NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

FENCE
(Ft.)

CODE 382

MATERIALS AND CONSTRUCTION SPECIFICATIONS

INTENDED USE OF FENCE

Fences are constructed as barriers to control the movement of animals and people, including vehicles. Fences may be designed or installed as permanent or temporary use.

The type and class of livestock as well as the degree of control needed will have a specific influence in the type of fence selected to perform its intended function. The number and spacing of fence wires, the spacing of vertical stays (for woven wire fence), and the height of the fence as well as the need for an electric component to the system should all be considered in the planning process.

Permanent fencing is intended to be in place for long periods of time with minimum maintenance requirements; therefore it should be built with durable materials and constructed to endure a longer life span. Permanent fences are most often used for exterior grazing or property boundaries or where animals or humans are prohibited.

Temporary or moveable fences are designed to be in place for short periods of time. Temporary fences are best used as subdivision fences for frequent movement or control of animals and where the exact location of the fence may not be the same from time to time. This fencing offers maximum flexibility in rotational stocking systems for subdividing pastures to enhance grazing efficiency, livestock movement, and afford temporary stream and riparian protection.

Fence Type or Style

Barbed wire fence is commonly used as a multi strand permanent fencing material for perimeter fences, land use boundaries, exclusion, and livestock containment and isolation areas as well as interior cross fencing to facilitate grazing management. Barbed wire fencing is generally not recommended for horses, sheep, goats and hogs.

Woven, net and mesh wire fences are used as permanent fences for both perimeter and subdivision fences. Wire spacing and height varies depending on the type of livestock or animals being controlled.

Woven wire fences consist of a series of horizontal (line) wires and vertical (stay) wires, and are offered in two main types including “hinge joint” and “continuous stay fixed knot.”

In a hinge joint woven wire fence the vertical stays actually wrap around the line wires. In a continuous stay fixed knot fence the vertical stay wires are fixed with another separate wire to the line wire. Both of these main fence types come in various designs (line and stay spacing), tensile strength grades and metallic coating types and grades. High tensile continuous stay fixed knot woven wire 12½ gauge may be used for all animals as specified by manufacturer.

High tensile smooth wire fence is commonly used as a multi-strand permanent fence for both perimeter and subdivision purposes. It can be used to control almost all animals when properly spaced. Smooth wire may be steel, aluminum or vinyl coated and electrified or non-electrified.

Electric fences may be permanent or temporary. The electrical power source can be from 110 or 220 electrical current or battery. Batteries may be re-charged by solar or electrical power. Livestock must be trained to respect electric fence.

Board fences are usually wood or some composite material used for permanent and subdivision purposes. Board fence is used primarily where aesthetics or animal safety is of

concern and most often used around horses or for working facilities.

Other fence types may include chain link, pipe, vinyl, galvanized panel, guard rail, and cable fences. These are commonly used around homesteads and in corrals. They may be used to restrict access to unsafe or prohibited areas.

Heavy use feed area containment fencing is used to control access into and out of feed areas to minimize damage to soil and pasture around these permanent feed sites. This fencing is usually constructed of board, pipe, cable or high tensile smooth wire built to sustain heavy use by high numbers of livestock around a confined feed area.

Non-conventional fencing includes variations of alternative fence systems that may be acceptable when installed according to manufacturer's recommendations and pre-approved by an NRCS Area Resource Conservationist (ARC). Alternative fence systems are often applicable for horses and other animals having special needs.

MATERIALS SPECIFICATIONS

Acceptable fencing criteria for various fencing needs may be selected from Tables 1 and 2.

The materials used in the construction of a chosen fence type must be of high quality and meet the size, strength, durability and lifespan requirements found in this specification including Tables 3 - 9.

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

CONSTRUCTION SPECIFICATIONS

Fence-Line Clearing

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

Setting posts

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

Posts in curves should be set approximately 4" off vertical. Posts set on slopes greater than 21% may be constructed. Posts set with a driver have about 9 times the holding strength of hand-set posts. If hand set, holes should be at least 6" larger than the diameter of the posts and all backfilled material shall be thoroughly tamped in layers no thicker than 4 inches. The post hole shall be filled to the ground surface.

Concrete backfill is not necessary when posts are driven or hand set with proper tamping; however, if used it shall be rodded into place in layers not thicker than 12 inches and shall completely fill the post hole to the ground surface. No stress shall be applied to posts set in concrete for 24 hours.

Line Posts

Specifications of line posts are found in Table 4. The maximum spacing of line posts for permanent fences is found in Table 1 and will be the same for all types of posts. **Spacing will vary depending on terrain and pressure from livestock.** Installation shall ensure that adequate fence height is maintained based on its purpose.

Note: Landscaping timbers should not be used for any post or brace component of a fence system.

Installing Curves

Installing curves in high tensile, woven wire, and barbed wire fences is permissible as long as the change in direction from one post to the next does not exceed 20 degrees. Posts on curves shall be 5 inch minimum top diameter for changes up to 14 degrees and 6 inch minimum top diameter for changes up to 20 degrees. Posts on curves should be driven 48 inches deep with 4 inches of lean to the outside of the curve and spaced no closer than 4 foot apart. (In an 8-foot long section, 14 degrees is approximately 24 inches off straight line and 20 degrees is approx. 35 inches off the straight line).

Line Posts – Stream Crossing

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

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

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

Stays or battens between line posts

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

Offset Brackets

Offset brackets made of galvanized high tensile spring wire with an insulator of high density polyethylene with ultraviolet stabilizer or porcelain can be attached to standard barbed wire fence or woven wire fence to provide transmission line and /or to protect a standard fence. Other corrosion resistant offset brackets with insulators that attach directly to the fence posts can also be used.

Place offset brackets up to 60 feet apart and attach to wires of standard fence next to post. If control of animals is desired, place offset brackets at 2/3 the height of the animals to be controlled. Make sure no wires of the old fence come in contact of the electric fence wire, as a short will occur. Use offset brackets that hold the electric wire at least 4 inches from the non-electrified fence material.

Post Bracing

Bracing of anchor (pull) posts is required at all corners, gates, fence ends and at definite slope and alignment changes in the fence line. The type of fence, number of fence wires, and length of span will determine the type, size and spacing of bracing required to support a fence. See table 8.

The purpose of bracing is to withstand the forces of the fence load and transfer them to the surrounding soil. They come in a number of configurations depending on the purpose and number of posts utilized. The width of braces should be at least 2 times the height of the fence fabric they are supporting, but 2 ½ times is ideal.

See Tables 5 and 6 for selection criteria and design specifications of single and double brace assemblies.

Corner braces are required at all points where the fence alignment has a change of 20 degrees or more from one post to the next. (In an 8-foot long section, 20 degrees is approx. 35 inches off the straight line).

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

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

Single post braces may be used with 2 strand or less high tensile electrical wire fence (Table 7).

Brace Rails

Refer to Table 6 for Brace Rail Criteria and Specifications.

- Placement of the horizontal brace rail will be between the top two wires of the fence or fence fabric. This should be a minimum 3 feet above ground.
- The horizontal brace rail will be between 6 feet and 12 feet long
- The length of the horizontal brace shall be at least 2 times the height of the fence fabric it is supporting.
- The longer the brace rail the stronger the brace. **A single H brace with a 10' brace rail is strong enough to take the place of a double 8' H brace.**

- The brace post and anchor posts should be fastened to the compression brace using galvanized brace pins (1/2” X 10” and 1/2” X 4”) (drilled through vertical post and into end of horizontal brace, 2 inches deep).
- Do not notch vertical posts (wood) for stabilizing horizontal brace support as this will increase chance of wood rot.

Diagonal Floating Brace Assembly

The diagonal floating brace assembly can be substituted at corner, gate and end post H brace assemblies and in-line pull assemblies. The brace post specifications for diagonal floating brace assemblies are consistent with the specifications in Table 5.

The diagonal floating brace rail specification is found in Table 6. The brace member for the diagonal floating brace shall be installed below the top wire and be at least 2.5 times the length of the height of the top wire.

Brace blocks for the diagonal floating brace shall have a minimum of 100 square inches of top surface area and can be made of a flat rock, solid concrete block, or a paving stone.

Note: Landscaping timbers should not be used for any post or brace component of a fence system.

Adjoining Fences

A fence adjoining an existing fence must terminate in a brace assembly as required per the fence brace specifications in Table 5, 6, and 7.

Tension of Brace (Guy) Wires

For guy wires use two complete loops of 12½ gage HT wire or one loop of 9 gauge soft wire, or a single 3/16” galvanized cable with cable lock.

For horizontal braces, brace wire will be double wrapped and stapled to brace post at a height of just above the brace member and to the anchor (pull) post at a point approximately 2-3 inches above the ground level.

Brace (Guy) wire will be tightened using a wire tightener or strainer. Another suitable method is to use a twist stick of 18-24” approximately midway along brace wire to provide moderate tension and to remain in place.

INSTALLATION OF WIRE

Barbed and woven wire will be stretched to sufficient tension prior to being fastened to posts. Temperature variations must be considered (wire will tighten in cold weather and expand in hot weather). See wire specification requirements in Table 3.

Tensioning the wire

Woven Wire - In warm weather, wire shall be stretched until 1/3 of the height of the "tension curve" is removed. In cold weather, remove ½ of the tension curve. *Fixed-Knot High Tensile Woven Wire*- The tension crimp should be ½ the size of an un-tensioned crimp.

Barbed Wire - In warm weather, a 100 ft stretch of wire should sag no more than 4 inches in the middle (prior to attaching to posts) and no more than 2 inches in cold weather.

High Tensile Wire - Tension should be 200 lbs for cattle, horses and 300 lbs for goats and sheep. For electrified high tensile wire the tension should be sufficient to maintain the proper average height and spacing of the fence wires.

Tension springs

In-line wire spring-tensioners are designed to indicate lbs of tension on the line, assuming placement within the line is appropriate. On most fences the use of one tensioner per pull will provide sufficient indication of the tension on adjacent wires.

Springs offer only 3-6 inches of elasticity therefore are of little benefit when something like a tree falls on the wire.

Staples and fasteners

Staples should be installed into post to allow free slippage of wire.

Staples shall be driven diagonally across the grain of the wood and at a slight downward angle (except in dips of landscape) and shall not be driven so tightly as to bind the wire against the post.

Electrically charged smooth wires must be

attached to conductive posts with an appropriate ceramic, UV resistant HDPE (High Density Polyethylene) or HDPP (High Density Polypropylene) or tube type plastic reinforced insulators.

For steel line posts, the fencing shall be fastened with either 2 turns of 14 gauge galvanized steel wire or the post manufacturer's special wire clips. For all other types of posts, attach as specified by manufacturer.

Tie off of wire or insulators: High tensile wire is tied off using the "thread through method" (a half hitch and 3 wraps) or with compression sleeves. A length of high tensile wire is fastened around the groove of the insulator then looped around the post and stapled on opposite side of post. An alternative is the tubular plastic reinforced insulator to prevent cracking of the plastic and grounding of the wire. All insulators must be rated for use with high tensile fence.

Wire attachment to posts

Attaching Fence Wire to Anchor (Pull) Post: For **Barbed wire** fences, wires will be attached to anchor (pull) post by one complete wrap around the post, double stapled (wood posts) or wired (steel posts) and ends tightly wrapped around stretched wire five times. Compression sleeves may be used to connect ends of brace wire.

For **Woven or Mesh wire**, determine amount of wire needed to fully wrap around post once then remove enough vertical stays to provide that length. The wire ends are then attached as described in previous paragraph.

For **High Tensile** wire, the line wires are attached to each anchor post by wrapping the post and securing with a half hitch with 3 wraps, or using appropriate double crimp sleeves.

Fixed-knot woven wire fence shall be stapled to wood post or fastened to steel post at every horizontal wire using manufacturer's special wire clips.

High Tensile wire that pulls through corners or bends may be suspended from the inside of posts in corners and bends using ceramic or appropriate UV resistant HDPE or HDPP donut type plastic high strain insulators. The tubular plastic reinforced high strain insulators can wrap around the outside of bends and corner posts.

Barbed wire shall be attached at each post with 1.5 inch staples driven to allow slippage. The top wire shall be at least 2 inches below the top of posts on wood posts and at least 1 inch below the top on steel posts. Wire shall be spaced no more than 10 inches apart and often closer depending on livestock controlled.

Woven wire fencing shall be attached at a minimum to alternate horizontal strands. Staples shall allow slippage.

Post side wire placement: the wire shall be placed on the livestock side of line posts and on the outside of curves and bends. HT electric wire may be suspended from the inside of posts in corners and bends using ceramic or appropriate UV resistant HDPE or HDPP plastic donut type insulators. The tubular plastic reinforced high strain insulator can be used on the outside of corners, curves or bends.

Wire Splicing

There are four basic ways to splice wire:
1. Figure 8 knot
2. Western Union splice
3. Reef knot
4. Crimping sleeves (per manufacturer recommendation)

Barbed wire and woven wire shall be spliced by means of a western union splice or by suitable compression sleeves applied with a tool designed for the purpose.

All wires on electrical fence are recommended to have positive electrical charge

It is recommended that in VA climatic and soil environments, all wires on electrical fences should be electrified to provide the maximum electrical conductivity and animal behavior modification. If heavy vegetation grows over the bottom wire, it should be fitted to allow it to be switched to a ground wire during that season.

Gates

Gates weighing less than 100 lbs may be hung from single end post properly installed. Heavy

metal or wood gates more than 6 ft. wide shall best be attached to the pull post of an H-brace or diagonal floating brace.

All 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.

Gates between electrical subdivision fences may be composed of polywire, polyrope, polytape or coiled spring connected to spring loaded handles.

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

Gates Over Streams and Ditches

Hanging gates should terminate approximately 6 inches above average normal water level.

Non-electric flood gates should be hinged such that gate will swing with the rising water during storm events.

An electrified flood gate may be used to minimize debris problems on stream crossings. The electrified flood gate is constructed by stretching an electrified wire across the drainage above high water flow level. Attach, with compression sleeves, hanging galvanized chains or wire to the electrified wire at a spacing of 6 inches for goats, hogs and sheep or 12 inches for cattle and horses. It is advisable to connect the gate to electric fence with double insulated cable through a cut-off switch and flood gate controller.

Stream Bank Protection

Permanent fencing will be placed at least 10 feet from the top of the stream bank and should allow for more area in meanders and in areas with bank erosion to minimize corner bracing. Permanent fencing setback distance from drainage ditches should be enough to allow sufficient room for vegetation management and fence maintenance.

Safety

Barbed wire will not be electrified because of safety hazard.

Fencing operations can result in painful and serious injury. Wear heavy gauntlet leather gloves to protect hands and wrists, and boots or high-top shoes to protect legs and ankles. Tough, close fitting clothing will reduce risks of catching on wire. Wear safety glasses to protect eyes from injury. When stretching woven, fixed-knot, or barbed wire, stand on the opposite side of the post from the wire and stretcher unit.

It is dangerous to use a tractor to stretch wire fencing because of potential breaking of the wire resulting in serious injury from the recoil of the clamp bar, chain, or wire. Keep chains and wire stretching clamps in good condition.

Carry staples, nails, or other fasteners in a metal container or in an apron and not in your trouser pockets. Do not hold fasteners in your mouth which is a common but extremely dangerous habit.

If you handle preservative treated posts, do not rub your hands or gloves on your skin. Minimize the inhaling of sawdust.

Electrical fences should be clearly labeled or identified with the appropriate warning signs.

Considerations and helpful hints in construction

1. It is recommended to consult a professional fencing contractor in the planning phase of any fence system.
2. Woven wire for sheep and goats should have vertical wire wide enough (9” to 12”) or narrow enough (<4”) to minimize catching their heads. Otherwise use an electric offset wire to keep animals away from woven wire that might “entangle” them.
3. Never use household electrical wire for any part of an electrified fence. Splicing wires of different metals often results in oxidation and corrosion which causes short circuits and poor conductivity.
4. A digital voltmeter is essential to monitoring and maintaining electrical power fences.
5. Avoid placing electrical fences parallel with telephone or commercial power lines since static field can sometimes be created.

6. It is recommended that fences be located 20 feet or more from streams with a maintenance gate to allow for emergency access to water. This distance can also lessen fence maintenance by reducing flood damage. Temporary fencing may be used to protect streambanks while using forage adjacent to the stream.

REFERENCES

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VA NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE STANDARD FENCE (382)

Table 1. Permanent 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 ww fences start 2-4" above the ground	Line Posts and Stay Spacing (Maximum spacing)		
		Perimeter	Travel Lanes	Interior Subdivision	Surface Water Exclusion		Posts w/o stay	Post with stay	Stay Spacing
		Minimum Criteria				Inches	Feet		
Cattle	Barbed 3-wire	NO	Meets	Meets	NO	18, 28, 38	16.5	20	10
Cattle	Barbed 4-wire	Meets	Exceeds	Exceeds	Meets	14 to 44 evenly spaced	12	20	10
Cattle	Barbed 5-wire	Exceeds	Exceeds	Exceeds	Exceeds	10 to 46 evenly spaced	12	20	10
Cattle	Non-Electric 6-wire high tensile smooth	Meets	Exceeds	Exceeds	Meets	12 to 44 evenly spaced	16.5	30	10
Cattle*	Non-Electric 8-wire high tensile smooth	Exceeds	Exceeds	Exceeds	Exceeds	12 to 44 evenly spaced	16.5	30	10
Cattle	Electric 1-wire high tensile smooth	NO	NO	Meets	NO	26-32	100	NA	NA
Cattle	Electric 2-wire high tensile smooth (both hot)	NO	Meets	Exceeds	Meets	20, 32	100	150	50
Cattle	Electric 3-wire high tensile smooth (min. 2 hot)	NO	Exceeds	Exceeds	Exceeds	18, 30, 42,	50	150	50
Cattle	Electric 4-wire high tensile smooth (min. 2 hot)	Meets	Exceeds	Exceeds	Exceeds	12 to 42 evenly spaced	50	150	50
Cattle	Electric 5-wire high tensile smooth (min. 2 hot)	Exceeds	Exceeds	Exceeds	Exceeds	12 to 44 evenly spaced	50	150	50
Cattle	Woven wire (hinge joint) plus one or more HT or barbed top wires	Meets	Exceeds	Exceeds	Meets	47 min, 6" max between top wires	16.5	NA	NA
Cattle	HT woven wire (hinged joint) plus one or more HT or barbed top wires	Meets	Exceeds	Exceeds	Meets	47"min, 6" max between top wires	20	NA	NA
Cattle	HT Woven wire (fixed knot)	Meets	Exceeds	Exceeds	Meets	47 min	25	NA	NA
Cattle	Wood or Composition 4 board (6" wide)	Exceeds	Exceeds	Exceeds	Exceeds	6 , 6, 8, 10 between boards	8	NA	NA
Goats & Sheep**	Electric 3-wire high tensile smooth (all hot)	NO	Meets	Meets	NO	8, 18, 30	50	100	20
Goats & Sheep**	Electric 4-wire high tensile smooth (all hot)	NO	Exceeds	Exceeds	Meets	6 to 36 evenly spaced	50	100	20
Goats & Sheep**	Electric 5-wire high tensile smooth (all hot)	Meets	Exceeds	Exceeds	Exceeds	6, 12, 18, 28, 38	50	100	20
Goats & Sheep	Woven wire plus one HTE offset inside	Meets	Meets	Meets	Meets	42" min, one HTE offset 2/3 animal ht	16.5	NA	NA
Goats & Sheep	Woven wire plus one or more HT or Barbed top wires to 48"	Meets	Meets	Meets	Meets	36 min, 6" max between top wires	16.5	NA	NA
Goats & Sheep	HT fixed knot woven wire plus one or more HT or Barbed top wires to 48"	Meets	Exceeds	Meets	Meets	36 min, 6" max between top wires	25	NA	NA
Horses***	Electric 2-wire high tensile smooth (both hot)	No	Meets	Meets	Meets	28, 38	50	100	20
Horses***	Electric 3-wire high tensile smooth (min 2 hot)	No	Exceeds	Exceeds	Exceeds	28, 38, 48	50	100	20
Horses***	Electric 4-wire high tensile smooth (min 2 hot)	Meets	Exceeds	Exceeds	Exceeds	18 – 54 evenly spaced, minimum 2 hot	50	100	20
Horses	Woven wire w/1 wire HT on top	Meets	Exceeds	Exceeds	Meets	48 + HT at 54	16.5	NA	NA
Horses	HT woven wire (fixed knot)	Meets	Exceeds	Exceeds	Meets	60	25	NA	NA
Horses	Mesh "No climb" 2"x4" spacing	Exceeds	Exceeds	Exceeds	Exceeds	48 + HT at 54"	16.5	NA	NA
Horses	Wood or Composition boards (6" wide)	Exceeds	Exceeds	Exceeds	Exceeds	18 min. 12 max. between boards	8	NA	NA

VA NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE STANDARD FENCE (382)

Table 1. Permanent Fence Selection Criteria Continued

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 ww fences start 2-4" above the ground	Line Posts and Stay Spacing (Maximum spacing)		
		Perimeter	Travel Lanes	Interior Subdivision	Surface Water Exclusion		Posts w/o stay	Post with stay	Stay Spacing
		Minimum Criteria				Inches	Feet		
Hogs	Electric 2-wire high tensile smooth (both hot)	NO	Meets	Meets	Meets	6-10, & 16-18	20	30	15
Hogs	Electric 6-wire high tensile smooth (min 2 hot)	Meets	Exceeds	Exceeds	Exceeds	6, 12(+), 18(+), 26, 34, 42	20	30	15
Hogs	Woven wire 32" w/ barbed wire	Meets	Exceeds	Exceeds	Meets	32 + 1 barb above, and one barbed 2" off ground and 2" below woven wire	16.5	NA	NA
Hogs	Woven wire 32" w/ 1 HT electric inside	Meets	Exceeds	Exceeds	Meets	32 + 1barbed or HTE 6" above and one HTE wire 8" off ground, 8" inside of fence.	16.5	NA	NA
Hogs	HT woven wire (fixed knot) 32" w/ 1 barb or HTE	Meets	Exceeds	Exceeds	Meets	35" + 1 HTE offset like above	25	NA	NA
Deer****	HT woven wire (fixed knot) 96" tall	Meets	Meets	Meets	Meets	96"	25	NA	NA
Deer****	Electric 7-wire High tensile smooth wire slanted	Meets	Meets	Meets	Meets	see diagram of slant measurements	30	100	25
Deer****	Electric 9-wire High tensile smooth wire	Meets	Meets	Meets	Meets	8, to 72 evenly spaced	30	100	25
Deer****	Electric 12-wire High tensile smooth wire	Exceeds	Exceeds	Exceeds	Exceeds	6, to 72 evenly spaced	30	100	25
Deer****	Electric 15-wire High tensile smooth wire	Exceeds	Exceeds	Exceeds	Exceeds	2, to 96 evenly spaced	30	100	25
Buffalo	Electric 4-wire high tensile smooth	NO	Meets	Meets	Meets	16 to 42 evenly spaced	30	100	25
Buffalo	Electric 5-wire high tensile smooth	NO	Exceeds	Exceeds	Exceeds	16 to 48 evenly spaced	30	100	25
Buffalo	Electric 6-wire high tensile smooth	Meets	Exceeds	Exceeds	Exceeds	12 to 52 evenly spaced	30	100	25
Buffalo	HT woven wire (fixed knot)	NO	Meets	Meets	Meets	48	25	NA	NA
Buffalo	HT woven wire (fixed knot)	Meets	Exceeds	Exceeds	Exceeds	60	25	NA	NA
Chickens/turkey	Woven wire 2"x4" 1 wire HT or barb above	Exceeds	Exceeds	Exceeds	Exceeds	72	16.5	NA	NA
Emu and ostrich	Woven wire 6"x6" 1 wire HT or barb above	Exceeds	Exceeds	Exceeds	Exceeds	72	16.5	NA	NA
Chickens/turkey	HT Woven wire 2"x4" 1 wire HT or barb above	Exceeds	Exceeds	Exceeds	Exceeds	72	18	NA	NA
Emu and ostrich	HT Woven wire 6"x6" 1 wire HT or barb above	Exceeds	Exceeds	Exceeds	Exceeds	72	18	NA	NA
People	Chain link	Meets	Preferred option			60	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 barbed wires or HT electric	Meets				47 min. HT or barb at 6 spacing to 48. HT may be electrified	16.5	NA	NA

Use the information in this table as a guide to determine the number of strands and spacing requirements. Adjustments may be made based on manufacturer's recommendations and landowners preference for confinement with NRCS approval.

*Heavy use feed area containment fencing should be built of a suitable material (usually HT smooth wire, pipe, cable, guardrail, or board) and post spacing to endure heavy use around permanent feed areas.

** If the goats or sheep are not trained to electric fencing then high tensile electric fencing is probably not a good option for the livestock operation.

***Consideration for visibility should be taken when using high tensile fence for horses. Poly coated or vinyl encased wire or rail can be used following manufacturer recommendations for installation.

**** Exclusion fence only

VA Natural Resources Conservation Service Conservation Practice Standard Fence (382)

Table 2. Temporary Fence Selection Criteria

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

Animal Type to Control	Fence Type[1] (all wires hot)	Purpose of Fence			Typical Spacing Above Ground Level	Line Posts (maximum spacing)
		Travel Lanes	Interior Subdivision	Surface Water Exclusion		
		Minimum Criteria			Inches	Feet
Cattle	Electric 1-wire Polywire or Polytape or galvanized steel braided wire	Meets	Meets	Meets[2]	26-36	60
Cattle	Electric 2-wire Polywire or Polytape or galvanized steel braided wire	Exceeds	Exceeds	Exceeds	20, 32	60
Goats/Sheep	Electric 4-wire Polywire or Polytape	Meets	Meets	NO	8, 16, 24, 32,	60
Goats/Sheep	Electric Net Fencing[3]	Meets	Meets	Meets	0, (minimum 35 inches tall)	built in[4]
Horses	Electric 1-wire Polywire or Polytape	Meets	Meets	NO	34	25
Horses	Electric 2-wire Polywire or Polytape	Exceeds	Exceeds	Meets	28, 40	25
Hogs	Electric 2-wire Polywire or Polytape or galvanized steel braded wire	Meets	Meets	NO	8, 18	40
	Electric Net Fencing[3]	Meets	Meets	Meets	0, (35 inches tall)	built in[4]
Poultry	Electric Net Fencing[3]	Meets	Meets	Meets	0, (minimum 42 inches tall)	built in[4]

[1] Livestock must be trained to respect electric fencing prior to using temporary fence products for complete containment.

[2] Two wires may be needed to prevent young calves from going beneath the fence.

[3] Use electric netting specifically designed for the type of livestock being controlled; it is not suggested for small animals with horns (consider spacing of vertical stays and horizontal lines and fence height).

[4] Line posts are typically built into the rolls of netting near 12.5 feet spacing.

Based on the type of livestock, use the information in this table as a guide to determine the number of strands and spacing for different types of temporary fencing products. Adjustments may be made based on manufacturer's recommendations and landowners preference and ability to control the livestock. Temporary fencing products are not intended to be used as permanent or semi-permanent containment fencing.

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Table 3. Wire Specifications				
Wire Type	Minimum Wire Size	Minimum Wire Coating/Composition	Wire Strength and Other Considerations	
Barbed, Standard Double Strand (must meet ASTM A121)	12.5 gauge (ga.) with 4 point barbs spaced on 5" centers	Class 3 zinc coating per ASTM A641-	950 lbf	
	15.5 ga. with 4 point barbs spaced on 5" centers	Class 3 zinc coating per ASTM-A641		
Barbed, High-Tensile Double Strand (Gaucho Wire) (must meet ASTM A121)	15.5 ga. 4 point barbs	Class 3 zinc coating per ASTM-A641	170,000 psi or 950 lbs.	
High Tensile Smooth single strand (must meet ASTM A854)	12.5 ga.	Class 3 zinc coating per ASTM-A641	130,000 psi or 1300 lbs.	
High Tensile Vinyl Coated or Polymer Encased Wire	12.5 ga.	UV resistant polymer	1,300 lbs per wire or 4,000 lbs per rail	
Galvanized Steel	1.7 mm	Class IV	160 lbs	Can be used for 1 or 2 wire temporary fences
Standard Woven Wire "hinged joint" or continuous stay "fixed knot" (must meet ASTM A116)	Top & Bottom wires: 12 gauge min. Intermediate wires: 12.5 ga.	Class 3 zinc coating per ASTM A641	Horizontal and vertical spacing should be appropriate for animal types. Design numbers of woven fence are related to the characteristics of the fence fabric. For example: 1047-12-12 ½ has 10 line wires is 47" high has 12" stay wire spacing and is 12.5 gauge.	
High Tensile Woven Wire (must meet ASTM A116)	12.5 gauge	Class 3 zinc coating per ASTM A641	175,000 psi on line wires	
Mesh Wire; such as Horse-No-Climb	Top & Bottom wires: 10 gauge Intermediate & Stay Wires: 12.5 gauge	Class 3 zinc coating per ASTM A641	At least 48" high, less than or equal to 2-inch x 4-inch mesh spacing.	
Polywire or "Twine " – Type	Minimum of 8 strands of aluminum, stainless steel or mixed metal wires	Wires interwoven with polyethylene or polypropylene fiber.	Polywire (twine-type), as compared to polytape is more durable under frequent movement. Polytape is best used where high visibility is needed. Do not use on fences more than 1 mile in length (low-conductivity). Life expectancy is 3-5 years if moved frequently.	
Polytape or Tape-Type	Minimum ½ inch wide and 5 strands of stainless steel or mixed metal wire filaments			
Aluminum	12.5 gauge	Aluminum	May be used as one of the wires in a multi-wire fence or as single wire subdivision fence. May be used as lead out cable from Power Energizer to fence.	
Steel wire and hardware used to construct a permanent fence will be new and galvanized material. Not all materials are for permanent or containment fencing, reference Table 1 to ensure the fence material selected is appropriate for the type of fence and the livestock to control.				

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Table 4. Line Post Type, Size and Depth Specifications			
Fence Type	**Post Type**	**Minimum Diameter/ Weight**	**Minimum Depth***
Barbed Wire Woven Wire Smooth High Tensile wire non-electrified	Pressure treated wood (Material Spec 585), black locust, red cedar (>50% heartwood)	4”	24” or 18” in rocky soil, 30” in very sandy soil
	Steel T posts[1] Steel U posts[1] Steel L posts[1] (When using steel posts, wooden posts shall be set every 4th post)	1-3/8” x 1-3/8” x 1/8” thick 2” x 1-1/4” x 3/32” thick 2” x 2” x ¼” thick All 1.25 lbs. per foot, exclusive of anchor plates	18”
	Steel pipe, galvanized	2” outside diameter	16”
Smooth High Tensile wire electrified	Pressure treated wood (Material Spec 585), black locust, red cedar (>50% heartwood) bb	4”	24” or 18” in rocky soil, 30” in very sandy soil
	Steel T posts[1] Steel U posts[1] Steel L posts[1] (When using steel posts, wooden posts shall be set every 4th post)	1-3/8” x 1-3/8” x 1/8” thick 2” x 1-1/4” x 3/32” thick 2” x 2” x ¼” thick All 1.25 lbs. per foot, exclusive of anchor plates	16”
	Fiberglass[2,4]	5/8”	16”
	HDPE[3,4]	1.33” (per manufacturer recommendations)	12”
	Composite[3,4]	1 1/8” (per manufacturer recommendations)	16”
	PVC T posts[3,4]	1.5”	12”
Stays (Battens, Droppers, or Spacers)	Wire stays Composite Fiberglass Steel T post w insulators Wood PVC	12 ga. galvanized for barbed wire 1” ½” Listed above 1.5”X1.5” 1”	Stays are not always designed to touch the soil surface, but should be sufficient to maintain wire spacing
Temporary Electric Fences	Fiberglass, composite, plastic, PVC, steel rod	3/8”	4”

[1]All steel posts shall be new and painted or galvanized.
[2]Fiberglass posts should be coated to prevent splintering and cracking.
[3] All HDPE, PVC and composite material must be UV protected.
[4]Fiberglass, composite, PVC and HDPE posts are not to be used in bends, curves or at places in the fence with abrupt changes in elevation.
*Minimum depth unless specified by manufacturer. If top fence wire is greater than 60 inches minimum depth increases, consult NRCS technical specialist during design for approval prior to construction.

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Table 5. H-Brace Pull Post (corner, gate and end) Specifications			
Brace Post Type	**Minimum Top Diameter**	**Depth Anchoring[1]**	**Other**
Pressure treated pine (Material Spec 585) or other wood of suitable strength: red cedar (>50% heartwood), black locust.	6" top diameter (corners, ends, pull posts and gates); 5" top diameter all other wooden brace posts	36 – 42" in ground 36" in ground	Minimum post lengths should allow for required buried depth and fence height plus at least 2 inches of post above top wire. Posts will have appropriate treatment to prevent rust and deterioration. The assembly strength of a corner post set 2.5' deep is approximately half compared to a post set at 3.5' deep. A single post brace assembly can be used as bracing for ≤2 HT smooth electric wires. See Table 7.
Steel round pipe – braced[2]	2-3/8" nominal; 7 lbs/ft. or equivalent	36" set in 12 in diameter hole with concrete	
	4" nominal; 10 lb./foot or equivalent	36" driven	
Steel, angle iron – braced[2]	2.5" x 2.5" x 0.25"	36" set in 12 in diameter hole with concrete	
[1]If top fence wire is greater than 60 inches depth anchoring increases, consult NRCS technical specialist during design for approval prior to construction. [2]All steel posts shall be new and painted or galvanized.			

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Table 6. Brace Rail Specifications for H-Brace or Diagonal[1] Floating Brace			
Brace Member Type	**Minimum Diameter/ Weight**	**Typical Length**	**Other**
Pressure treated pine (Material Spec 585) or other wood of suitable strength; red cedar (>50% heartwood), black locust.	4 inches	8-10 feet	Posts will be straight and free of splintering. Posts will have appropriate treatment for rust and deterioration. The wider this brace the stronger the brace. A 10-12' single H brace may replace a standard double 8' H brace.
Galvanized steel pipe[2]	1.5"diameter, schedule 40	8-10 feet	
Steel, angle iron[2]	2.5" x 2.5" x 0.25"	8-10 feet	
[1]Length of the diagonal floating brace rail must be at least 2.5 times the height of the top wire.			
[2]All steel posts shall be new and painted or galvanized.			

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Table 7. Single Post Brace[1] Specifications for 1-2 strands high tensile electric fence only			
Brace Post Type	**Minimum Top Diameter**	**Minimum Depth Anchoring**	**Other**
Steel round pipe or tubular steel[2] (galvanized)	2.5" outside diameter schedule 40	24" set in 12" diameter hole with concrete	For single wire fences, concrete not needed if posts are driven 3 feet deep
Steel angle iron[2]	2.5" x 2.5" x 0.25"		
Steel[2]	4" outside diameter	Depth equal to or greater than height of top wire above ground.	Concrete not needed
Pressure treated pine (Material Spec 585) or other wood of suitable strength; red cedar (>50% heartwood), black locust.	6 inch (post must be driven)		The strength of a corner post set 2.5' deep is approximately half as much as for one set 3.5' deep.
[1]Single posts as braces should lean approximately 4 inches away from the direction of pull.			
[2]All steel posts shall be new and painted or galvanized.			

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Table 8. Maximum Brace Assembly Spacing (on straight and level pulls)*			
Fence Type	**Distance Between Anchor (pull) Posts (ft.)**	**End / Corner Brace Types**	**Inline Brace Type**
Barbed Wire	0 - 660	Single H or Diagonal Brace Assembly	NA
	660 – 1,320	Double H or Diagonal Brace Assembly[1]	NA
	>1,320	Double H or Diagonal Brace Assembly[1]	Double H-10 ft or Diagonal Brace Assembly
Posts with brace assemblies should not exceed 1,320 feet for standard barbed wire in straight sections of fence.			
Smooth HT wire non-electrified	0 – 1,320	Single H or Diagonal Brace Assembly	NA
	1,320 – 2,640	Double H or Diagonal Brace Assembly[1]	NA
	>2,640	Double H or Diagonal Brace Assembly[1]	Double H-10 ft or Diagonal Brace Assembly
Posts with brace assemblies should not exceed 2,640 feet for HT smooth wire fences in straight sections of fence.			
Smooth HT wire - electrified	0 – 1,320	Single H or Diagonal Brace Assembly[2]	NA
	1,320 – 2,640	Double H or Diagonal Brace Assembly[1&2]	NA
	>2,640	Double H or Diagonal Brace Assembly[2]	Double H-10 ft or Diagonal Brace Assembly
Posts with brace assemblies should not exceed 2,640 feet for HTE smooth wire fences in straight sections of fence.			
Standard Woven (net) wire (Hinge Joint)	0 - 330	Single H or Diagonal Brace Assembly	N/A
	330 - 660	Double H or Diagonal Brace Assembly[1]	N/A
	>660	Double H or Diagonal Brace Assembly[1]	Double H-10 ft or Diagonal Brace Assembly
Posts with brace assemblies should not exceed 660 feet for standard WW fences in straight sections of fence.			
High Tensile Fixed Knot Woven Wire (Continuous Stay)[3]	0 – 1,320	Double H or Diagonal Brace Assembly[1]	N/A
	>1,320	Double H or Diagonal Brace Assembly[1]	Double H-10 ft or Diagonal Brace Assembly
Posts with brace assemblies should not exceed 1,320 feet for HT FK WW fences in straight sections of fence.			
*The maximum distance between anchor posts of a brace assembly will often be shorter than what is listed in this table due to abrupt changes in topography or fence direction that will require closer brace assembly spacing.			
*All wires must be tied off at in-line pull assemblies and new wires started for the next fence section.			
*Use this information as a guide to determine bracing requirements for the type of fence being constructed. Minor adjustments may be made based on topography and the number or height of fence wires installed with NRCS approval.			

[1]Single H brace with a 10' – 12' brace rail can take the place of the standard double 8' H brace.
[2]Single post brace assembly of suitable diameter can be used for fences with 1-2 strands HT electric wires, see Table 7.
[3]Build HT fixed knot WW fence according to recommendations of the fencing manufacturer.

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Table 9. Specifications of other Fence Components	
Component	**Description/Specification**
Electrical Energizers or "Chargers"	Energizers for permanent electric fencing must be U.L. or CSA approved and manufactured for the purpose of agricultural fencing and be high power, low impedance that can produce at least 5,000 volt peak output and a short pulse less than 300 milliamps (mAmps) in intensity, finished within 0.0003 of a second, and at a rate of 35-65 pulses per minute. It is recommended that the energizer have a fence charge meter. Only one charger is allowed per fence. It is recommended the unit include a high impact self-insulating weather resist case, a snap-in circuit panel, a safety pace fuse, a lightening arrester, have full power input and reduced power output. May be solar, 110 or 220 volt, or 12 volt battery units. OUT PUT Joule rating should be based on the size of fence system, the type of fence being electrified and high enough to provide a minimum shock at the farthest point in the fence. To control most livestock it is recommended to maintain fence line voltage ≥ 3,000 volts. Use higher voltage for sheep, goats and predator control.
Lightening Arrestor	A properly grounded lightning arrester and a "lightning choke" shall be installed to protect the energizer from lightning strikes. A voltage spike protector is also recommended.
Electrical Insulators	Insulators shall be made of high quality glazed porcelain or UV resistant HDPE or HDPP plastic manufactured for durability under high tensile strain. UV resistant tubular plastic insulators that wrap around end and corner posts must have a reinforced strip to prevent cracking and grounding under high tensile strain. Galvanized 12.5 gauge wire may be used on fiberglass and other non conductive posts to secure wire to post.
Wire connecting energizer to fence or beneath gate or road	Underground cable (insulated wire) is often used where wires are buried under gates and as leads from the energizer to the fence. Underground cable should be 12.5 gauge galvanized or soft steel wire with bonded, high density, ultra-violet stabilized polyethylene or polypropylene or polypropylene insulation. Never use household or underground electrical copper wire with fence energizers. Where underground insulated wire is buried under gates or roads, it is strongly recommended to run the wire through a non-metal conduit (with water tight connections) to decrease the incidence of short circuiting over time.
Ground rod and installation	Ground rods should be 6 to 8 feet long x ½"- 5/8" galvanized steel rod set minimum 10 feet apart and driven to no more than 6" above the ground. The number of ground rods needed is based on a minimum of 3 feet of ground rod per joule of energizer output capacity. All energizers must be grounded sufficiently to test less than 300 Ohms on the last ground rod when the fence is "grounded" 300 feet from energizer. Galvanized ground rods for the fence must be driven into the ground a minimum of 6 feet. If this is impossible, alternative methods of grounding include putting rods in trenches surrounded with Epson Salt or Bentonite. Placing ground rods in damp areas will improve effectiveness. Follow manufacturer's recommendations for grounding the system.
Staples or Fasteners	Staples used to fasten wire to wood post shall be 9 gauge Class 3 galvanized barbed with a minimum length of 1 ½ inches. For steel line posts, the fencing shall be fastened with 14 gauge galvanized steel wire or the post manufacturer's special wire clips. For all other types of posts, attach as specified by manufacturer.
Gates	Only new materials may be used for gates and they must be made of suitable material and coated to be durable enough to last 10 years with suitable maintenance. All non-electrified gates must be substantial enough to withstand expected pressures from livestock and wildlife. Gates between electrical subdivision fences may be of polywire, polyrope or coiled spring connected to spring loaded handles.