

TECHNICAL NOTE

RANGE TECHNICAL NOTE NO. 7

OCTOBER 1, 2014

FENCE

Stan Boltz, State Range Management Specialist

Installation of Fence (382) shall adhere to the South Dakota (SD) Natural Resources Conservation Service (NRCS) conservation practice standard in the SD Technical Guide (SDTG).

The General Purpose Fence is designed to contain or control movements of livestock where heavy concentrations or pressures are not expected.

The Protective Fence is designed for uses such as excluding livestock from agricultural waste storage structures, spring development areas, portions of stockwater impoundments, seeps, critical area plantings, windbreaks, or other areas where a high degree of protection is desired. Protective fence is not necessarily a requirement in these situations, and the need for protective fence will be determined by the operator and the planner.

The size, gauge, amount, weight, or type of materials specified for each fence type shall be regarded as minimums, unless otherwise specified. Post seating depths shall be regarded as minimums. Post spacing and wire spacing shall be regarded as maximums, unless otherwise specified.

All materials used in construction of a fence will be new or like new. Any materials or construction features that exceed these specifications, or that are of different designs that are of equal or greater effectiveness, are acceptable for meeting specifications. Questionable materials or construction features require prior approval of the State Resource Conservationist.

GENERAL PURPOSE FENCE

General Purpose Fence (three- or four-wire barbed, and woven-wire)

For construction details, please see South Dakota Job Plan 19.1, General Purpose Fence.

Materials

A. Barbed wire

1. Standard weight: Double-strand galvanized wire of 12.5-gauge with two-point 14-gauge wire barbs at a spacing of approximately 4 to 6 inches.
2. High-tensile strength (110,000 pounds per square inch (PSI): Double-strand galvanized wire of 15.5-gauge with two-point 16.5-gauge barbs at a spacing of 4 to 6 inches.

B. Woven wire

1. Standard weight: 26 to 34 inches high netting with 11-gauge top and bottom wires, 14.5-gauge intermediate and stay wires, all galvanized. Mesh size can be 6 inches x 6 inches or 6 inches x 12 inches; 12-inch mesh is recommended for goats to reduce hang-up.
2. High-tensile strength: 42-inch netting with 12.5-gauge high-tensile strength (179,000 PSI) line wires, 12.5-gauge medium-tensile strength (125,000 PSI) stay wires, all galvanized. Mesh will be 4 inches x 6 inches to 7 inches x 12 inches.

- C. Wood posts: All decay-susceptible wood posts (such as pine) must be treated with proper chemical preservatives for below-ground application (i.e., creosote or pentachlorophenol). Posts made from rot-resistant woods such as red cedar or Rocky Mountain juniper are suitable without treatment; however, at least half the diameter on the small end of the post should be heartwood.
1. Line posts: Three-inch diameter, six-foot length, sound, and reasonably straight.
 2. Corner, gate, and in-line brace posts: Five-inch diameter, seven-foot length, straight and sound wood. Sound railroad ties and telephone poles are acceptable.
- D. Steel posts: Length, five and one-half feet; weight, one and one-quarter pounds per foot (excluding anchor plate); must have knobs, studs, or grooves for holding wire in place; must be equipped with a sturdy anchor plate firmly attached.
- E. Brace material
1. Braces: Straight and sound 4 inches x 4 inches x 8 feet treated lumber or 4-inch diameter post of 8-foot length; or 2 3/8 inches x 8 feet steel pipe, with a wall thickness of 0.125 inches; or 1 5/8 inch x 8 feet solid steel rod. Braces will be securely attached to the vertical posts.
 2. Wire: either of the following:
 - a. Galvanized, double-strand 12.5-gauge.
 - b. Galvanized, single-strand 9-gauge.
- F. Wire fasteners
1. Staples: 9-gauge wire staples, 1-1/2 inches long (1-1/4 inch length may be used for high-density hardwoods).
 2. Ties and/or clips: Made especially for the particular style of post used or #12 galvanized wire.
- G. Stays: Galvanized, twisted, wire stays shall be long enough to hold each fence wire at specified spacing.

Construction

- A. Post seating depth: All posts should be set deep enough to gain maximum sturdiness consistent with soil conditions. Set posts to the following depth under normal conditions:
1. Line posts:
 - a. Wood: Two feet.
 - b. Steel: One and one-half feet.
 2. Corner, in-line brace, and gate posts will be wood, seated at least three feet deep.
- B. Line post spacing
1. Barbed-wire fence
 - a. Up to 20 feet without stays.
 - b. Up to 30 feet with at least one stay. Stays must divide the space between posts about equally.
 2. Woven-wire fence: Up to 20 feet.

- C. Alignment: Construction should be as straight as possible between corners or turns. Fence construction along curved lines should be in straight segments with in-line bracing at appropriate angles. Sound railroad ties or five-inch by seven-foot posts set at a depth of three feet are adequate for bracing many of these turns, especially where the angles are wide and the segment of fence is short.
- D. Bracing and anchoring: When fencing over uneven terrain, the fence shall be adequately anchored at low spots.
1. In-line brace and end (gate) brace assemblies: Install at 1,320-foot intervals or closer, between corners or other major turns. Set two posts about eight feet apart with top timber between the two, and diagonal wires from the base of each to the top of other posts. A diagonal style brace may be used in place of the standard H-style brace. Gate ends may consist of telephone poles (or equivalent) installed at least five feet deep and attached at the top with galvanized wire. Please refer to JS 382-4, Diagonal Brace.
 2. Corner braces: Set brace a minimum of eight feet from the corner with top timber between the posts, with one diagonal wire wrapped and twisted from the top of the brace post to the bottom of the corner post. A diagonal style brace may be used in place of the standard H-style brace. Please refer to JS 382-4, Diagonal Brace.
- E. Wire placement: All line wires will be double-wrapped and stapled at all corners, in-line brace post assemblies, and gate posts.
1. Barbed wire
 - a. Three-wire: Attach top wire at least 42 inches above ground level at post locations. Attach middle and bottom wires so wire-to-wire and wire-to-ground intervals are all about equal.
 - b. Four or more wire: Same as above, except operator may attach some wires closer together at their discretion, based on types of livestock involved.
 2. Woven wire
 - a. Netting will be supplemented with a barbed wire attached approximately three inches above it. Attach bottom wire of netting about two inches above ground level at post locations.

Power Fence

For construction details, please see JS 382-3, Power Fence. Power fences erected in areas of potential high public use should be properly signed.

Wire

- A. Type: Use smooth, single-strand, 12.5-gauge high-tensile strength (170,000 PSI minimum), type III galvanized or better.
- B. Placement
1. A single hot wire may be used in situations where the earth will provide an adequate ground to complete the circuit back to the energizer. This single hot wire should generally be located 24 to 32 inches above the ground line for cattle (cows) and at the nose height of the animal to be controlled when it is walking for other species and age classes.
 2. For two or more wires alternate ground and hot wires. The ground wires will be connected either directly to the negative side of the energizer or to the same grounding

rod as the energizer. Listed below are suggested wire spacing (first distance is from ground level) and polarities for typical power fence uses.

Wire No.	Use	Spacing and Polarity
2	Cattle cross fence	20"(-), 10"(+)
3	Cattle cross fence	22"(+), 10"(-), 10"(+)
3	Horses	28"(+), 10"(-), 10"(+)
3	Hogs	6"(+), 8"(-), 10"(+)
4	Cattle boundary	12"(-), 10"(+), 10"(-), 10"(+)
5	Cattle boundary	12"(+), 6"(-), 10"(+), 10"(-), 10"(+)
5	Cattle feedlot	14"(+), 8"(-), 8"(+), 10"(-), 10"(+)
5	Horse boundary	18"(+), 6"(-), 6"(+), 8"(-), 10"(+)
5	Sheep, goat boundary	6"(+), 6"(-), 6"(+), 8"(-), 10"(+)
5	Buffalo	20"(+), 10"(-), 10"(+), 10"(-), 10"(+)
6	Sheep, goat boundary predator exclusion	6"(-), 6"(+), 6"(-), 6"(+), 8"(-), 10"(+)
7	Sheep, goat boundary predator exclusion	6"(+), 6"(-), 6"(+), 6"(-), 6"(+), 8"(-), 10"(+)

- C. Tension: Tension on each wire shall be sufficient to maintain proper wire spacing between line posts. In-line strainers will be installed on each wire to maintain correct tension on each wire between all brace corners and gate assemblies. Tension springs may be used on each wire to maintain proper tension.

Line posts

A. Material

1. Fiberglass T-posts will be a minimum of one inch by one inch with notches to allow proper wire spacing. Fiberglass rods will be a minimum of seven-eighth of an inch diameter with notches or holes located for proper wire spacing.
2. Self-insulating wood posts will have a diameter of one and one-half inches or larger. Posts must be treated or made from rot-resistant wood.
3. Steel posts will weigh one pound per foot, excluding anchor plate, and have a firmly attached anchor plate.
4. Composite posts made of polypropylene and wood will be a minimum of one and one quarter inches in diameter, and be at least 60 inches in length.

B. Placement requirements

1. Posts will be driven a minimum depth of 16 inches, except in sand where 24 inches may be required.
2. For 3 or more wire power fences, line posts are not to exceed 75-foot centers without stays, or 100-foot centers with stays on 50-foot centers between line posts. Generally, posts are spaced to maintain desired wire spacing.
3. For single-wire and two-wire power fences, line posts are not to exceed 75-foot centers. Stays should not be used on two-wire power fences. Generally, posts are spaced to maintain desired wire spacing.

Corner, Gate, and Brace Assemblies

A. Materials and design will meet the same requirements as general-purpose fence.

1. For permanent power fences, the diagonal or H-style style corner may be used. Gate ends may consist of telephone poles (or equivalent) installed at least five feet deep and attached at the top with galvanized wire. Please refer to JS 382-4, Diagonal Brace.

2. In-line brace assemblies will be spaced at intervals no greater than 4,000 feet on level terrain.
3. Over uneven terrain, provide additional bracing as needed between corner, gate, end, and brace assemblies to put vertical pull of fencing on brace posts instead of line posts. Use properly anchored posts of adequate size with attached deadmen in low spots. On rises, use wood posts of four-inch diameter or larger to counteract downward pull.

Fence Alignment

Construction should be as straight as possible between corners or turns. Construction along curved lines should be done in straight segments with in-line bracing at appropriate angles. Sound railroad ties or five-inch by seven-foot posts set at a depth of three feet are usually adequate for bracing these turns, especially where the angles are wide and the fence segment is short.

Fence Fasteners and Insulators

A. Materials

1. On wood posts and steel posts, use porcelain, ceramic, or high-quality, UV-stabilized polypropylene insulator to which the wire can be attached. Polypropylene insulators shall be of the type that provides adequate spacing from the post to prevent current leakage.
2. Use only manufacturer's recommended insulators at all points where tension from the wire is transferred to corner, gate, end, and brace posts.

B. Attachment

1. Attach wire to porcelain and ceramic insulators with the appropriate manufacturer's clip or use 12-gauge, galvanized wire.
2. Attach wire to fiberglass and self insulating wood posts and fiberglass rods, with the specifically designed manufacturer's fastener or "clip" or use 12.5-gauge galvanized wire tied in a loop to attach wire to post. Instead of using "clips" or wire ties, holes may be drilled in fiberglass rods. Holes should be drilled at the proper spacing. The line wire is not to be threaded through predrilled holes but will be attached with wire or proper fasteners. High-tensile strength wire is attached to the post using a short length of galvanized wire that is looped around the line wire, threaded through the hole in the post, and wrapped back around the line wire on either side of the post ("Cotter key" style fastener).

C. Stays: Fiberglass or self insulating wood stays will be used.

D. Energizers: Electronic energizers or power-fence controllers shall be Underwriters Laboratory (UL) listed. Installation shall be according to manufacturer's recommendations. The maximum length of wire per controller shall not exceed manufacturer's recommendation for size and type of wire used. Controllers will have the following features and/or meet the following minimum specifications:

1. High power, low impedance with 5,000-volt peak output, a pulse that is finished within 1/3,000 of a second, and 54-60 pulses per minute.
2. High impact, weather-resistant cases.
3. Solid-state circuitry (snap-in circuit panels).
4. Lightning arrester.
5. Safety-pace fuse.

6. Any of the following power requirements:
 - a. 110-volt
 - b. 220-volt
 - c. 12-volt battery-powered, capable of working three weeks without recharge.
- F. Electrical Grounding: All power fences must be properly grounded with galvanized ground rods per the energizer manufacturer's recommendation. Inadequate grounding is the leading cause of power fences' failure to control livestock.
- G. Insulated cable: To cross gates and other areas where the power fence is located some distance away from the energizer or controller, use 12.5-gauge insulated cable with 56 ohms or less of resistance per mile. Use galvanized wire with two layers of insulation for underground burial or overhead transmission. Where feasible, use overhead transmission to reduce the incidence of short-circuiting, which can occur with underground burial. Do not use copper insulated wire due to corrosion factor and lack of tensile strength.

PROTECTIVE FENCE

For details, please see JS 382-2, Protective Fence. Construct standard protective fences by the same method and design as specified for general purpose fence except for the following variations:

Materials

- A. Line posts
 1. Wood: Four-inch diameter, length six and one-half feet
 2. Steel: Six-foot length, weight of one and one-quarter pounds per foot, excluding anchor plate

Construction

- A. Post seating depth: All posts should be set deep enough to gain maximum sturdiness consistent with soil conditions. Set posts to the following depth under normal conditions:
 1. Line posts
 - a. Wood: Two and one-half feet
 - b. Steel: Two feet
- B. Line post spacing
 1. Sixteen feet; wood at least every third post: applicable for barbed and woven-wire protective fence
- C. In-line bracing and anchoring
 1. Maximum 825-foot interval.
- D. Wire
 1. Four barbed wires with top wire at least 42 inches above the ground. Lower wires to be spaced at the discretion of the operator, based upon types of livestock to be excluded.
 2. Woven wire will have at least one barbed wire attached approximately three inches above the top of the woven wire.

CHAIN-LINK FENCE

For use as protective fence where high-hazard risks need to be reduced (i.e., around waste storage structures, power generators, etc.).

Materials

A. Wire

1. Fabric wire will be a minimum of 11.5-gauge, 2½ inch mesh, 48 inches high, with zinc coating or equivalent.
2. Barbed wire: See General Purpose Fence design section for barbed wire specifications.

B. Posts

1. Line posts: galvanized steel with a minimum outside diameter of 1⅝ inches, a length of 5½ feet, and a wall thickness of .08 inches.
2. Corner posts: galvanized steel with a minimum outside diameter of 2⅜ inches, a length of 6 feet, and a wall thickness of .125 inches.
3. Gate posts: galvanized steel with a minimum diameter and length to support the gate width needed according to the manufacturer's recommendations.

C. Top rail

1. Will be galvanized steel pipe, or equivalent, with a minimum diameter of 1⅝ inches with a wall thickness of .08 inches.

D. Gates

1. Gates will be of the size necessary to allow for equipment access.
2. Gates shall be installed according to manufacturer's recommendations.
3. Gates may be single-swing or double-swing with the appropriate fittings for latches, stops, hinges, keepers, and other needed accessories. All materials will be steel with zinc coating or equivalent.

E. Chain-link fence accessories

1. Caps, rail and brace ends, rail sleeves, wire ties and clips, brace bands, tension bands, tension bars, tension wire, barbed wire support arms, and other accessories will be of steel and zinc coated as per manufacturer's recommendations. Install lock, latches, or chains where safety is a concern.

Construction

All chain-link fences will be constructed according to the manufacturer's recommendations and/or completed job sheets.

FENCE DESIGN FOR SPECIALIZED LIVESTOCK MANAGEMENT SYSTEMS AND OTHER ANIMALS

Managed Intensive Grazing

Prescribed grazing systems where livestock are rotated rapidly through a series of varying sized temporary paddocks may utilize single polywire electric fencing.

The wire, twine, tape, or rope shall contain a minimum of six mixed metal strands consisting of stainless steel and aluminum or tinned copper (all stainless steel strands are not adequate). Posts will be fiberglass, easily inserted into the ground and have clips insuring easy attachment of the wire, twine, or

tape. Post will generally be spaced about 40 feet apart. Wire height will be set at the height of the nose of the animal to be controlled when walking.

Wildlife

Please refer to the Wyoming Game and Fish Department, Habitat Extension Bulletin No. 53, 2004, for additional configurations related to fencing for wildlife.

Bison

- A. Boundary fences: The specification for a standard protective fence will be used as the minimum design criteria for a boundary fence. Six-foot length steel posts will be utilized in place of the standard five and one-half-foot length, steel post. Wood posts will be six and one-half feet in length. Top wire should be set at 52 inches in height.
- B. Internal cross fences: The minimum design criteria are a standard three-wire barbed or two-wire power fence. Fences exceeding minimum criteria will be dependent on producer's need and management.

Elk

- A. Boundary fences: The minimum height will be eight feet. Woven wire with a six-inch by six-inch even spacing or three inches to seven inches variable spacing will be used. Seven feet of woven wire with at least two high tensile wires spaced six inches apart may also be used. Corner, gate, and inline brace posts will be treated wood and a minimum of 8 inches in diameter and 14 feet in length. Line posts will be treated wood with a minimum diameter of 6 inches and 12 feet in length. Maximum line post spacing will be 20 feet.
- B. Internal cross fences: The minimum height will be six feet. Woven wire with six-inch by six-inch even spacing or three inches to seven inches variable spacing will be used. Five feet of woven wire with at least two high tensile wires spaced six inches apart may also be used. Corner, gate, and inline brace posts will be a minimum of 6 inches in diameter and 10 feet in length. Line posts will be treated wood and a minimum of 4 inches in diameter and 10 feet in length. Maximum line post spacing is 20 feet. Specifications for power fence may also be used. Power fences will be a minimum of 6 feet tall with 7 wires spaced approximately 10 inches apart. Posts should be spaced no more than 45 feet apart with stays every 15 feet. A six-inch diameter, eight feet long treated wood line post should be installed every fourth post.
- C. Cross fencing for livestock control in elk country: Migrating elk can cause severe damage to standard barbed wire fencing. To reduce elk impacts a three-eighth inch steel cable should be used as a replacement for the top barbed wire. A four-wire fence is required with the steel cable replacing the top barbed wire.

Deer

Boundary and internal cross fences: Same requirement as for elk boundary fences except the minimum height will be nine feet for both boundary and cross fences. Power fence will not be used.

Horses

To minimize or prevent injury; double-strand, galvanized, barbless wire of 12.5-gauge may be substituted for the barbed wire in a general-purpose or protective fence.

Antelope Crossing

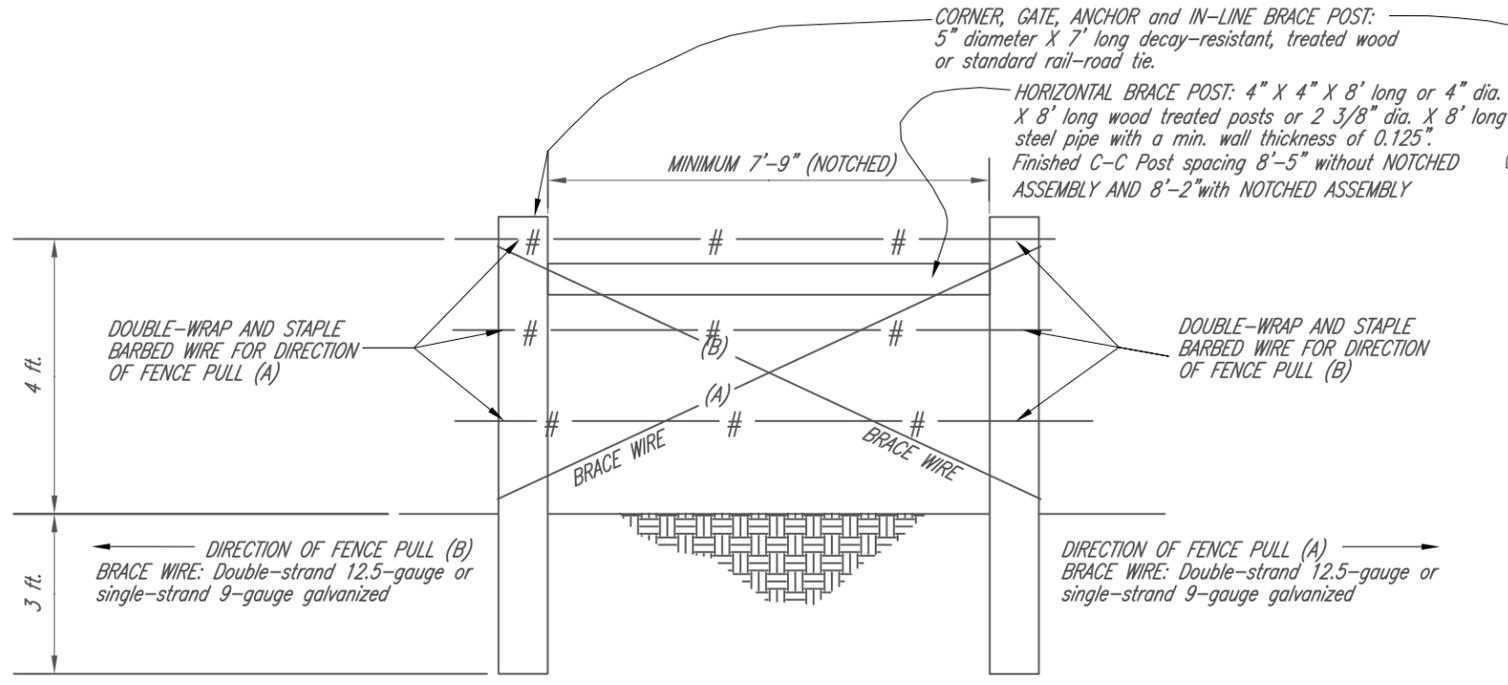
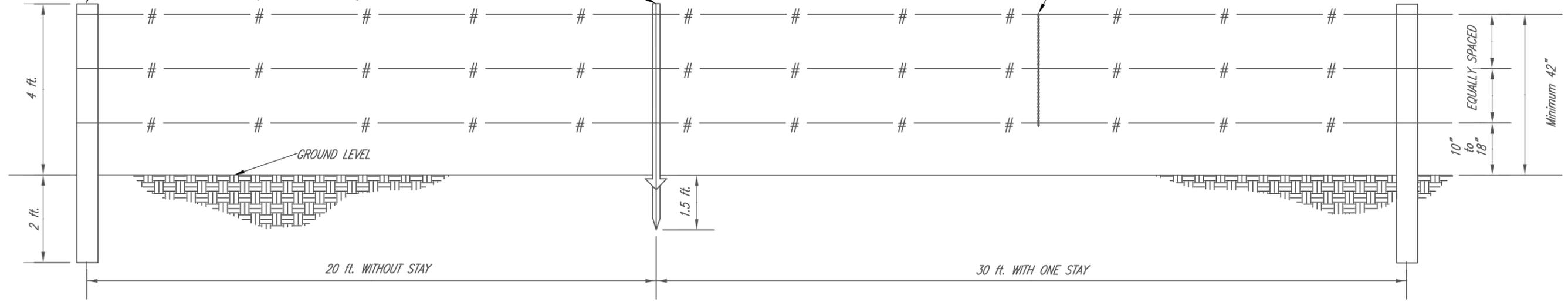
Antelope seldom jump over or go through a fence, but will crawl underneath the fence. The adequate height for an antelope to crawl under is 16-18 inches. The bottom wire should be smooth to further reduce impacts to antelope. Wire spacings are different for cattle and sheep. These fences can be installed in full-length sections or in sections where antelope typically cross. Please see Diagram #1, Antelope Crossing.

Stream Crossing

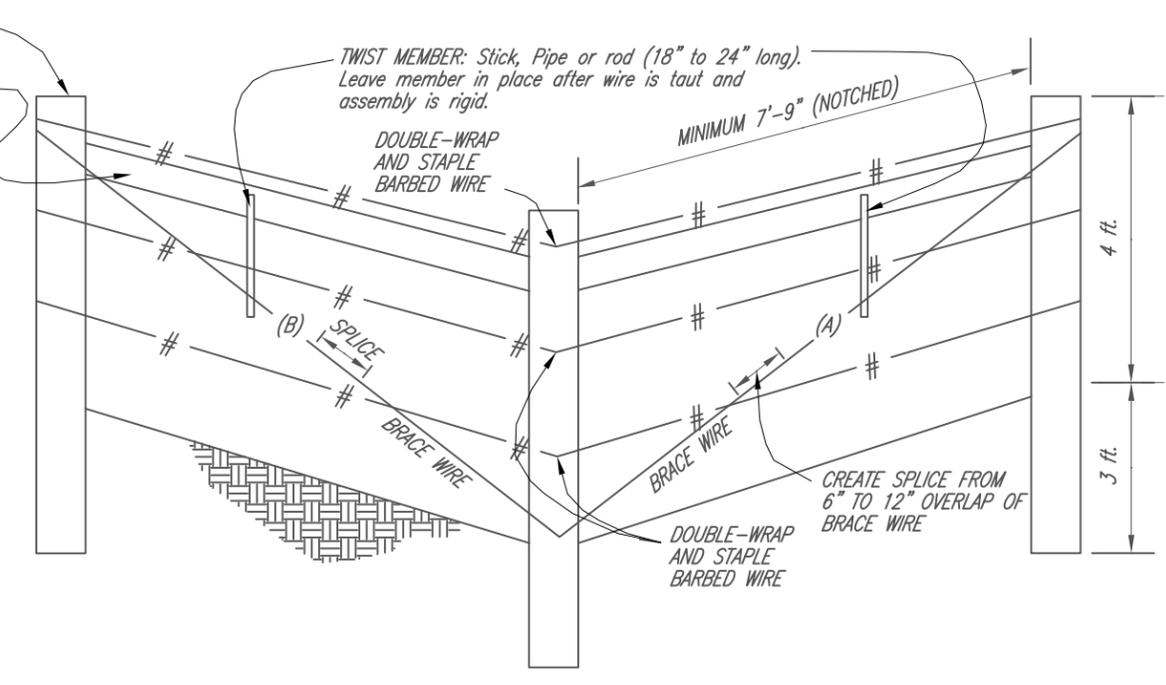
Because of continual maintenance requirements and potential negative impacts on water quality and threatened and endangered species, construction of fences which cross streams should be avoided whenever possible. When fences that cross streams must be constructed, reasonable precautions should be taken to reduce any negative impact to the stream and associated species. South Dakota JS 382-5, Fence Stream Crossing, describes several methods of constructing fences across streams which will minimize impacts. These methods should be used in place of standard fence building techniques when crossing streams.

LINE POSTS: Posts can be either Wood or Steel.
 Wood posts shall be nominal 3" diameter X 6 ft. long.
 Decay-susceptible wood must be treated for below-ground application.
 Steel posts shall be a minimum length of 5.5 ft. and weigh 1.25 lbs./ft. excluding the anchor plate.
 Anchor plate must be firmly attached.

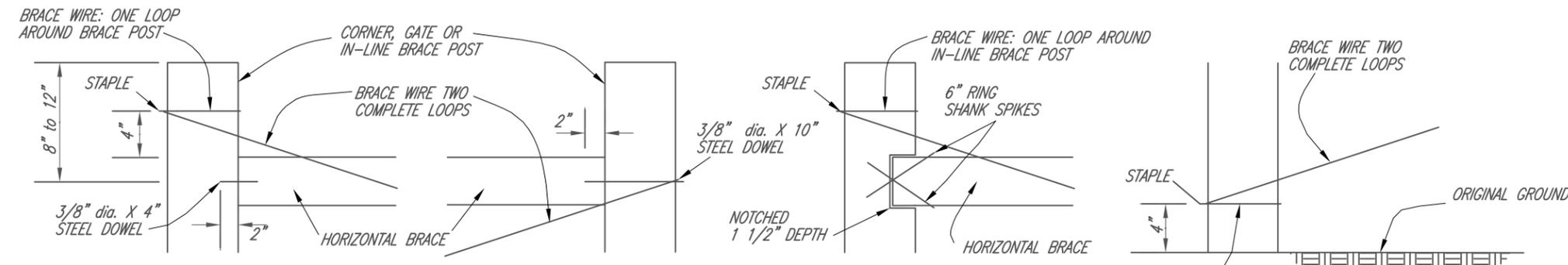
BARBED WIRE: Double-strand galvanized 12.5-gauge with 14-gauge barbs or 15.5-gauge high-tensile strength with 16.5-gauge barbs. Barbs spaced every four to six inches.



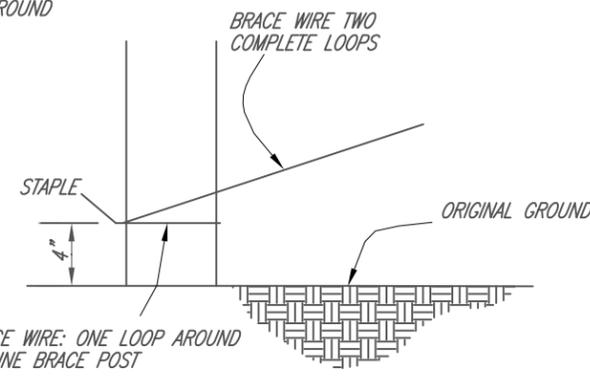
IN-LINE AND GATE BRACING



CORNER BRACING



HORIZONTAL BRACE and ANCHOR ASSEMBLY
 BRACE WIRE OPTIONS FOR SECURED ATTACHMENTS



BRACING AND ANCHORING REQUIRED AT GATES, CORNERS, IN-LINE AND ANY OTHER MAJOR TURNS OR CHANGE IN BOTH HORIZONTAL AND VERTICAL DIRECTION. MAXIMUM IN-LINE BRACE SPACING 1,320 ft.

GENERAL PURPOSE FENCE
 Job Plan No. 19.1 Rev. 9/14

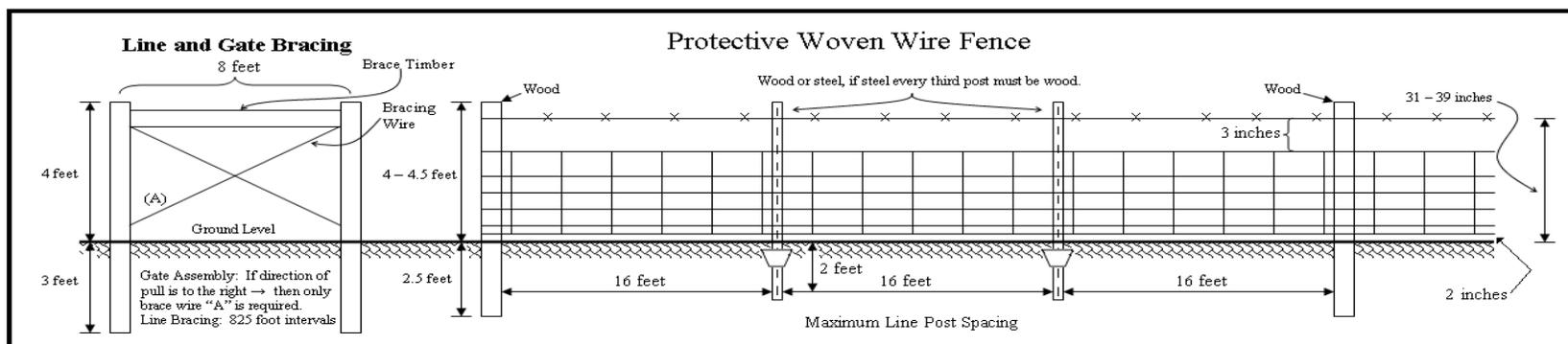
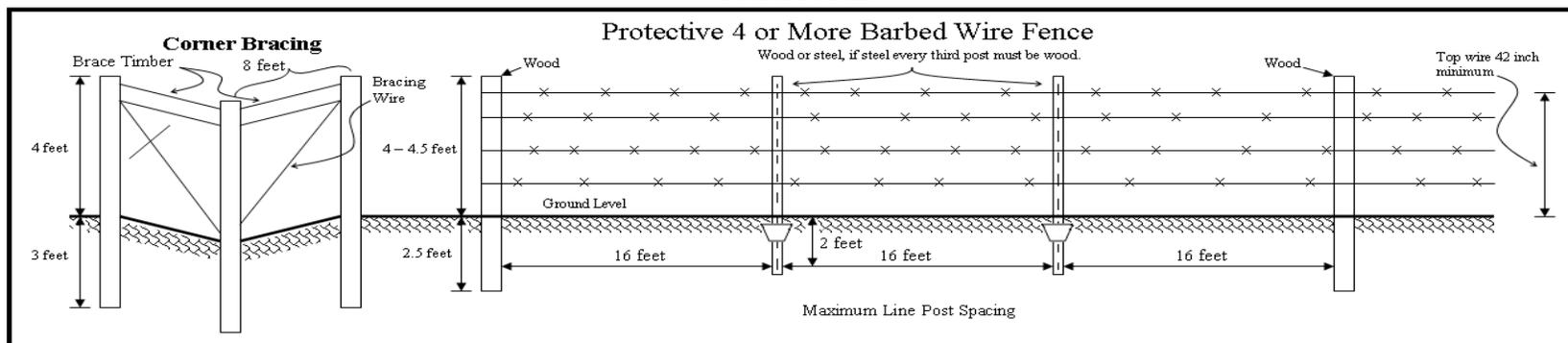
Date _____ Designed _____ Drawn _____ Checked _____ Approved _____
PRODUCER _____ SECT. T. _____ R. _____ COUNTY _____ CONSERVATION DISTRICT _____
USDA - NRCS Natural Resources Conservation Service USDA
File Name: GENERAL PURPOSE FENCE Drawing No. _____ NOTICE SD-380 OCTOBER 2014 Sheet of _____

1. Barbed wire: Double-strand galvanized 12.5-gauge with 14-gauge barbs or 15.5-gauge high-tensile strength with 16.5-gauge barbs. Barbs spaced every four to six inches.
2. Woven wire: 26-34 inch high netting. 11-gauge top and bottom wires. 14.5-gauge intermediate and stay wires. Galvanized or aluminum coated. 6" x 6" or 6" x 12" mesh.
3. Line posts: Wood line posts shall be 4 inch diameter, 6.5 feet long, seated 2.5 feet deep. Decay susceptible wood must be treated for below ground application. Steel line posts shall be a minimum of 6 feet and 1.25 lbs./ft exclusive of the anchor plate. Anchor plate must be firmly attached.
NOTE: Steel posts seated, two feet deep are permitted only if wood post is used every third post.
4. Line post spacing: Maximum line post spacing shall be 16 feet.
5. Clips or 12-gauge galvanized wire will be used for fastening barbed wire to steel posts. 9-gauge x 1.5 inch staples will be used for fastening barbed wire to wood posts.
6. Wire spacing: Barbed-wire fence will have a minimum of four wires with top

wire attached no less than 42 inches above the ground. Lower wires will be spaced at the discretion of the operator. Woven wire fence will have at least one barbed wire attached about three inches above the top of the woven wire. The bottom wire of the woven-wire netting will be attached to the posts within two inches of the ground.

7. Brace: 4"x 4" x 8' treated lumber, 4" diameter x 8' treated wood post or 2 3/8" x 8' galvanized pipe with a wall thickness of .125 inches.
8. Brace wire: Double-strand, 12.5-gauge or single-strand 9-gauge. Must be galvanized.
9. In-line brace assemblies will be spaced at intervals no greater than 825 feet on level terrain.
10. Diagonal braces may be substituted for H-style braces. See SD Job Sheet 382-4.
11. Corner, gate, and in-line brace posts: decay-resistant or treated wood; 5" x 7', seated at least three feet deep.
12. Wires will be double-wrapped and stapled at all corners, in-line brace assemblies, and gate posts.

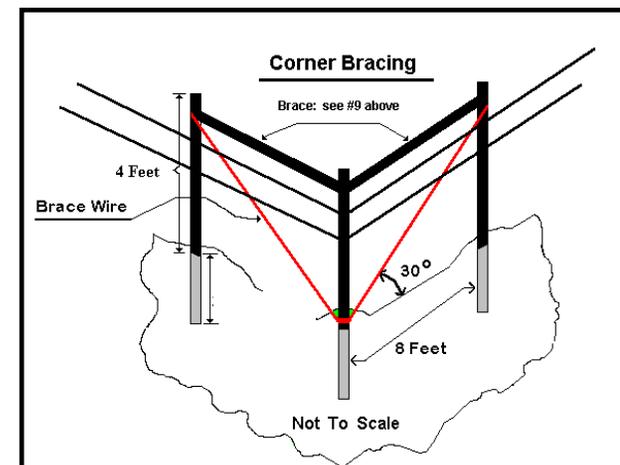
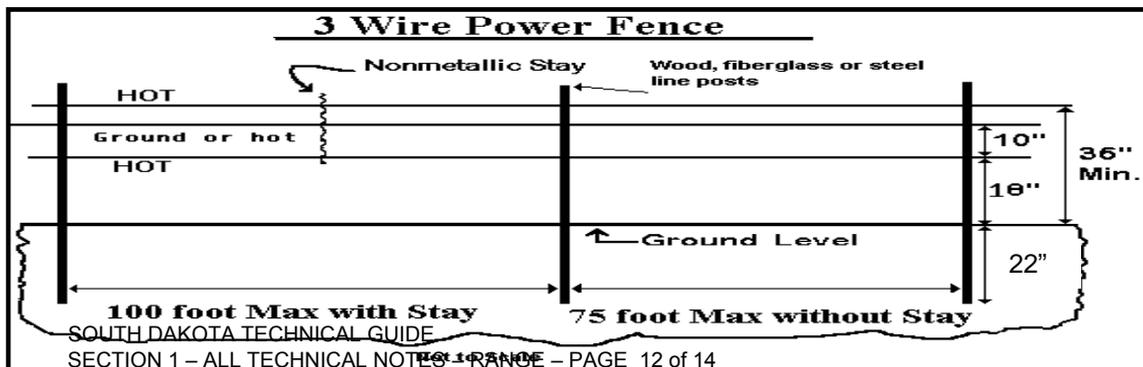
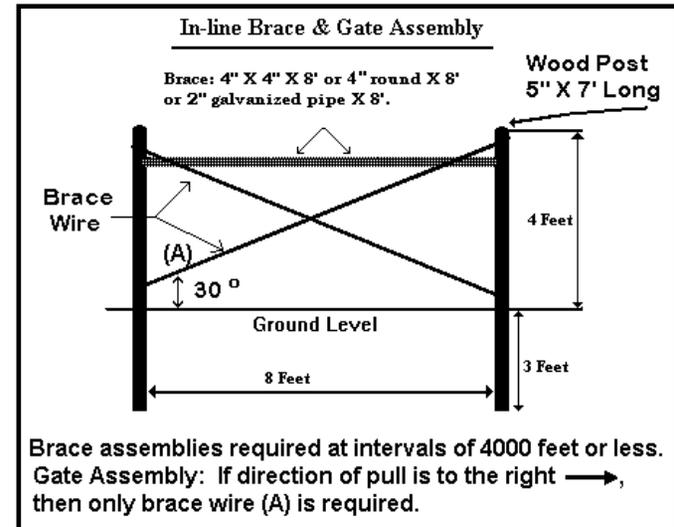
Construction



1. Wire will be smooth, 12.5 gauge, high-tensile strength (170,000 psi), type III galvanization or better.
2. Single wire permanent power fence will have the wire located 24 to 32 inches above the ground level.
3. Two-wire power fence will have the top wire (hot) at least 30 inches above the ground and the bottom wire (cold) 10 inches below the top wire.
4. Three-wire power fence will have the top wire (hot) 42 inches above the ground. The middle wire (cold) will be 10 inches below the top and the bottom wire (hot) will be 10 inches below the middle wire.
5. An in-line strainer device will be installed on each wire to maintain correct tension. Wire tension will be sufficient to maintain proper wire spacing between posts.
6. For one and two-wire power fence, line post spacing shall not exceed 75 feet. Stays are not recommended.
7. For three or more wire power fences post spacing shall not exceed 75 feet without stays, or 100 feet with stays. Stays will be made from non-conductive material.
8. Brace assemblies will be spaced at intervals no greater than 4000 feet.
9. Brace timbers will measure a minimum of 4" x 4" x 8' treated lumber, 4" diameter treated posts, or 2 3/8" x 8' galvanized steel pipe with an wall thickness of .125".
10. Diagonal braces may be substituted for H-style braces. See SD Conservation Job Sheet 382-4 Diagonal Brace.
11. Brace wire will be double strand, 12.5 gauge or single strand 9 gauge galvanized smooth wire.
12. Corner, gate, and in-line brace posts will be a minimum of 5" x 7" treated or decay resistant wood.
13. Line posts: wood post will have a minimum top diameter of 1.5 inches and be treated or decay resistant. Fiberglass T-posts will be a minimum of 1" x 1". Steel posts will weigh a minimum of one pound per foot and have an anchor plate attached. Fiberglass posts will have a minimum diameter of 7/8". Posts will be set a minimum of 16" in the ground except in sandy material where 24" may be required.

Porcelain, ceramic, or high quality UV stabilized polypropylene insulators will be used on wood and steel posts.

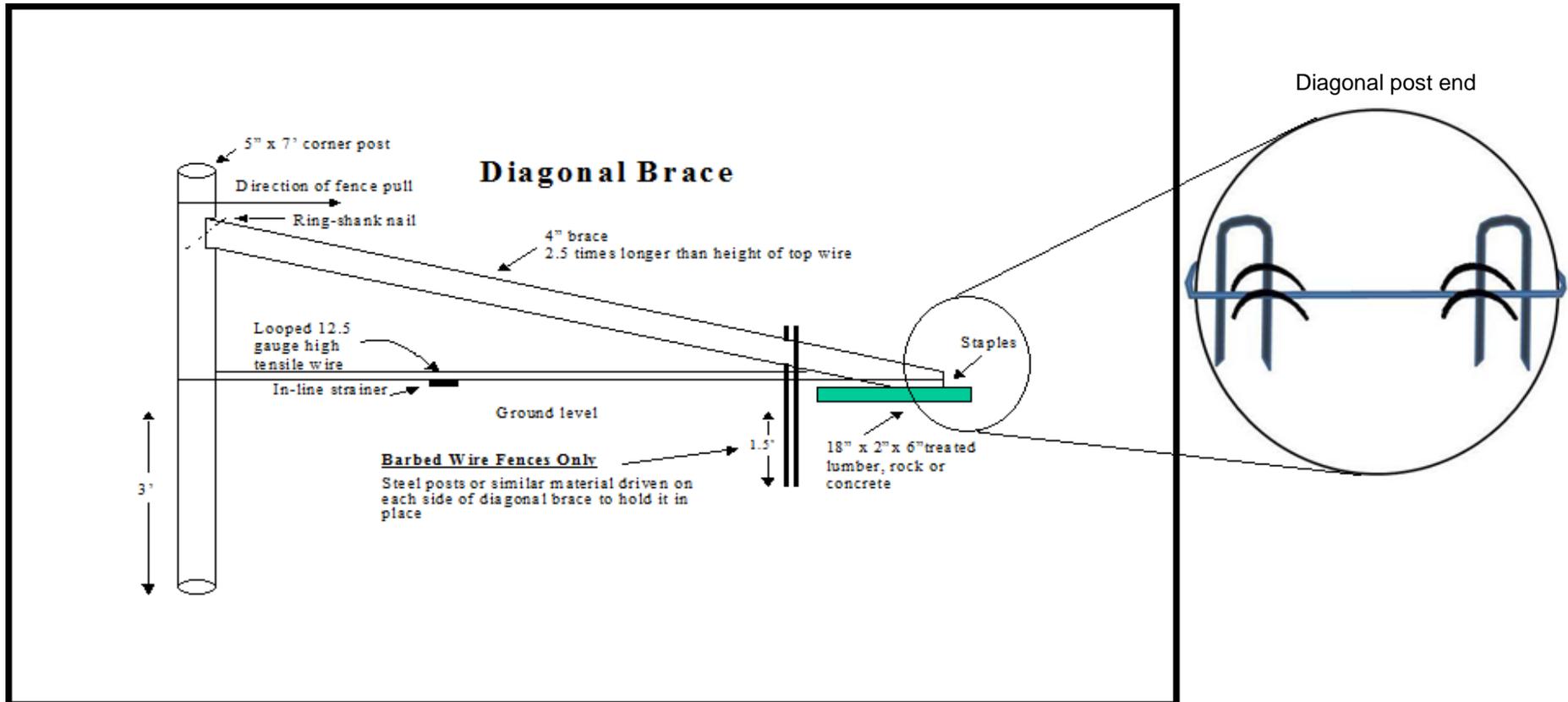
14. Fence and energizer will be grounded as per energizers manufacturer's recommendation.
15. Energizers will be high power, low impedance with a peak output of 5000 volts and a pulse duration of 1/3000 second or less.



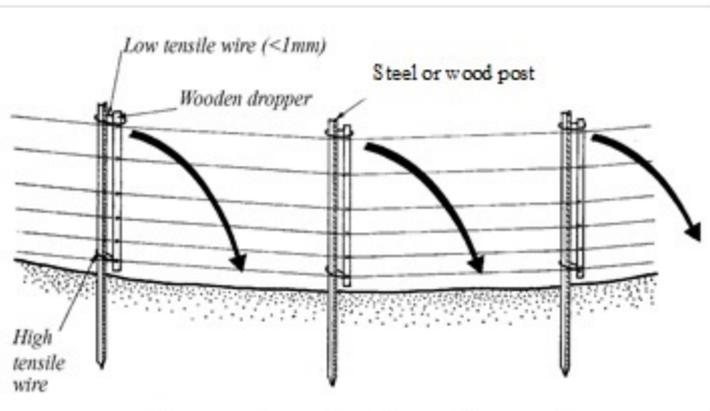
1. The diagonal brace assembly may be used as a brace at a gate, an in-line brace, or at corners. When used as an in-line brace or at corners another diagonal brace post and required appurtenances will be added at the appropriate angle to the single 5" x 7" vertical post.
2. Brace: 4" x 4" treated lumber or 4" diameter treated wood post that has a minimum length of 2.5 times the height of the top fence wire. Also, can be 2 3/8" diameter with a 0.125 wall thickness steel pipe of the same length requirements as the wood.
3. Brace wire: High tensile 12.5-gauge wire with an in-line strainer attached for proper tensioning.
4. In-line brace assemblies will be spaced at intervals no greater than 4,000 feet for power fence, 1,320 feet for general purpose fence and, 825 feet for protective fence on level terrain.
5. Corner, gate, and in-line brace posts will be decay-resistant or treated wood, 5" x 7' long. Seating depth at least three feet.

6. Treated lumber, a flat rock, concrete or patio block will be placed under the diagonal to keep it from digging into the ground and allowing it to "float."
7. Staples should be placed between the brace wire and the post at the end of the diagonal brace to keep the tensioning wire from digging into the wooden brace post.
8. When the diagonal brace assembly is used with a barbed wire fence, two pieces of steel post or similar material should be used to stabilize the brace. Drive each piece 1.5 feet deep on each side of the lower end of the brace as shown in the figure below.
9. To function properly the diagonal brace must be allowed to float. Do not firmly attach any of the fence line wires to the diagonal. Wires attached to the diagonal must be allowed to slide through an insulator or a staple.

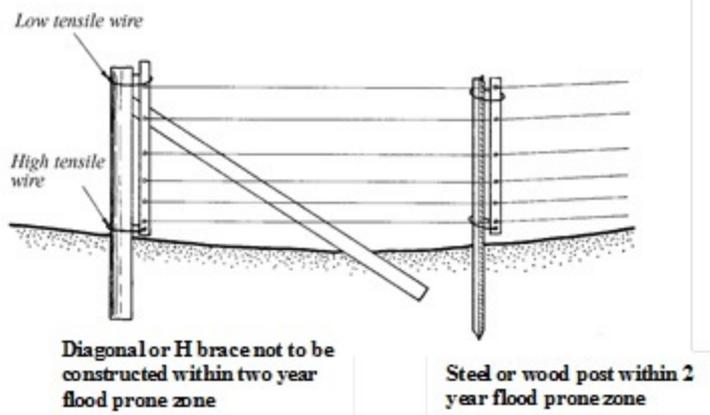
Construction



FENCE STREAM CROSSING



Figures 1 and 2. Drop-Down Fence



Fences that work most successfully on streams which flood are those that give way and lay down flat under flood conditions (Figures 1 and 2). Another successful option is to leave a gap in the permanent fencing and fill it in with temporary electric fencing when livestock are present or if terrain allows a gate which is open or closed depending on livestock presence or absence (Figure 3).

When using either fencing methods no H or diagonal brace assemblies should be placed within the two year flood prone zone. Brace posts are placed outside the flood prone zone and the drop-down or temporary electric fences or gate assembly are built between the braces. Any posts placed into the ground within the two year flood prone zone should be driven steel T posts or 2x2 or similar wooden post. No posts should be placed in bored holes within the flood prone zone.

A drop down fence shown in Figures 1 and 2 is constructed as a normal fence except that the section built in the flood prone zone is not attached to posts but to wooden droppers which are attached to posts with low tensile wire at the top and high tensile at the bottom. When flooding occurs, the top wires will break causing the fence to lay flat thus reducing the amount of trapped debris. In the event of complete failure, damage will be limited to in between the brace post assemblies.

If terrain and stream size allow, a gate assembly can be built across the two year flood prone zone. Simply close it when livestock are present and open when they are removed. Temporary electric fences can also be used to fence across the flood prone zone. See the Range Technical Note No. 7 for more detail on installing electric fence.

Figure 3. Temporary Electric Fence or Gate Assembly

