post and double stapled on the opposite side (see illustration). The ends of the loop are fastened the same as the fencing. Tubular plastic insulators may be used. Where a wire wraps around a corner post, the

tube insulator must be equipped with an internal metal strip to prevent damage to the plastic. All insulators must be rated for use with high tensile fence.

All wires must be electrified. These wires shall be placed on the livestock side of line posts and on the outside of corners and posts in bends and braces in bends, or suspended from the inside of corner posts using ceramic donuts as above.

Insulators for end, corner, and angle braces must be porcelain or high-density, ultra-violet stabilized polyethylene or polypropylene.

#### Wire placement

All wires are to be spaced according to **Table 1** located at end of job sheet.

#### Stays or battens (Wood or fiberglass)

Stays (Battens): Fiberglass stays shall be ½” in diameter. Wood stays shall be 1½” x 1½” of non-conductive wood. Stay length shall be sufficient to support all fence wires while maintaining correct wire spacing. All stays shall be non-metallic, and shall be secured to wires to maintain stay spacing. Stays will be placed every 25 feet if posts are 50 feet apart.

#### **Temporary or Portable Fencing with 1 or 2 Strands of HT Wire, Polywire or Polytape**

Absolute containment is not an important factor when using this type fencing. This fencing is intended for use in rotational grazing systems for subdividing pastures to enhance grazing efficiency, livestock movement, and afford temporary stream and riparian protection.

#### Wire

All wire(s) will be “hot”. A variety of synthetic braided fence with non-corrosive metal conductors may be used. The material must be UV protected and durable enough to last for the designed life of the project. Fence material options include:

- Twine-type with at least 8 conductor filaments of aluminum or stainless steel

- Tape-type ½” wide min. with at least 5 conductor filaments of aluminum or stainless steel

- 12 ½ gauge galvanized steel

- 12 ½ gauge anodized aluminum

The conductive fence wire must be electrically connected in a sound manner to a charged wire on the perimeter fence or directly to an appropriate, UL approved fence charger.

#### Line post

All line posts must be insulated and may be any type of durable “step-in-ground” portable posts. Metal T posts may be used with proper insulators. Only all new materials are allowed in this fence.

#### Post spacing

Maximum post spacing for all types of portable fence material is 25 feet. Conditions, terrain, and livestock may require closer post spacing to maintain proper wire heights and spacing.

#### Corners and braces

Any pull-posts at corners, gates and ends, if needed, should be stout, permanent-type fence posts that are insulated and stiff enough to support the fence. These posts should be set at least 30” into the ground.

#### Other considerations

Fences across gullies or streams require special braces and design. Breakaway fences or swinging water gaps allow debris and water to flow past the fence line without destroying the adjacent fence.

Any permanent fencing for grazing livestock should allow flexibility to facilitate implementation of the grazing plan and permit land management activities such as nutrient application, pest control, forage harvest, and other appropriate practices.

Follow all manufacturers' safety precautions for handling and installing fencing materials.

Locate fences to facilitate maintenance. Where applicable, clear right of ways should be established and maintained to facilitate fence construction and maintenance.

When possible, install fences across slopes to improve grazing distribution, rainfall infiltration and reduce soil erosion.

Locate fences to facilitate livestock management, handling, watering and feeding.

Consider placing riparian stream fencing at the edge of the protected buffer or at least 2 times the active channel width from the top of the stream bank but never less than 10 feet. It is recommended that the stream fence have a maintenance gate installed.

Approved alternative fence systems include "Common Sense Fence" or other equivalent fencing systems that may be approved by an NRCS Resource Conservationist (RC) and installed to manufacturer's recommendation as approved by area RC.

Alternative fencing and bracing systems must be pre-approved by an NRCS Resource Conservationist (RC) and installed according to manufacturer's recommendations as approved by RC.

## Specifications K cf\_g\ Yh

Site-specific requirements are listed on the specifications sheet. Additional provisions may be contained in the conservation plan or other acceptable form of documentation. Specifications are prepared in accordance with the NRCS Field Office Technical Guide. See Conservation Practice Standard *Fence* (382).

<b>Client: Farm</b>	<b>#:</b>
<b>Field(s): Tract</b>	<b>#:</b>
<b>Planned By:</b>	<b>Location:</b>
<b>Date:</b>	<b>Length of Fence:</b>
<b>Landowner Objectives:</b>	

<b>Purpose</b> (check all that apply)	
<input type="checkbox"/> Reduce erosion and improve water quality by controlling livestock access to streams, springs, wetlands, and ponds.	<input type="checkbox"/> Protect sensitive environmental areas and the flora from vehicular, pedestrian, or animal traffic use.
<input type="checkbox"/> Protect newly planted areas from disturbance until established.	<input type="checkbox"/> Improve distribution and timing of livestock grazing.
<input type="checkbox"/> Facilitate handling, movement, and feeding of livestock in the pasture environment.	
<input type="checkbox"/> Other (specify)	

Type of Fence - Electric
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	Type of wire	Number of strands and which are hot	Wire spacing	Fence height	Tension required
Permanent					
Temporary/portable					

Posts		
<b>Type</b> Black locust, Eastern red cedar OR pressure treated pine or other preservative treated wood	<b>Size</b> Line posts are wood 8 feet or longer 3 1/2" minimum diameter	<b>Spacing</b> Wood line posts spaced at 50 feet with stays at 25 feet OR Spaced at 30 feet w/out stays Wood post 30 inches deep minimum

Braces	
<b>Wooden Braces, Corners, Ends &amp; Gates</b> (8 feet minimum length) 6" diameter at small end Horizontal Brace Rails 8 feet by 4" diameter	<b>Brace Wire</b> High Tensile, Galvanized Steel, 9 Gauge OR 12-1/2 Gauge High Tensile, Galvanized, Double Wrapped

## Operation and Maintenance

Inspections and maintenance are required to achieve the intended function, benefits, and life of the practice. The landowner/operator is responsible to establish and implement an inspection and maintenance program. Regular inspection of fences should be part of an ongoing maintenance program. Items to inspect and maintain during the 20-year design life of the practice include, but are not limited to the following:

1. Inspection of fences after storm events is necessary to ensure the continued proper function of the fence. Promptly repair or replace damaged or broken fencing.
2. Retain and properly discard all broken fencing material and hardware to prevent ingestion by animals or injury to equipment, people, or animals.
3. Remove debris collected in the fencing.
4. Clear the brush from fence lines to reduce voltage loss. Vegetative control can be achieved by herbicides applied per the manufacturer's label.
5. Remove fallen limbs and maintain proper tension on the fence wires. Overhanging trees and limbs should be trimmed or removed as needed.
6. Maintain proper tension on the fence wires.
7. Electric fences will be regularly checked to determine the voltage on the fence. If voltage is not sufficient, determine the cause and correct.
8. During dry weather, ground rods may need water applied to soil around them.
9. Electrified floodgates must be maintained and kept clear of debris. During extended flooding periods, switch off the floodgates.
10. Follow your grazing plan, where appropriate.
11. All necessary precautions should be taken to ensure the safety of construction and maintenance crews.

### Other:

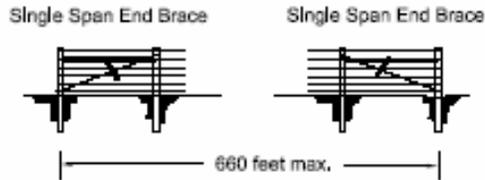
For information regarding this practice contact:

\_\_\_\_\_ at \_\_\_\_\_.

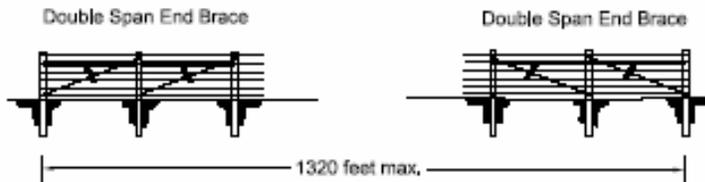
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## HIGH TENSILE SMOOTH WIRE FENCE SPACING FOR BRACE ASSEMBLIES

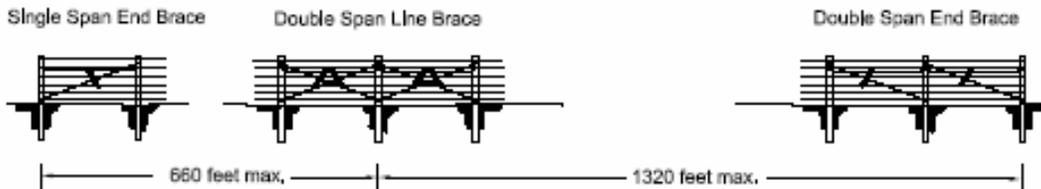
1. Use single span brace assemblies for runs of fence that are less than 660 feet between corner, end, and/or gate posts.



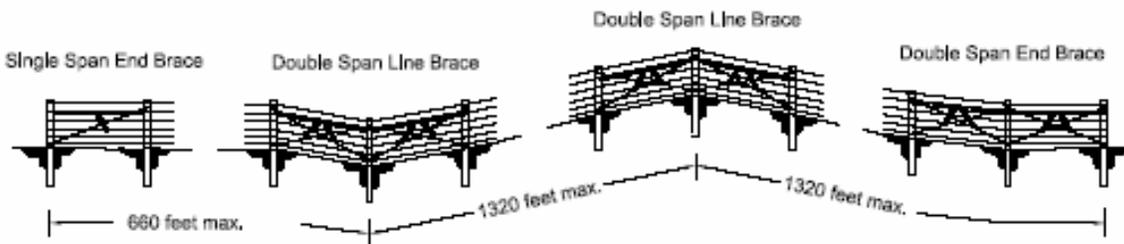
2. Use double span brace assemblies for runs of fence that are 660 to 1320 feet between corner, end, and/or gate posts.



3. Use line braces to divide fence lengths where runs of fence are more than 1320 feet long. A run is the distance between a corner, end or gate post and the next corner, end, or gate post.

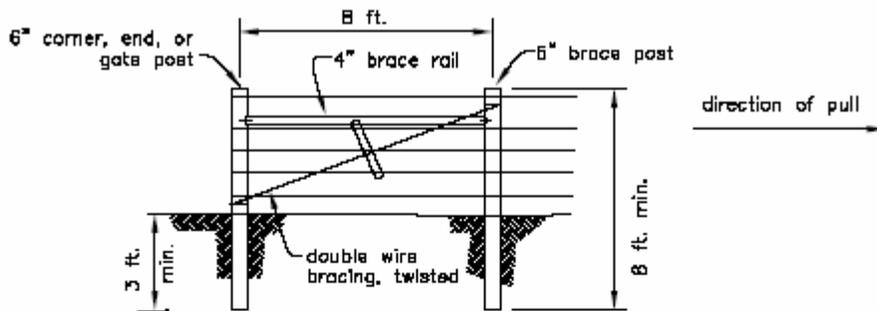


4. On uneven terrain, locate line braces at the top and bottom of each hill.

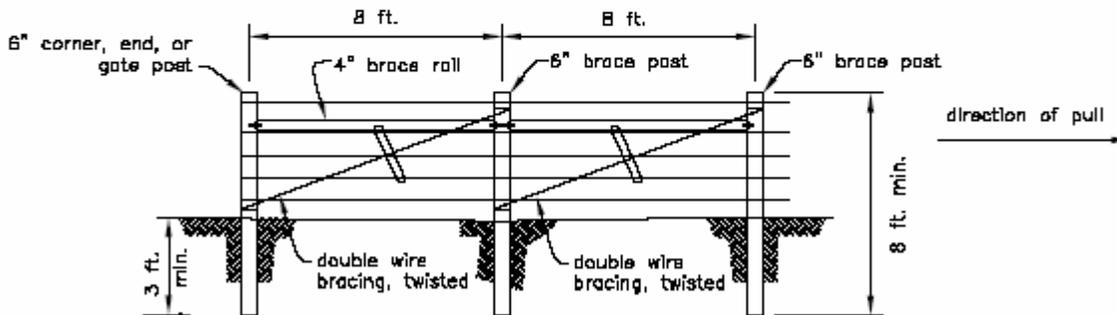


Drawing not to scale. Standardized drawing must be adapted to the specific site.

## HIGH TENSILE SMOOTH WIRE FENCE BRACES



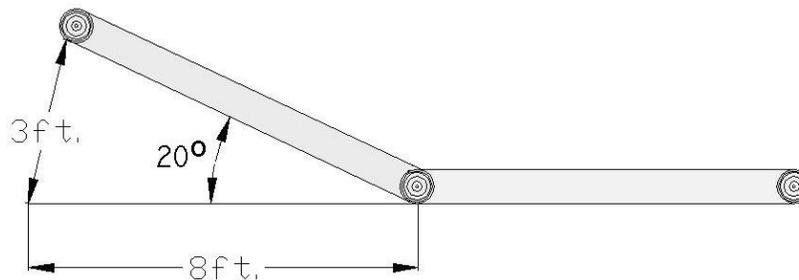
SINGLE SPAN BRACE ASSEMBLY



DOUBLE SPAN BRACE ASSEMBLY

All brace, corner, end, and gate posts: min. 6 in. diameter.

Steel horizontal brace rails min. 2 in. diameter. Wood horizontal brace rails min. 4 in. diameter.



**Top View of Fence Brace Showing Minimum Angle to be Considered a Corner**



**RI NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE STANDARD FENCE (382)**

**Table 1. Fence Selection Criteria**

Fence design and construction must meet the minimum requirements for controlling specific animal types.

Animal type to control	Fence type	Purpose of Fence				Spacing Inches above ground level <small>ww fences start 2-3 " above the ground</small>
		Perimeter (boundary prohibited areas)	Access lanes & stream crossings	Interior subdivision	Stream exclusion	
		Minimum Criteria				Inches
Cattle	Barbed 3-wire	NO	NO	Meets	Meets	18, 30, 42
Cattle	Barbed 4-wire	NO	Meets	Exceeds	Exceeds	16 to 48 evenly spaced
Cattle	Barbed 5-wire	Meets	Exceeds	Exceeds	Exceeds	14 to 48 evenly spaced
Cattle	Non-Electric 4-wire high tensile smooth			Exceeds	Meets	12 to 42 evenly spaced
Cattle	Non-Electric 6-wire high tensile smooth	No	Meets	Exceeds	Exceeds	12 to 44 evenly spaced
Cattle	Non-Electric 8-wire high tensile smooth	Meets	Exceeds	Exceeds	Exceeds	12 to 44 evenly spaced
Cattle	Electric 1-wire high tensile smooth	NO	NO	Meets	NO	32
Cattle	Electric 2-wire high tensile smooth	NO	Meets	Exceeds	Meets	20, 32
Cattle	Electric 3-wire high tensile smooth	NO	Exceeds	Exceeds	Exceeds	18, 30, 42
Cattle	Electric 4-wire high tensile smooth	Meets	Exceeds	Exceeds	Exceeds	12 to 42 evenly spaced
Cattle	Electric 5-wire high tensile smooth	Exceeds	Exceeds	Exceeds	Exceeds	12 to 44 evenly spaced
Cattle	Electric 1-wire Polywire or Polytape (1hot wire)	NO	NO	Meets	NO	32
Cattle	Electric 2-wire Polywire or Polytape (2 hot wires)	NO	Meets	Exceeds	Meets	20, 32
Cattle	Woven wire plus one or more top wire	Exceeds	Exceeds	Exceeds	Exceeds	47 min, 6 max between top wires
Cattle	Wood or Composition boards (6" wide)	Exceeds	Exceeds	Exceeds	Exceeds	6, 6, 8, 10 between boards
Cattle	HT Woven wire plus one or more top wires	Exceeds	Exceeds	Exceeds	Exceeds	47 min, 6 max between top wires
Goats & sheep	Barbed 5-wire	NO	NO	Meets	Meets	6 to 32 evenly spaced
Goats & sheep	Barbed 6-wire	NO	Meets	Exceeds	Exceeds	6 to 36 evenly spaced
Goats & sheep	Barbed 8-wire	Meets	Exceeds	Exceeds	Exceeds	6 to 48 evenly spaced
Goats & sheep	Non-Electric 5-wire high tensile smooth	NO	NO	Meets	Meets	6 to 32 evenly spaced
Goats & sheep	Non-Electric 6-wire high tensile smooth	NO	Meets	Exceeds	Exceeds	6 to 36 evenly spaced
Goats & sheep	Non-Electric 7-wire high tensile smooth	Meets	Exceeds	Exceeds	Exceeds	6 to 42 evenly spaced
Goats & sheep	Electric 3-wire high tensile smooth	NO	NO	Meets	Meets	8, 18, 30
Goats & sheep	Electric 4-wire high tensile smooth	NO	Meets	Exceeds	Exceeds	6 to 36 evenly spaced
Goats & sheep	Electric 5-wire high tensile smooth	Meets	Exceeds	Exceeds	Exceeds	6 to 38 evenly spaced
Goats & sheep	Woven wire plus one or more top wire	Exceeds	Exceeds	Exceeds	Exceeds	32 min, 6" max between top wires
Goats & sheep	Wood or Composition boards (6" wide)	Exceeds	Exceeds	Exceeds	Exceeds	6, 6, 8, 10 between boards
Goats & sheep	HT Woven wire plus one or more top wires	Exceeds	Exceeds	Exceeds	Exceeds	35 min, 6" max between top wires

Animal type to control	Fence type	Purpose of Fence				Spacing Inches above ground level ww fences start 2-3 " above the ground
		Perimeter (boundary) prohibited areas	Access lanes & stream crossings	Interior subdivision	Stream exclusion	
Minimum Criteria						Inches
Horses	Electric 2-wire high tensile smooth	NO	Meets	Meets	Meets	28, 38
Horses	Electric 3-wire high tensile smooth	NO	Exceeds	Exceeds	Exceeds	28, 38, 48
Horses	Electric 4-wire high tensile smooth	Meets	Exceeds	Exceeds	Exceeds	18 to 54 evenly spaced
Horses	Electric 5-wire high tensile smooth	Exceeds	Exceeds	Exceeds	Exceeds	18 to 54 evenly spaced
Horses	Electric 1-wire Polywire or Polytape	NO	NO	Meets	NO	34
Horses	Electric 2-wire Polywire or Polytape	NO	Meets	Meets	Meets	28, 48
Horses	Woven wire w/1 wire HT on top	Exceeds	Exceeds	Exceeds	Exceeds	48 + HT at 54
Horses	Mesh "No climb" 2"x4" spacing	Exceeds	Exceeds	Exceeds	Exceeds	48 + HT at 54"
Horses	Wood or Composition boards (6" wide)	Exceeds	Exceeds	Exceeds	Exceeds	18 min. 12 max. between boards
Hogs	Electric 2-wire high tensile smooth	NO	NO	Meets	Meets	8, 16
Hogs	Electric 3-wire high tensile smooth	NO	Meets	Exceeds	Exceeds	8, 16, 24
Hogs	Woven wire 32" w/ 1 wire barb or HT	Exceeds	Exceeds	Exceeds	Exceeds	32 + barb or HT at 38
Hogs	Woven wire 32" w/ 1 Ht electric inside	Meets	Meets	Meets	Meets	32 + 1 electric wire 8 off ground, 8 inside of fence.
Deer	Woven wire 96" tall w/2 strands of smooth wire	Meets	Meets	Meets	Meets	96" w/smooth wire at 9' and 10'
Buffalo	Electric 4-wire high tensile smooth	NO	NO	Meets	Meets	16 to 42 evenly spaced
Buffalo	Electric 5-wire high tensile smooth	NO	Meets	Exceeds	Exceeds	16 to 48 evenly spaced
Buffalo	Electric 6-wire high tensile smooth	Meets	Exceeds	Exceeds	Exceeds	12 to 52 evenly spaced
Chickens/turkey	Woven wire 2"x4" 1 wire HT or barb above	Exceeds	Exceeds	Exceeds	Exceeds	72
Emu and ostrich	Woven wire 6"x6" 1 wire HT or barb above	Exceeds	Exceeds	Exceeds	Exceeds	72
Chickens/turkey	HT Woven wire 2"x4" 1 wire HT or barb above	Exceeds	Exceeds	Exceeds	Exceeds	72
Emu and ostrich	HT Woven wire 6"x6" 1 wire HT or barb above	Exceeds	Exceeds	Exceeds	Exceeds	72
People	Chain link	Meets	Preferred option			60 with 1 barb above
People	Electric 5-wire	Meets				12 to 60 evenly spaced
People	Woven wire 47 inch plus 1 or 2 barbed wires	Meets				47 min. HT or barb at 6" spacing to 48

Alternative fencing and bracing systems may be approved by the Resource Conservationist, i.e. *common sense fence, horseguard or equivalent.*