



United States Department of Agriculture
Natural Resources Conservation Service

Fence

Woven Wire

Virginia Conservation Practice Job Sheet

Code 382(b)



Definition

A constructed barrier to animals or people.

Purpose

This job sheet is provided as a component of a resource conservation plan. This practice facilitates the accomplishment of conservation objectives by providing a means to control movement of animals and people, including vehicles.

General Criteria and Specifications

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

Position fences to facilitate management requirements. Plan ingress/egress features such as gates and cattle guards.

Plan and install fence to provide the desired control, life expectancy, and management of animals and people of concern by using the appropriate fence height, size, wire spacing and type of materials.

Use the VA Materials and Construction Specifications and this Job Sheet to plan, design and construct the appropriate type of fence to meet project needs.

Design and install fences to meet the life expectancy of the practice and to comply with all federal, state and local laws and regulations.

Landscape timbers shall not be used for any part of a fence system.

Fence Type

Woven 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 is offered in two main types including the traditional “hinge joint” and “continuous stay fixed knot.”

In a conventional 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.

The combination of high tensile strength plus the continuous stay fixed knot design, provides superior vertical strength in a woven wire fence that won't stretch (<1% elongation) and allows for a wider line post spacing. All woven wire fence material shall conform to the requirements in Table 3 and ASTM A116.

Conventional Hinged Joint Woven Wire:

For Cattle, fencing shall be Type1047 woven wire, which has 10 line wires, with stays (the vertical wires) on 9” spacing. Top and bottom line wires shall be at least 10 gauge (medium

weight) and the filler wires (the remainder of the fence wires) will be a minimum of 12½ gauge.

For Horses, use “square knot mesh” which has 2” horizontal by 4” vertical openings, or “V-mesh” (diamond mesh) style horse fencing with triangular openings 2” wide by 4” tall. The mesh must be fastened by wire wrapping with no sharp wire ends. Horse fences should be 47” to 50” high. Horizontal wires and stay wires must be 12½ gauge steel.

For other Animals, use a woven, mesh or net wire fence configured with varying height and wire spacing appropriate to the type of animal being controlled as recommended by the manufacturer. Welded mesh is prone to failure, and therefore is not recommended or allowed.

Woven wire for sheep and goats should have vertical stays wide enough (9-12”) 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.

Fence Top Deterrent

All hinge joint woven wire fencing used for cattle, horses, goats, and sheep (Table 1) needs fence top deterrent using barbed wire, or high tensile electric, or wood rail according to the following:

Barbed wire: At least one strand of barbed wire is to be placed no more than 6” above the woven wire (Table 1). Additional strands may be added above the first at the same spacing. The barbed wire shall consist of 2 strands of wire with class 3 galvanized 4-point barbs spaced not more than 5” apart. Galvanized barbed wire shall be fabricated from 12½ gauge class 3 galvanized or high tensile 15½ gauge class 3 galvanized barbed wire and meeting the

requirements of ASTM A121. Barbed wire should not be electrified.

Electrified Wire: In lieu of barbed wire, the same number of 12½ gauge high tensile galvanized wires may be installed electrified on the spacing needed for barbed. The wire must be mounted on insulators or stand-offs and energized as required by the high tensile electric fence job sheet. Electric and barbed wire fence top deterrents should not be combined. Another very effective alternative is to use a single electric 12 ½ gauge high tensile galvanized wire mounted on an offset on the inside of the fence at nose height of the animal controlled.

Wood Rail: A wood top rail may be installed no more than 6” above the woven wire to strengthen the fence in lieu of top wires. The fencing may be stapled to the rail for added stiffness.

Wire placement

Fencing and top deterrent (barb wire) should be installed following guidance in Table 1 of the Fence Material and Construction Specification.

For barbed wire at the fence top, pull taut. A stretch of 100 feet (prior to attachment to posts) should sag no more than in the middle 4” in warm weather and not more than 2” in cold weather.

High tensile continuous stay fixed knot woven wire 12½ gauge may be used for all animals as specified by manufacturer.

Specific information regarding allowable materials and construction for line posts, brace posts, brace assemblies, brace rails, fence wire, staples, fasteners, splicing, gates and other considerations are explained in detail in the text and Tables 1-9 of the Fence Materials and Construction Specifications.

Specifications are prepared in accordance with the NRCS Field Office Technical Guide. See Conservation Practice Standard *Fence* (382) and the Fence Materials and Construction Specification. Additional provisions are entered on the job sketch sheet.

Client/Operating Unit:	Farm #:
Field(s):	Tract #:
Planned By:	Location:
Date:	Length of Fence:
Landowner Objectives:	

Purpose (check all that apply)	
<input type="checkbox"/> Control the movement of animals	<input type="checkbox"/> Control the movement of humans
<input type="checkbox"/> Control the movement of equipment or vehicles	<input type="checkbox"/> Other (specify)
List type(s) of animals controlled:	

Woven Wire Fence Characteristics (per ASTM A116)		
Check all that apply: <input type="checkbox"/> Conventional Hinge Joint <input type="checkbox"/> Fixed Knot Continuous Stay <input type="checkbox"/> High Tensile <input type="checkbox"/> Other _____	Number of line wires _____ Fence fabric height (in.) _____ Stay spacing (in.) _____ Size (gauge) • Stay wires _____ • Intermediated line wires _____ • Top and bottom line wires _____	• Class 3 Galvanized Coating <input type="checkbox"/> YES <input type="checkbox"/> NO (problem) • Tensile strength grade <input type="checkbox"/> Grade 60 <input type="checkbox"/> Grade 125 <input type="checkbox"/> Grade 175 <input type="checkbox"/> Other _____
Type of Fence Top Deterrent or Inside Offset Used if Applicable:		
<input type="checkbox"/> Double strand 12.5 gauge 4 point barbed wire Class 3 galvanized Number of strands: _____ <input type="checkbox"/> Double strand high tensile 15.5 gauge 4 point barbed wire, Class 3 galvanized No. of strands: _____ <input type="checkbox"/> 12.5 gauge high tensile smooth Class 3 galvanized electric wire Number of strands: _____ <input type="checkbox"/> Wooden board rail: ___ Oak ___ Red Cedar ___ Black locust ___ Pressure treated wood <input type="checkbox"/> Not applicable explain: _____		

Line Posts*	
• Material Type _____ • Top diameter (inches) _____ • Shape _____ • Length _____ • Coating (if applicable) _____ • Max spacing _____ • Depth in ground _____	Other notes:

***Landscaping timbers should not be used.**

Brace Posts*	Brace (Guy) Wire
<ul style="list-style-type: none"> ● Material _____ ● Size/diameter and length _____ (Corner, ends, pull, and gate posts) ● Size/diameter and length _____ (all other brace posts) ● Depth _____ 	<ul style="list-style-type: none"> <input type="checkbox"/> 12.5 ga., galvanized steel, HT double wrapped <input type="checkbox"/> 9 ga., galvanized steel, soft wire single wrap <input type="checkbox"/> A single 3/16" galvanized cable with cable lock

***Landscaping timbers should not be used.**

Horizontal Brace Rail	Diagonal Brace Rail
<ul style="list-style-type: none"> ● Material _____ ● Size (diameter and length) _____ ● Height from ground _____ ● Brace post notched <input type="checkbox"/> Yes or <input type="checkbox"/> No 	<ul style="list-style-type: none"> ● Material _____ ● Size (diameter and length) _____ ● Height of anchor post above ground _____

Operation and Maintenance
<p>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:</p> <ol style="list-style-type: none"> 1. Inspect fences after storm events 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 brush and vegetation from fence lines. 5. Remove fallen limbs from fence wires. Overhanging trees and limbs should be trimmed or removed as needed. 6. Maintain proper tension on the fence wires. 7. All necessary precautions should be taken to ensure the safety of construction and maintenance crews. <p>Other: _____</p>

Planner Certification
<p>The Fence practice planned in this job sheet fulfils minimum requirements of VA NRCS Practice 382(b).</p> <p>_____ Signature</p> <p>_____ Title</p> <p>_____ Date</p>

Certification of Practice Completion

The Fence practice planned in this job sheet has been completed according to NRCS specifications (indicate in Practice Specifications any changes to planned activities).

Signature

Title

Date

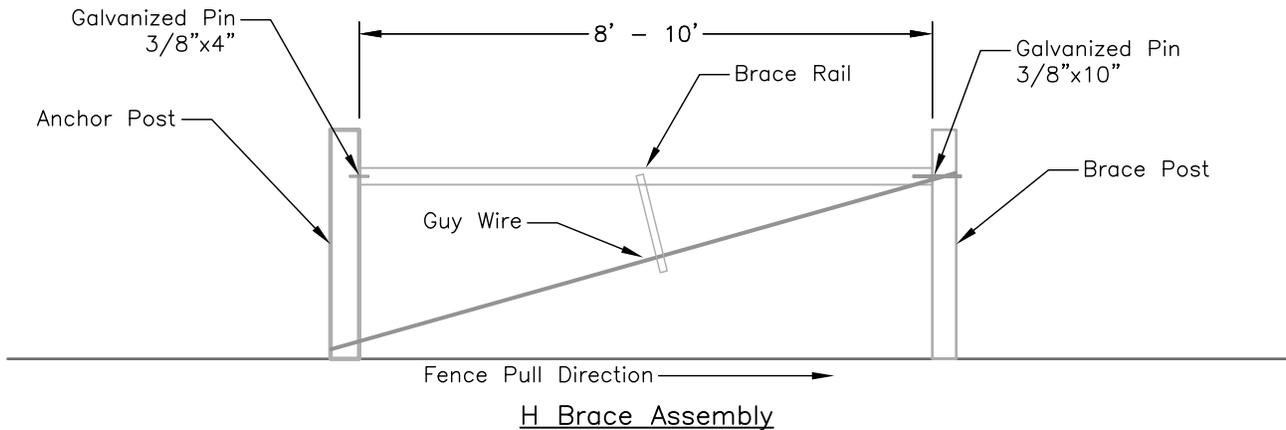
If needed, an aerial view or a side view of the practice can be shown below. Other relevant information, complementary practices and measures, and additional specifications may be included.

Scale 1"= _____ ft. (NA indicates sketch not to scale: grid size=1/2" by 1/2")

Additional Specifications and Notes:

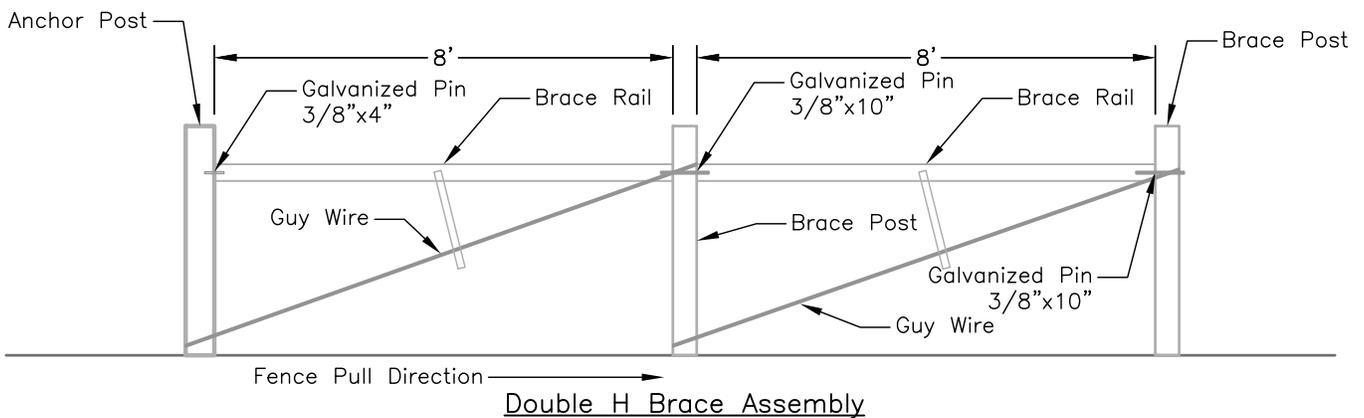
"The U.S. Department of Agriculture (USDA) prohibits discrimination in all of its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex (including gender identity and expression), marital status, familial status, parental status, religion, sexual orientation, political beliefs, genetic information, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD)."

Woven Wire Fence Construction and Installation Drawings



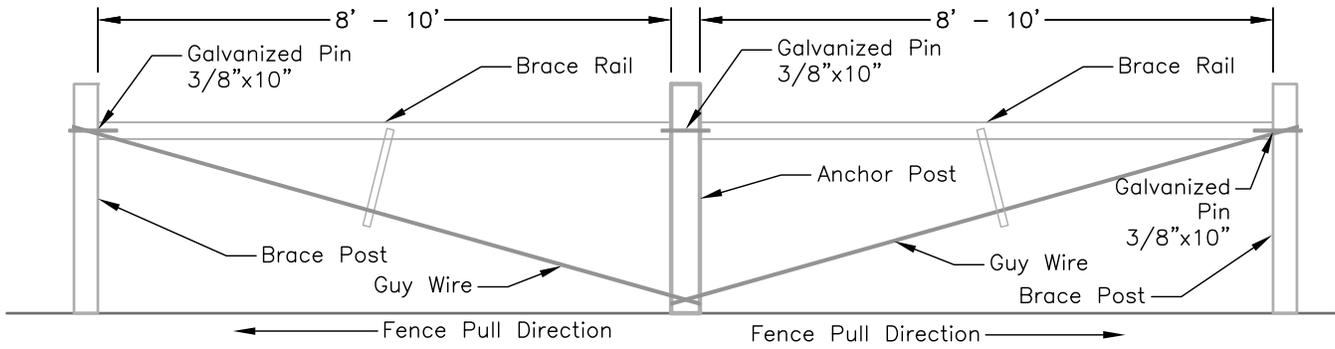
Construction Notes

1. Brace width will be a minimum of 2 times the height of the top fence wire above the ground. ($2\frac{1}{2}$ times is preferred)
2. See Table 5 for corner, gate, and end post size and depth requirements.
3. Tension guy wires with a fence wire tightener or a treated twist stick approximately in the middle of the guy wire.
4. For guy wires, use 2 complete loops of $12\frac{1}{2}$ ga. HT wire or a single strand of 9 ga. soft wire.
5. Brace rail should be between the top two fence wires of the fence fabric.



Construction Notes

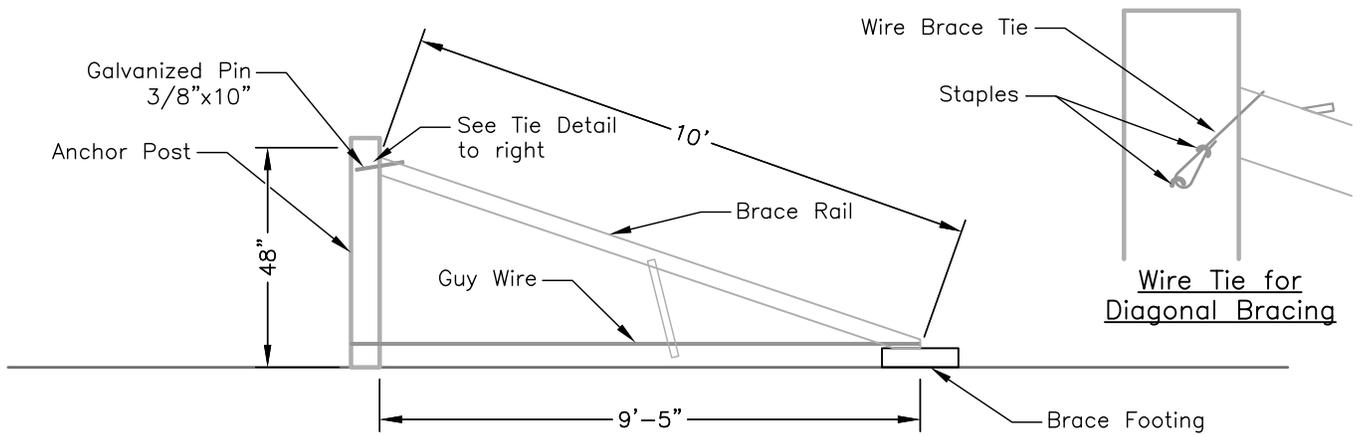
1. Brace width will be a minimum of 2 times the height of the top fence wire above the ground. ($2\frac{1}{2}$ times is preferred)
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In-Line Pull Post Assembly

Construction Notes

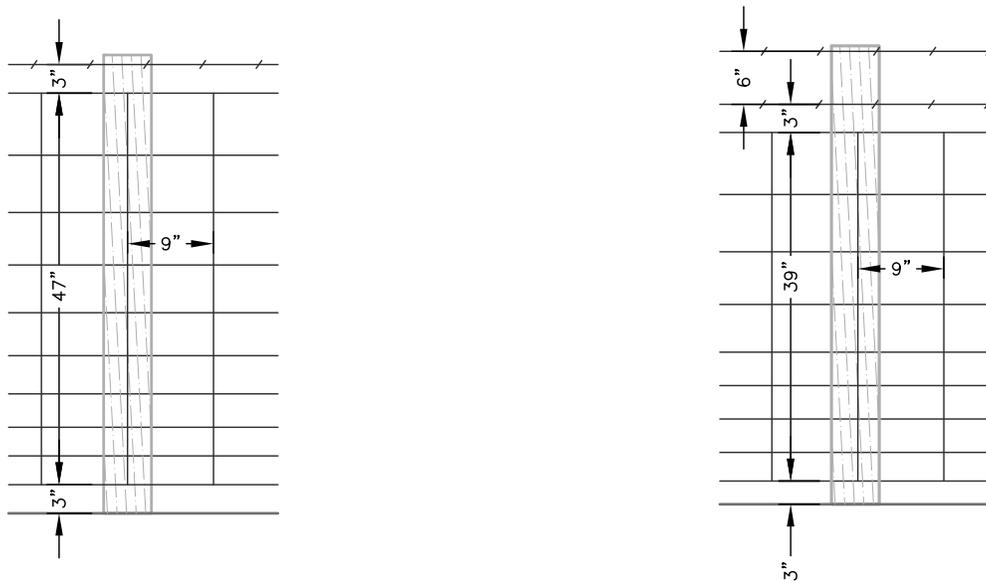
1. Brace width will be $2\frac{1}{2}$ times the height of the top fence wire above the ground.
2. See Table 5 for corner, gate, and end post size and depth requirements.
3. Tension guy wires with a fence wire tightener or a treated twist stick approximately in the middle of the guy wire.
4. For guy wires, use 2 complete loops of $12\frac{1}{2}$ ga. HT wire or a single strand of 9 ga. soft wire.
5. The fence wire shall be cut and tied off at the anchor post and start a new fence wire for the next fence section.
6. Brace rail should be between the top two fence wires of the fence fabric.



Typical Diagonal Floating Brace Assembly

Construction Notes

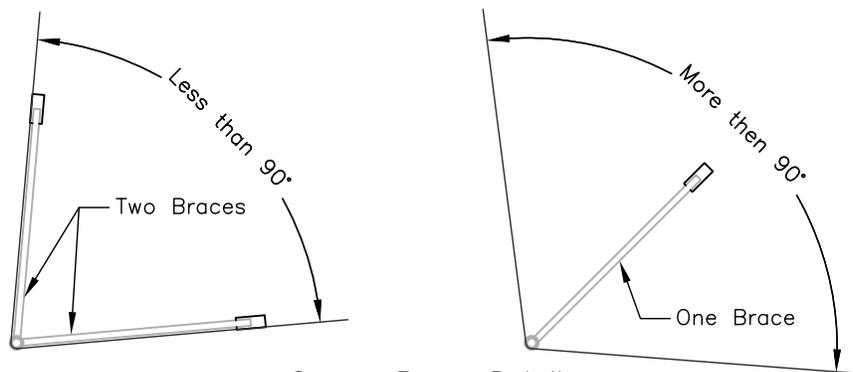
1. Diagonal brace member length will be $2\frac{1}{2}$ times the height of the top fence wire above the ground.
2. See Table 5 for corner, gate, and end post size and depth requirements.
3. Tension guy wires with a fence wire tightener or a treated twist stick approximately in the middle of the guy wire.
4. For guy wires, use 2 complete loops of $12\frac{1}{2}$ ga. HT wire or a single strand of 9 ga. soft wire.
5. The brace footing shall have 100 square inches of ground contact, at a minimum.
6. The footing shall be 2" to 4" thick and can be concrete block, paving stone or a flat rock.
7. A diagonal floating brace can be substituted at corner, gate, end post H brace assemblies and in-line pull assemblies.



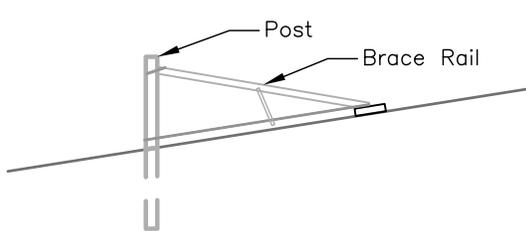
Typical Mounting Heights for Barbed Wire Used
Above Hinged Joint Woven Wire Fence

Construction Notes

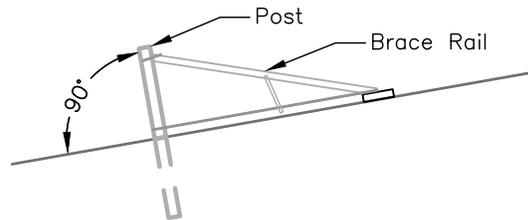
1. The bottom strand of woven wire is typically hung between 2" to 4" above the ground.
2. For small ruminants the woven wire is hung starting at the ground level to minimize the threat from some predators.
3. A single strand of HT smooth electric wire can be installed using 6" minimum offsets on the inside of the woven wire fencing at nose height of the livestock, to add an electric component to the fence system for enhanced grazing management.



Corner Brace Detail
Options

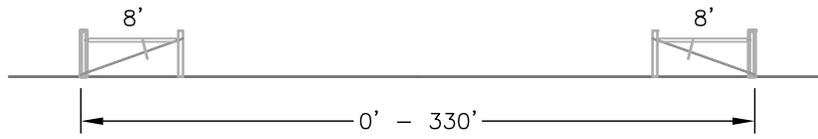


Posts on Slopes
Up to 21% Slope

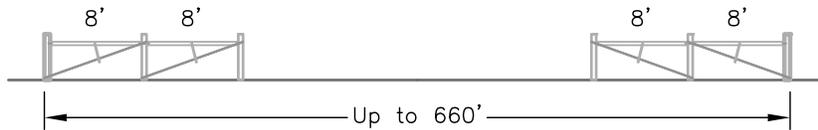


Posts on Slopes
More Than 21% Slope

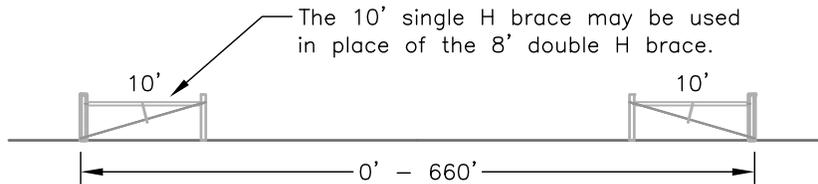
Single and Double H Brace Assembly Position and Construction
for Standard Hinge Joint Woven Wire Fence



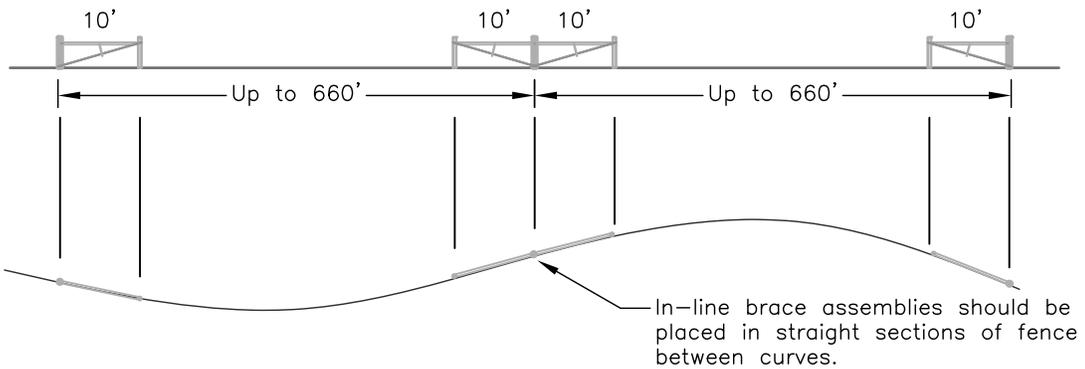
Single H Brace Assembly



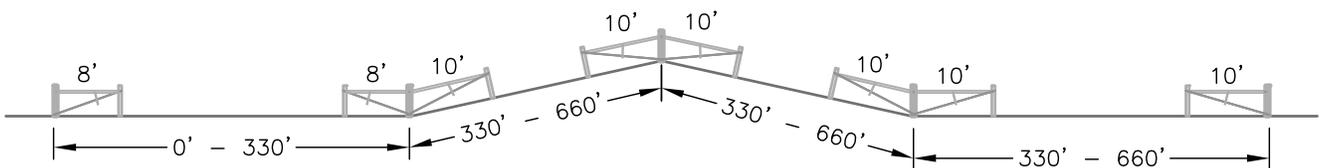
Double H Brace Assembly



Single H Brace Assembly

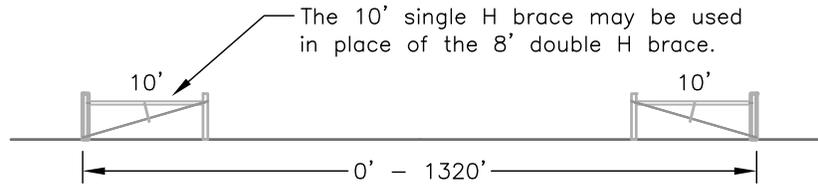


Curved Fence on Flat Land

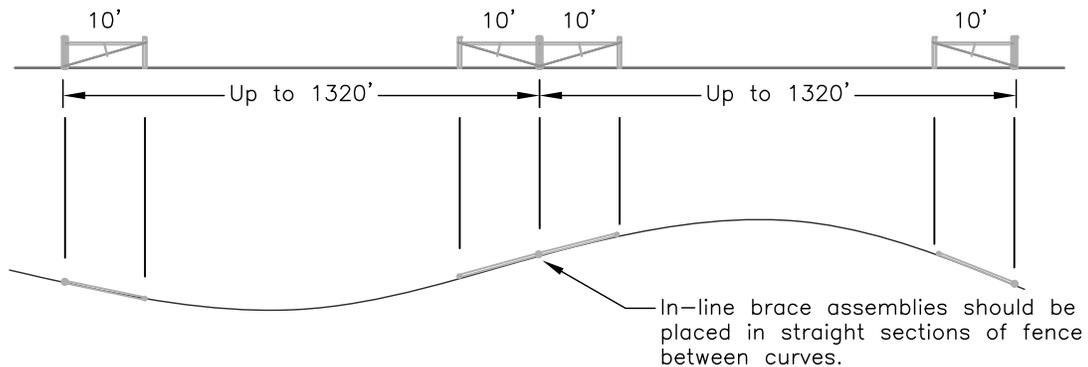


Straight Fence on Rolling Land

Brace Assembly Position and Construction for High Tensile Fixed Knot Woven Wire Fence

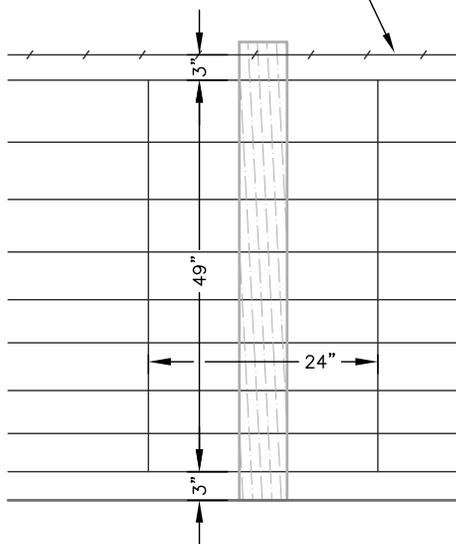


Single H Brace Assembly

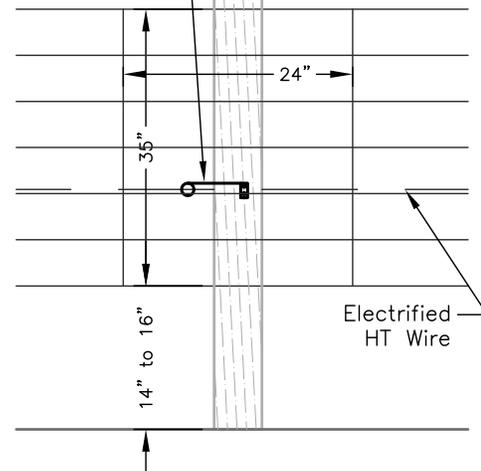


Curved Fence on Flat Land

Fence top deterrent wire optional
per manufacturers recommendations



Insulated Offset Bracket
4" long minimum

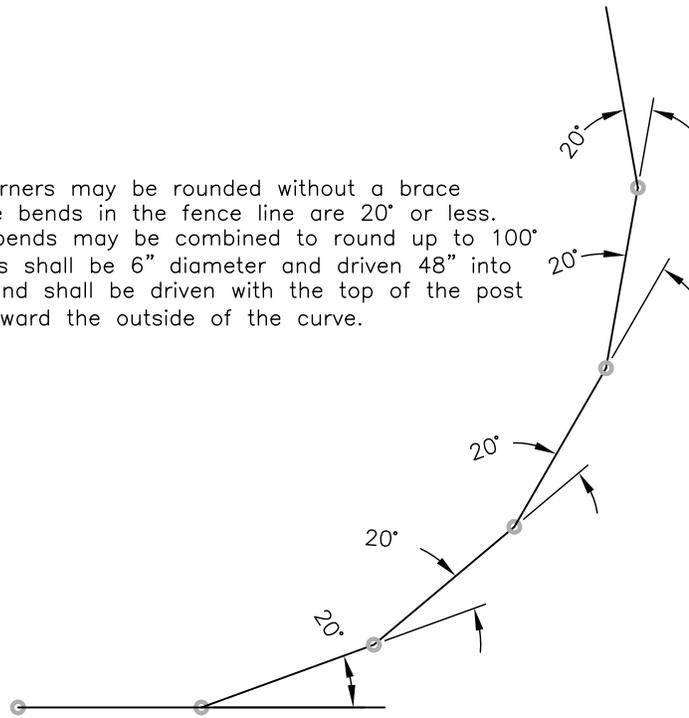


Typical Mounting Configuration for High Tensile
Fixed Knot Woven Wire Fence

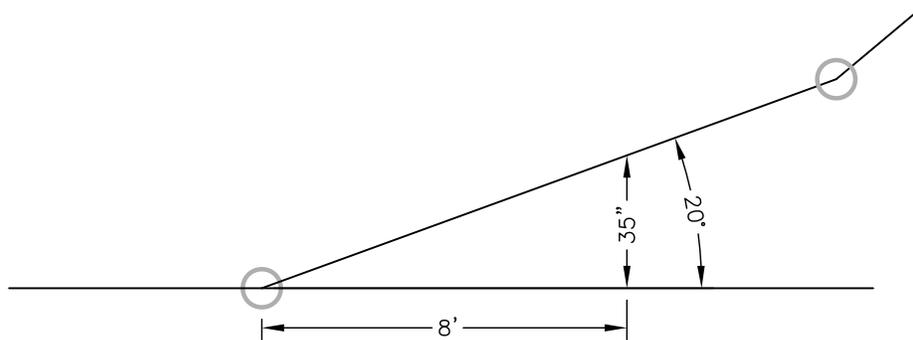
Construction Notes

1. The horizontal line wire and stay spacing will depend on the type of livestock being controlled
2. HT Fixed Knot WW fence can be installed per manufacturers recommendations up to 16" from the ground surface as internal cross fencing or as riparian exclusion fence if used with a single strand of HT electric wire offset at nose height of the cattle being controlled.
3. A single strand of HT smooth electric wire can be installed using 6" minimum offsets on the inside of the woven wire fencing at nose height of the livestock, to add an electric component to the fence system for enhancing grazing management or to maintain containment where fence is not installed near ground level.

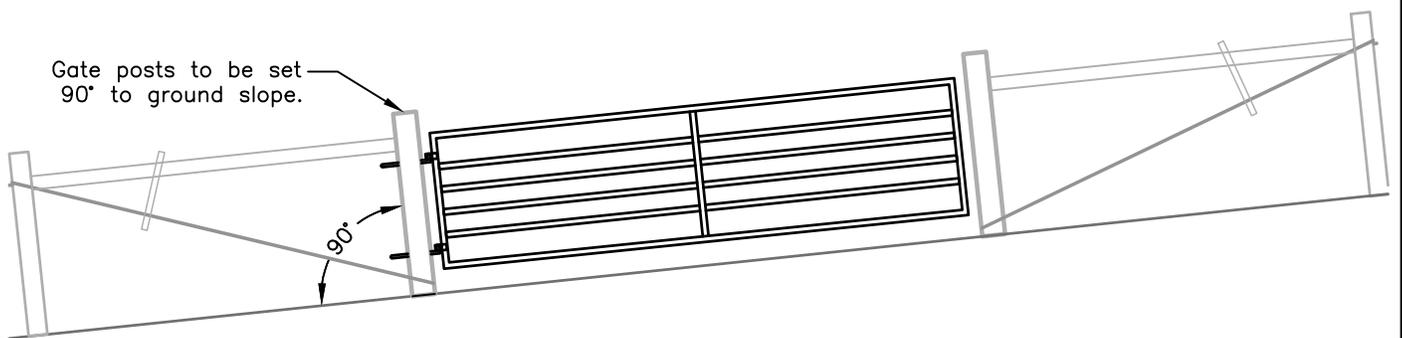
Curves or corners may be rounded without a brace system if the bends in the fence line are 20° or less. Multiple 20° bends may be combined to round up to 100° bends. Posts shall be 6" diameter and driven 48" into the ground and shall be driven with the top of the post leaning 4" toward the outside of the curve.



Rounding Sharp Corners or Curves

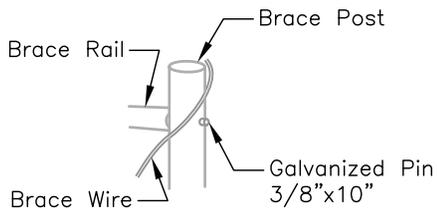


Determining Angle of Direction Change

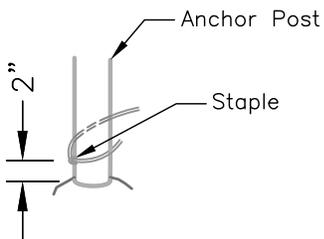


Hanging Gates

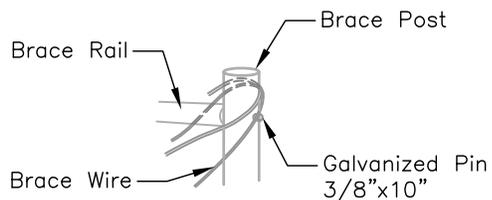
Brace Assembly Construction Detail



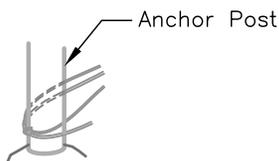
Wrap brace wire around brace post above protruding galvanized pin on opposite side from brace.



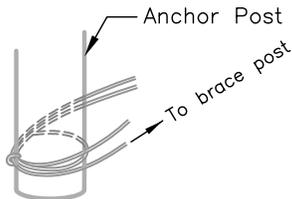
Drive a staple to half its length into anchor post about 2" from ground line opposite side of brace.



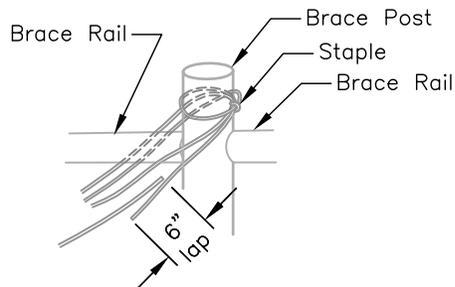
Unroll enough brace wire for two complete loops around anchor and brace post.



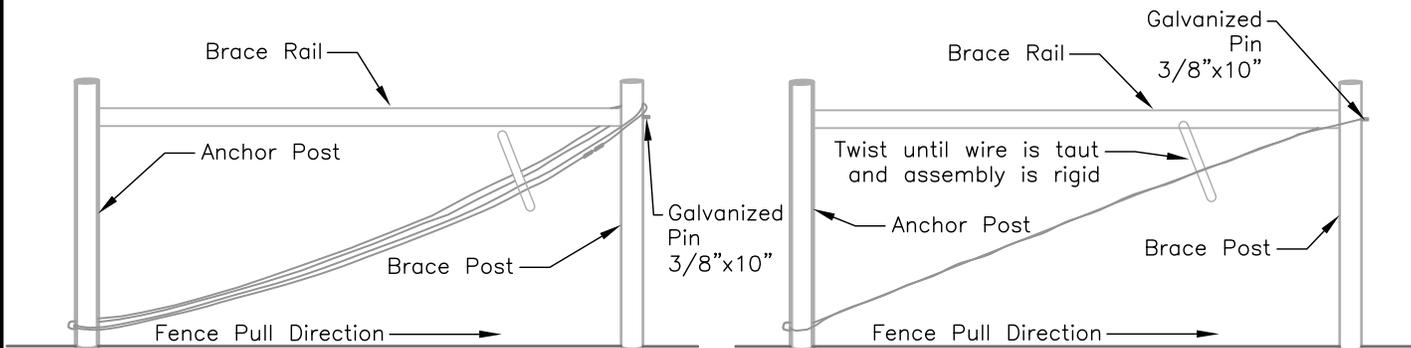
Thread end of brace wire through one staple and then through the other. Repeat to from three wire strands.



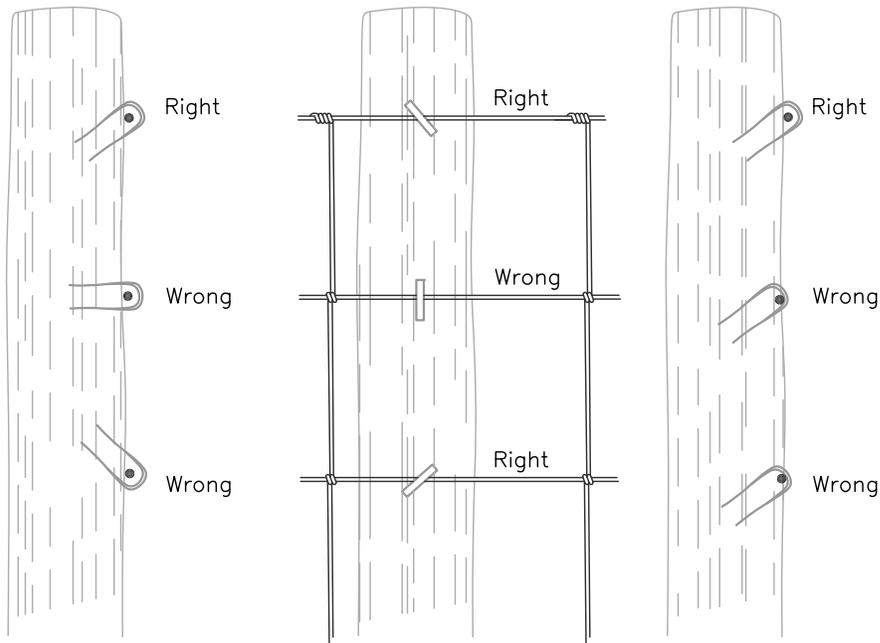
Wrap wire around anchor post and return toward brace post.



Cut brace wire from roll allowing enough wire to wrap around brace post and extend 6" to 12" past other wire end. Make splice.



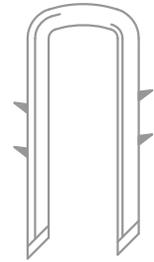
Wire Attachment Details



Drive staples at a downward angle.

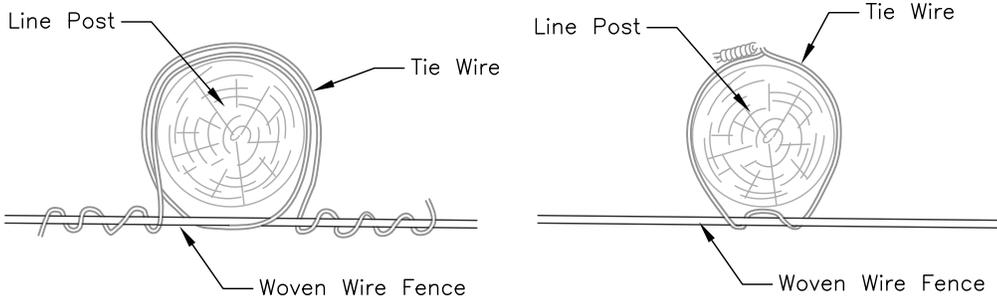
Do not drive staples parallel to side of post.

Leave wire loose in staple.

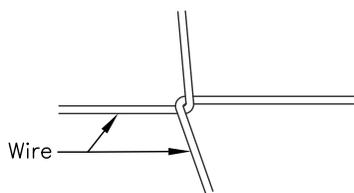


No. 9 gauge, Class 3 galvanized barbed staple, 1½" minimum

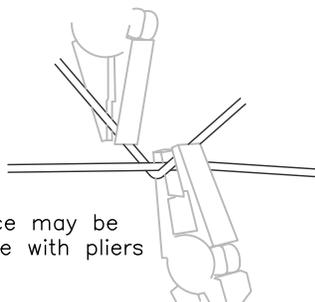
Staple Detail



Post Attachment Details



Step 1



Splice may be made with pliers

Step 2



Completed splice

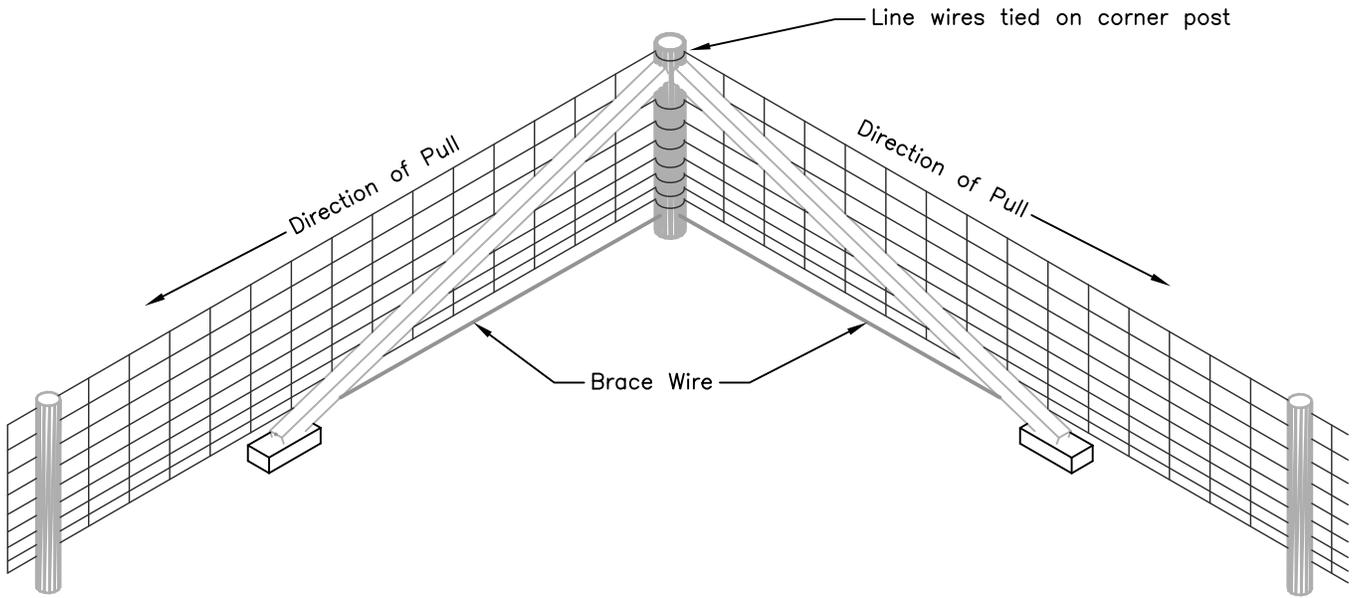
Step 3

Note:

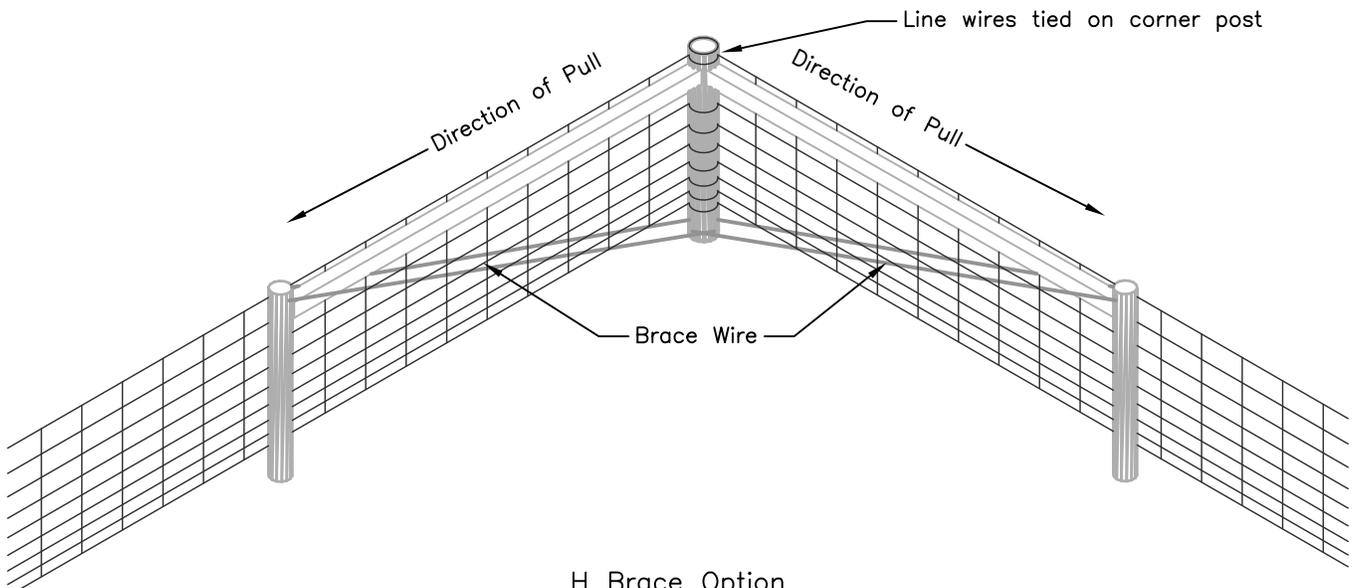
Woven wire splices shall use the Western Union Splice, with 8 wraps each wire, or be crimped using appropriate sleeves.

Western Union Splice Detail

Typical Corner Brace Assembly



Diagonal Floating Brace Option



H Brace Option