USDA NRCS United States Department of Agriculture Natural Resources Conservation Service

Fence

Electric HT Fence

Conservation Practice Specification Sheet

RI - 382

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.

Setting Posts

Earth 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, if approved by the Resource Conservationist, are to be installed as specified by the manufacturer.

Concrete around posts if posts cannot be set to the required depth due to rock or densic layer. 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.

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 ½"-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.

Permanent Fence Installation with 3 or More Strands of HT Wire

Line posts

Maximum spacing between line posts is 50 feet with a stay at 25 feet or spacing at 30 feet with no stay. All wooden line posts shall be set at least 30 inches into the ground.

Suitable line posts:

3½" 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.
Note: Landscaping timbers should not be used for post or brace assemblies.

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.

Wire

Fence wire shall be 12½ gauge, 170,000 PSI tensile strength minimum, with Class 3 galvanizing meeting ASTM A854.

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. 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.

Wire placement

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

Attaching fencing to post

The fencing wire 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 with electric high tensile fence, with 2 loops of high tensile wire stapled around the 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.

For wooden posts, each strand of wire shall be attached to each post using 9-gauge galvanized 1½" staples driven diagonally with the grain of the wood and at a slight downward angle (except in dips).

Gates

Each gate must be hung from an opposing brace assembly. See drawings for details.

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.

Brace posts

Posts shall be set and maintained in a vertical position. All wooden brace posts are to be 6" min. diameter and set 3 feet into the ground. Horizontal brace rails are to be 4" min. diameter wooden or 2" steel by 8 feet long and be installed 8"–12" below the top of the vertical brace post.
Note: Landscaping timbers should not be used for post or brace assemblies.

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 to 1320 feet.

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.

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

Corners: Corner assemblies shall be installed at all points where the fence alignment changes 20 degrees or more. (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.
Note: Combination single and double H corners are permitted.

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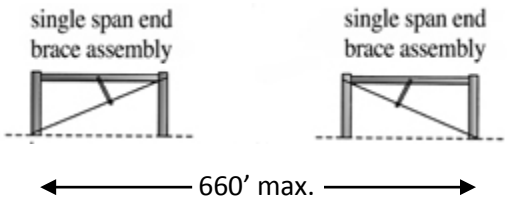
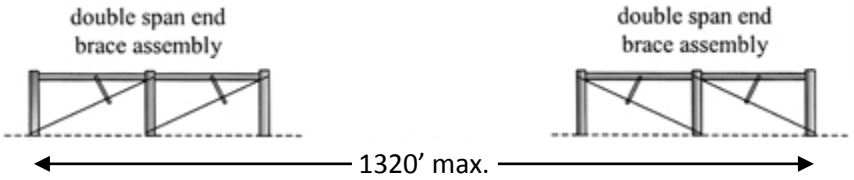
HIGH TENSILE SMOOTH WIRE FENCE SPACING FOR BRACE ASSEMBLIES

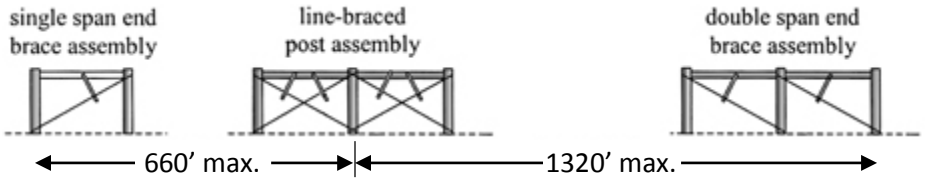
1. Use single span brace (Single H brace) assembly for runs of fence that are less than 660 feet between corner, end and/or gate posts.



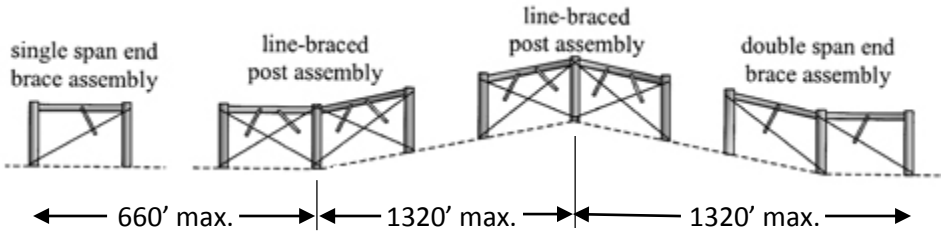
2. Use double span brace (Double H brace) assembly for runs of fence that are 660 to 1320 feet between corner, end and/or gate posts.



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.



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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.

Other considerations

Alternative fencing and bracing systems: Alternative fence systems include "Common Sense Fence" or other equivalent fencing systems. Alternative fencing and bracing systems must be pre-approved by an NRCS Resource Conservationist (RC) and installed according to manufacturer's requirements.

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 35 feet. It is recommended that the stream fence have a maintenance gate installed.

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. Follow your grazing plan, where appropriate. 8. All necessary precautions should be taken to ensure the safety of construction and maintenance crews. **Other:**

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	Line posts & Stay (maximum spacing)		
		Perimeter (boundary) prohibited areas	Access lanes & stream crossings	Interior subdivision	Stream exclusion	Perimeter with Predator Control	ww fences start 2-3 " above the ground	post w/o stay	post with stay	Stay spacing
		Minimum Criteria					Inches	Feet		
Cattle	Non-Electric 3-wire high tensile smooth	NO	Meets	Meets	Meets	NO	12 to 42 evenly spaced	50	100	25
Cattle	Non-Electric 4-wire high tensile smooth	Meets	Exceeds	Exceeds	Meets	NO	12 to 42 evenly spaced	50	100	25
Cattle	Non-Electric 5-wire high tensile smooth	Meets	Exceeds	Exceeds	Meets	NO	12 to 42 evenly spaced	50	100	25
Cattle	Non-Electric 6-wire high tensile smooth	Exceeds	Exceeds	Exceeds	Exceeds	Meets	6 to 44 evenly spaced	50	100	25
Cattle	Non-Electric 8-wire high tensile smooth	Exceeds	Exceeds	Exceeds	Exceeds	Meets	6 to 44 evenly spaced	50	100	25
Cattle	Electric 1-wire high tensile smooth	NO	NO	Meets	NO	NO	32	50	na	na
Cattle	Electric 2-wire high tensile smooth	NO	Meets	Meets	NO	NO	20, 32	50	100	25
Cattle	Electric 3-wire high tensile smooth	NO	Meets	Meets	Meets	NO	18, 30, 42	50	100	25
Cattle	Electric 4-wire high tensile smooth	Meets	Exceeds	Exceeds	Exceeds	NO	12 to 42 evenly spaced	50	100	25
Cattle	Electric 5-wire high tensile smooth	Meets	Exceeds	Exceeds	Exceeds	Meets	12 to 44 evenly spaced	50	100	25
Cattle	Electric 1-wire Polywire - temporary	NO	NO	Meets	NO	NO	32	25	na	25
Cattle	Electric 2-wire Polywire - temporary	NO	Meets	Meets	NO	NO	20, 32	25	na	25
Cattle	Electric 2-wire Polywire - semi - permanent	NO	Meets	Meets	NO	NO	20, 32	50	100	25
Goats & sheep	Non-Electric 5-wire high tensile smooth	Meets	NO	Meets	Meets	NO	6 to 32 evenly spaced	50	100	25
Goats & sheep	Non-Electric 6-wire high tensile smooth	Meets	Meets	Exceeds	Exceeds	Meets	6 to 36 evenly spaced	50	100	25
Goats & sheep	Non-Electric 7-wire high tensile smooth	Exceeds	Exceeds	Exceeds	Exceeds	Meets	6 to 42 evenly spaced	50	100	25
Goats & sheep	Electric 3-wire high tensile smooth	NO	NO	Meets	Meets	NO	8, 18, 30	50	100	25
Goats & sheep	Electric 4-wire high tensile smooth	NO	Meets	Exceeds	Exceeds	NO	6 to 36 evenly spaced	50	100	25
Goats & sheep	Electric 5-wire high tensile smooth	Meets	Exceeds	Exceeds	Exceeds	Meets	6 to 38 evenly spaced	50	100	25
Goats & sheep	Woven wire plus one or more top wire	Meets	Meets/NO	Meets	Meets	Meets	32 min, 6" max between top wires	16.5	na	na
Goats & sheep	Temporary electric netting	NO	NO	Meets	NO	NO	32 min, netting - 9" horizontal x 12"	na	na	12.5
Hogs	Electric 2-wire high tensile smooth	NO	NO	Meets	NO	NO	8, 16	20	30	15
Hogs	Electric 3-wire high tensile smooth	NO	Meets	Exceeds	Meets	NO	8, 16, 24	20	30	15
Hogs	Woven wire 32" w/ 1 HT wire	Meets	Meets/NO	Meets	Meets	Meets	32 + barb or HT at 38	16.5	na	na
Hogs	Woven wire 32" w/ 1 Ht electric inside	Meets	Meets/NO	Meets	Meets	Meets	32 + 1 electric wire 8 off ground, 8 inside of fence.	16.5	na	na

Animal type to control	Fence type	Purpose of Fence					Spacing Inches above ground level	Line posts & Stay (maximum spacing)		
		Perimeter (boundary) prohibited areas	Access lanes & stream crossings	Interior subdivision	Stream exclusion	Perimeter with Predator Control	ww fences start 2-3 " above the ground	post w/o stay	post with stay	Stay spacing
		Minimum Criteria					Inches	Feet		
Horses	Electric 2-wire high tensile smooth	NO	Meets	Meets	Meets	NO	28, 38	50	100	25
Horses	Electric 3-wire high tensile smooth	NO	Meets	Meets	Meets	NO	28, 38, 48	50	100	25
Horses	Electric 4-wire high tensile smooth	Meets	Exceeds	Exceeds	Meets	NO	18 to 54 evenly spaced	50	100	25
Horses	Electric 5-wire high tensile smooth	Exceeds	Exceeds	Exceeds	Exceeds	NO	18 to 54 evenly spaced	50	100	25
Horses	Electric 1-wire Polywire or Polytape (temp)	NO	NO	Meets	NO	NO	34	na	na	25
Horses	Electric 2-wire Polywire or Polytape (temp)	NO	Meets	Meets	Meets	NO	28, 48	na	na	25
Horses	Woven wire w/1 wire HT on top	Exceeds	Exceeds	Exceeds	Exceeds	Meets	48 + HT at 54	16.5	na	na
Horses	Wood or Composition boards (6" wide)	Meets	Meets	Meets	Meets	NO	4 boards with 5", 6", 8" and 10" spacing	8	na	na
Wildlife	Woven wire 96" tall w/2 strands of smooth HT	Meets	NO	NO	NO	Meets	6" w/smooth wire at 9' and 10'	12	na	na
Buffalo	Electric 4-wire high tensile smooth	NO	NO	Meets	Meets	NO	16 to 42 evenly spaced	30	90	15
Buffalo	Electric 5-wire high tensile smooth	NO	Meets	Exceeds	Exceeds	NO	16 to 48 evenly spaced	30	90	15
Buffalo	Electric 6-wire high tensile smooth	Meets	Exceeds	Exceeds	Exceeds	Meets	12 to 52 evenly spaced	30	90	15
Chickens/turkey	Woven wire 2"x4" 1 wire HT above	Meets	Exceeds	Exceeds	Exceeds	Meets	72	16.5	na	na
Emu and ostrich	Woven wire 6"x6" 1 wire HT above	Meets	Exceeds	Exceeds	Exceeds	Meets	72	16.5	na	na
People	Chain link	Meets	Preferred option				60 with 1 HT above	8	na	na
People	Electric 5-wire	Meets					12 to 60 evenly spaced	50	100	25
People	Woven wire 47 inch plus 1 or 2 HT wires	Meets					47 min. HT at 6" spacing to 48.	16.5	na	na

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