Practice Specification
Fence - H Brace (Code 382)

SCOPE

This specification establishes the technical details, workmanship, quality and extent of materials required to install the brace in accordance with the Conservation Practice Standard. Specifications for other braces and line assemblies are contained in separate documents.

The appropriate NRCS Washington Jobsheet for standard post and wire, woven wire, or electric fence shall be used to document the site-specific requirements for installing, operating, and maintaining the practice on a specific field or treatment unit. The work shall consist of furnishing and installing materials for the specified design at the location(s) shown on the plan map, drawings, or as staked in the field.

Fencing includes brace assemblies, line assemblies, gates, cattle guards, and other components required for meeting site conditions and achieving the objectives of the practice application. Other documents (worksheets, maps, drawings, and narrative statements in the conservation plan) may be used to document site specifications, plan or design the practice. If a fence is being planned that is not provided for in the following specifications, contact the Washington State Range Management Specialist for approval at the beginning of the planning process and prior to construction.

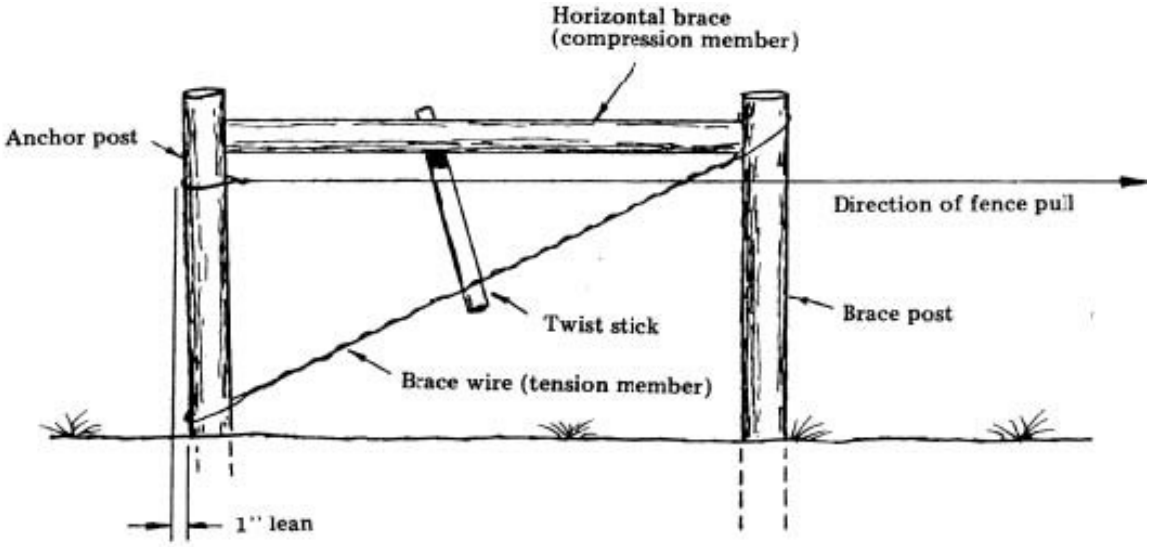
The fence will be installed in accordance with proper safety procedures. The completed job shall be workmanlike and present a good appearance.

If brush or rock clearing, grading or other land work is to be done in conjunction with the fence installation, appropriate grading and erosion control measures shall be undertaken or installed. Specifications for all measures to be installed in conjunction with the fence should be attached to the Jobsheet.

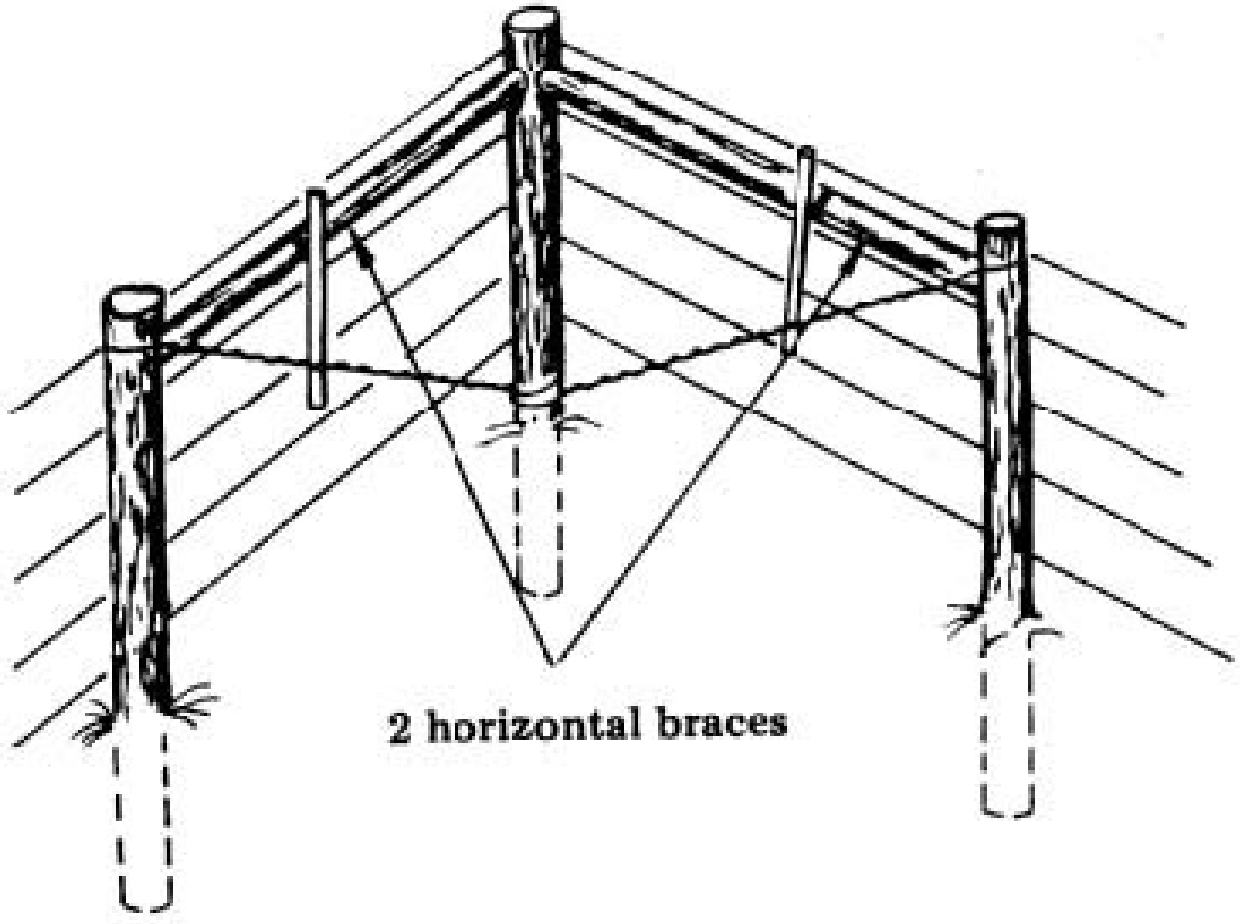
TYPES OF FENCES

Standard H-Brace

Standard H-Braces are suitable for all applications of post and wire fences, electric fences, and net wire fences.



Parts of horizontal brace.



MATERIAL SPECIFICATIONS

All materials used in the construction of fences shall have a minimum life expectancy of ten (10) years. Fences will be constructed that equal or exceed the strength and durability of one built in accordance with the materials specifications in the following tables.

If a brace is to have improved longevity and reduced maintenance use one of more of the following concepts:

1. Larger diameter wooden posts
2. Deeper setting of longer posts, and/or
3. Closer spacing braces

All posts shall be placed to the required depth and shall be firmly embedded. Posts shall be set to the minimum depths listed in **Brace and Anchor Post Requirements.**

Wood posts shall be driven or set in holes and backfilled with compacted earth or poured concrete. Where postholes are dug, the holes shall be at least six (6) inches larger than the diameter of side dimensions of the posts. Earth backfill around posts shall be thoroughly tamped in layers not thicker than 4 inches and shall completely fill the posthole to the ground surface. Concrete backfill around posts shall be rodded into place in layers not thicker than 12 inches and shall completely fill the posthole to ground surface. Backfill, either earth or concrete shall be crowned up around posts at the ground surface.

Concrete shall be class 3000 in accordance with Washington NRCS Construction Specification CS-42, Concrete for Minor Structures. Concrete shall be allowed to set for ten days before tension is applied to the brace assemblies through tightening of wire.

Where rock occur within the required embedment depth for posts, steel posts will be used. A hole of a diameter slightly larger than the largest dimension of the post shall be drilled in the rock and the post grouted in. The depth of post embedment shown on the Jobsheet will not be required and the post may be shortened as necessary, provided the brace and anchor posts are embedded within the rock for a minimum depth of 14 inches or the required embedment depth of the post is attained. Grouting will be required on the portion of the post in solid rock.

Where solid rock is encountered without an overburden of soil, posts shall be set into the solid rock a minimum depth of 14 inches. The posts shall be cut before installation to lengths which give the required height of post above ground.

After the post is set and plumbed, the hole shall be filled with grout consisting of one part Portland cement and three parts clean, well graded sand. The grout shall be thoroughly worked into the hole so as to leave no voids. The grout shall be crowned to carry water from the post.

BRACE AND ANCHOR POSTS (WHERE WIRE IS TIED OFF)

Brace and anchor posts need not be new materials, (Railroad Ties and Power Poles are adequate); however, all posts shall meet the minimum criteria for durability and protective coating and be sound and free from decay, with all limbs trimmed substantially flush with the body. Lengths listed below are based on a 42-inch top wire height. Steel pipe needs to be free from corrosion and pitting.

Posts must be of sufficient length to meet fence height, setting depth requirements, plus 6 inches.

Substitute for Brace Assembly	Live trees	10 inches at top wire	Wire not wrapped or stapled directly to tree. Several wood slats spaced around the tree trunk provide protection if wire is wrapped around the tree. Staple wire to slats.

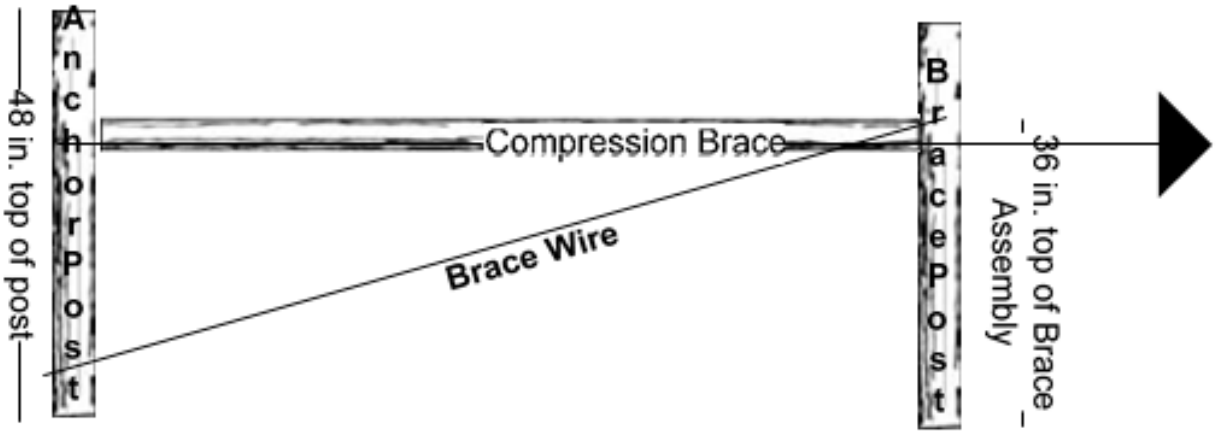


Table 1 Standard H-Brace Material Requirements

COMPONENT	MATERIAL TYPE	MINIMUM DIAMETER/ WEIGHT	MINIMUM SETTING DEPTHS	MINIMUM LENGTHS	OTHER
Brace & Anchor Post	Wood-juniper, cedar	5 inches	3 feet	7 feet	None
Brace & Anchor Post	Wood-pine or similar woods				Complete penetration of the sapwood with approved treatment materials. Pressure-treated, entire length of post (see Note).
Brace & Anchor Post	Steel, round	2-3/8 inches outside diameter (OD), 3.65 lb. /ft. or equivalent.	3 feet – set in 12” diameter concrete		Schedule 40 pipe will meet these requirements. . No concrete needed if welded to compression brace.
Brace & Anchor Post	Steel, angle iron	2.5 inches x 2.5 inches x 0.25 inch			No concrete needed if welded to compression brace.
Compression Brace	Wood, horizontal	4 inch nominal			None
Compression Brace	Steel, round, horizontal, pipe or tubular steel	2 inches OD, 2.25 lb./ft. or equivalent		8 feet	Steel braces shall be connected with a 3/8-in. lag screw at each end, or shall be inserted into 1-in.- deep,prepared sockets at each end.

NOTE: Chromated Copper Arsenate (CCA)-treated wood posts should not be used where treated wood may come into contact with water sources (wetlands, streams, high water tables, etc.). Other chemically-treated and pressure-treated wood posts may be used in these areas. (EPA 2002)

INSTALLATION SPECIFICATIONS STANDARD H-BRACE

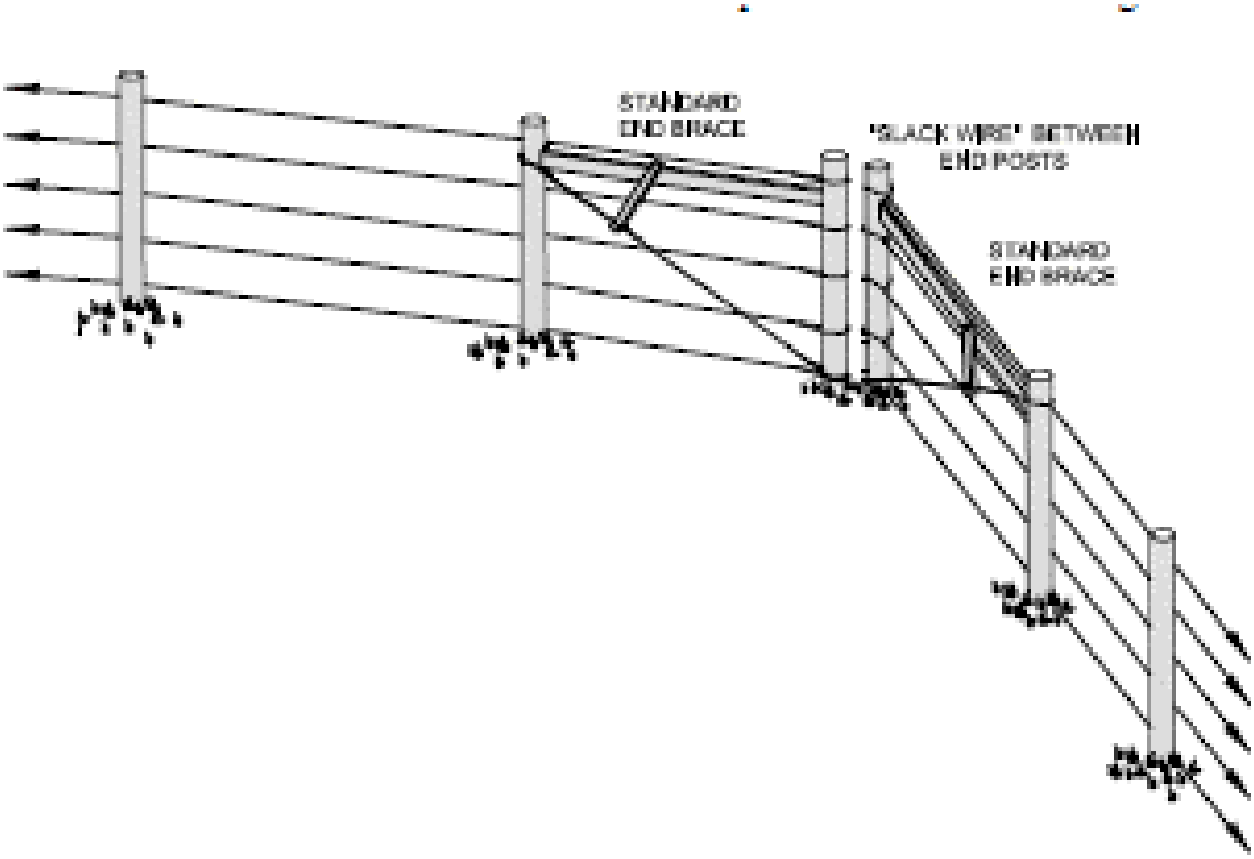
Brace posts shall not be set in muck, peat, or soils on which water stands.

BRACING AND ALIGNMENT

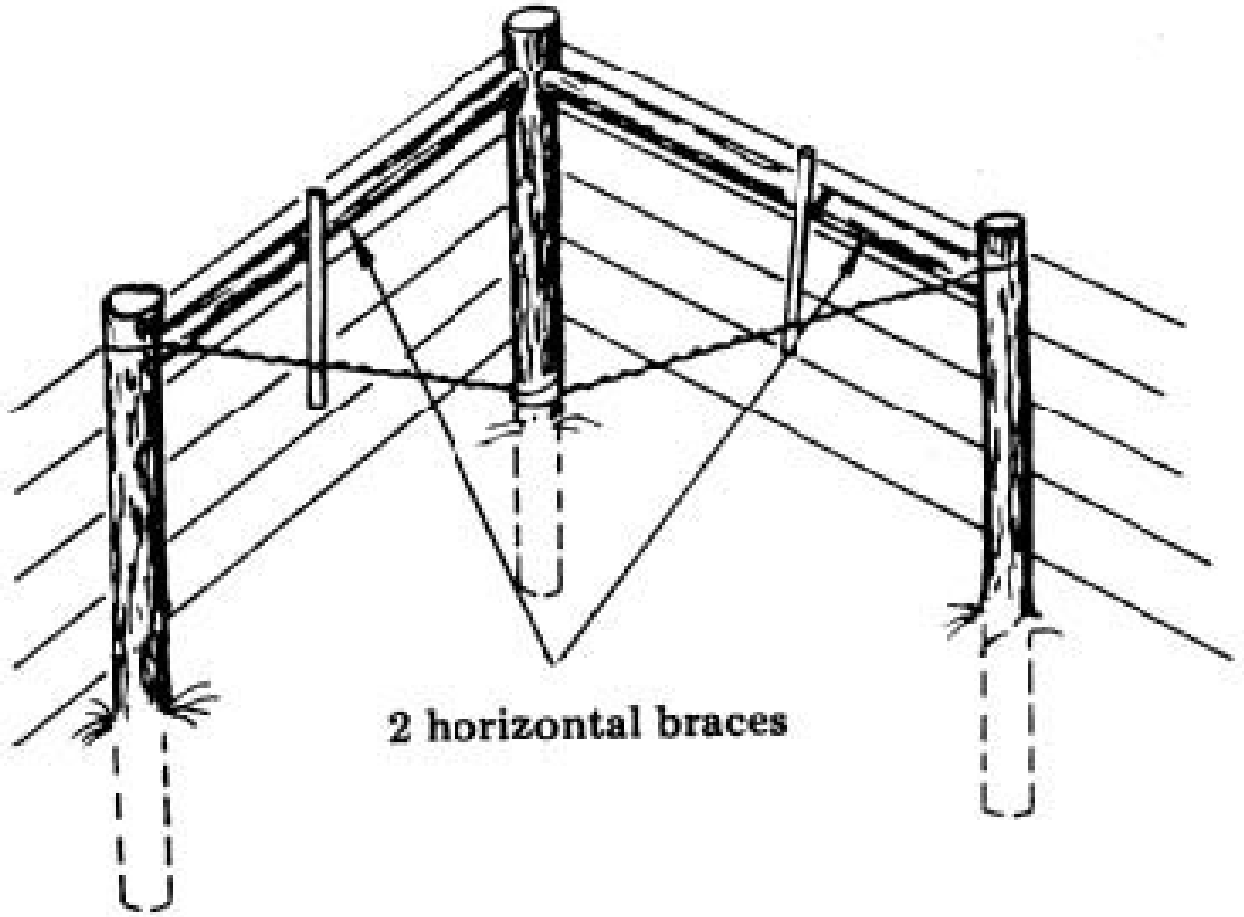
There is no maximum distance between brace spacing as long as means are available to stretch wires. A single 6-inch diameter brace post, buried 3 feet, spaced no greater than 1/4-mile apart is sufficient to stretch the wire. It is recommended not to exceed 1/2-mile between gates (braces) for ease of management.

Braces are required at all end corners, gates and definite angles of change (horizontal) greater than 5 degrees if bearing on a metal line posts, greater than 20 degrees if bearing on a sound wood post a minimum of 4 inches in diameter and embedded a minimum of 3 feet.

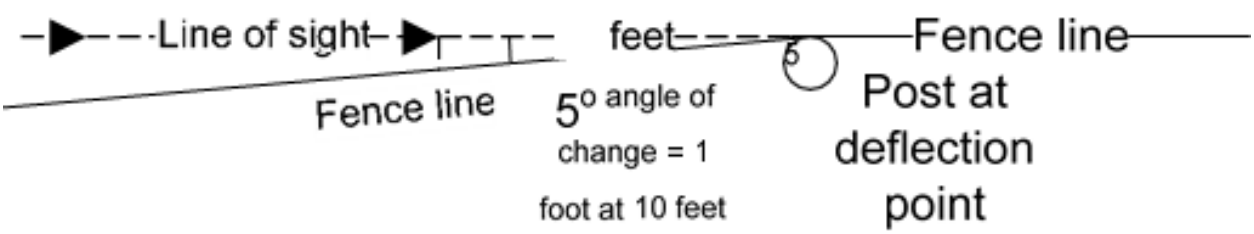
- Between 20 and 60 degrees angle of change use a 4 post brace (which is a double H that does not share a common post like the 3 post Standard H-brace) or a double diagonal floating or steel diagonal brace

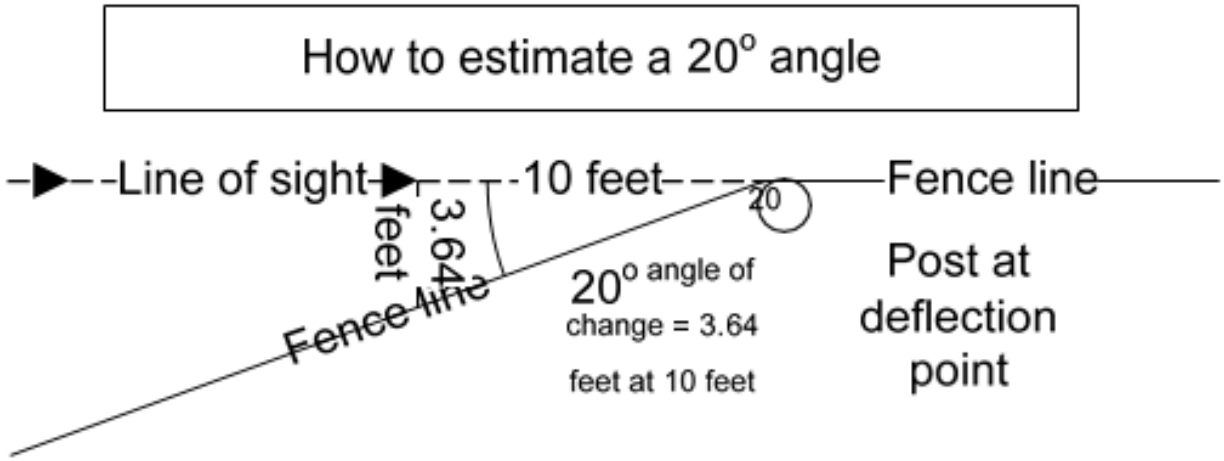


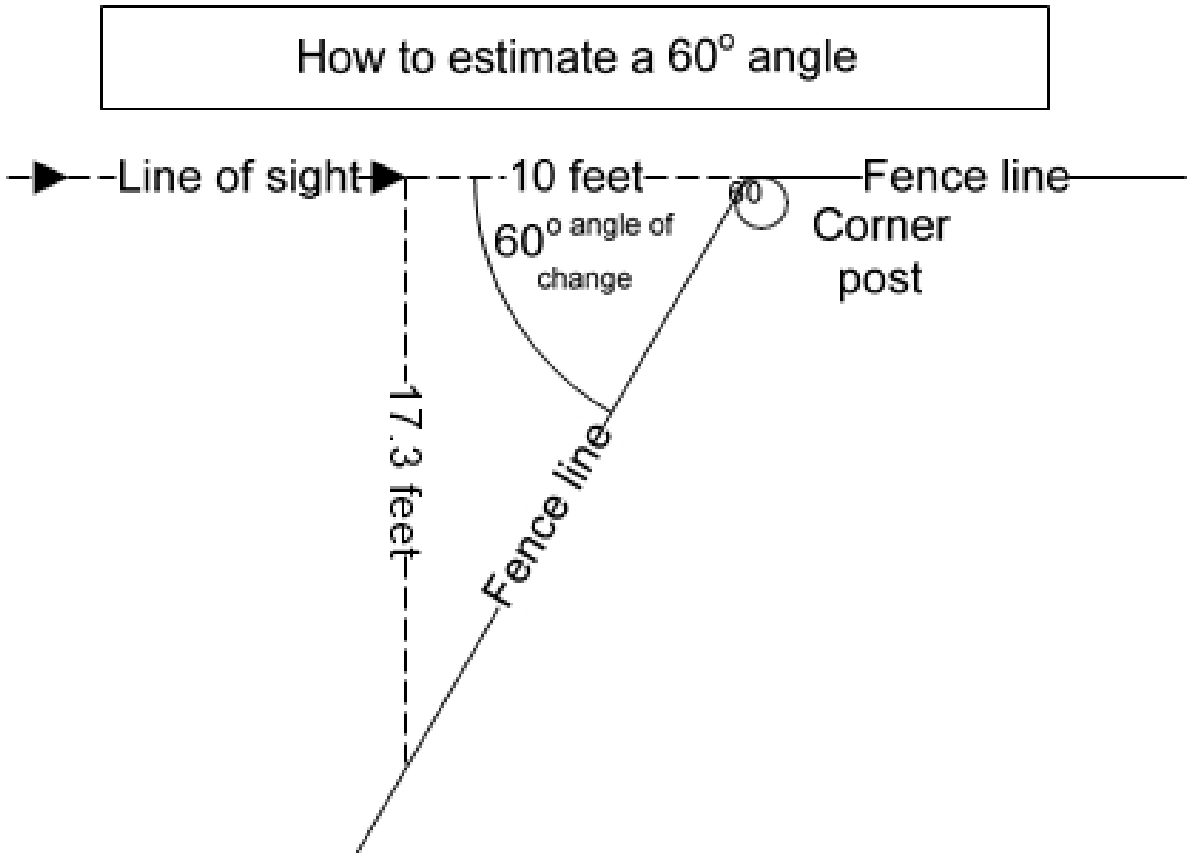
- Greater than 60 degrees angle of change a 3 post brace – horizontal (Standard H-brace) or a diagonal brace may be used



How to estimate a 5° angle

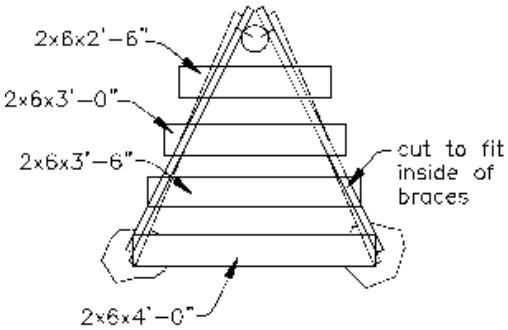




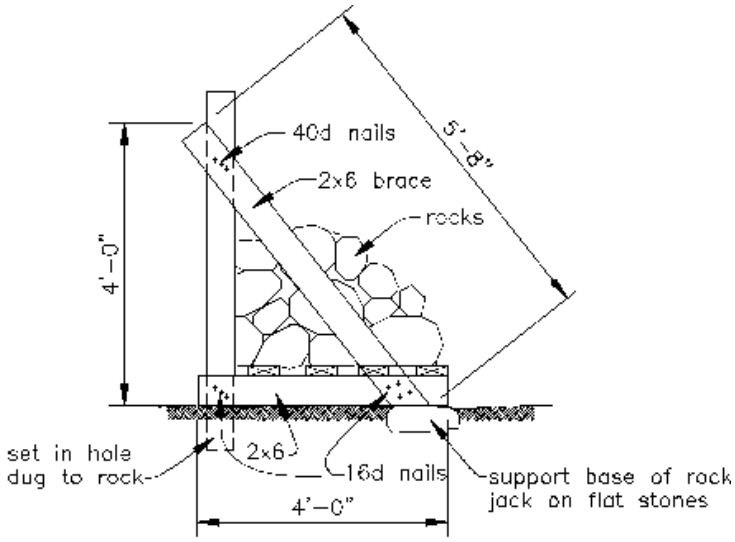


At any angles of change the following alternatives may be used:

- Rock Cribs –see NRCS-WA Standard Drawing Isk-0253
- Rock jack – see NRCS-WA Standard Drawing Isk-0260



ROCK JACK – PLAN

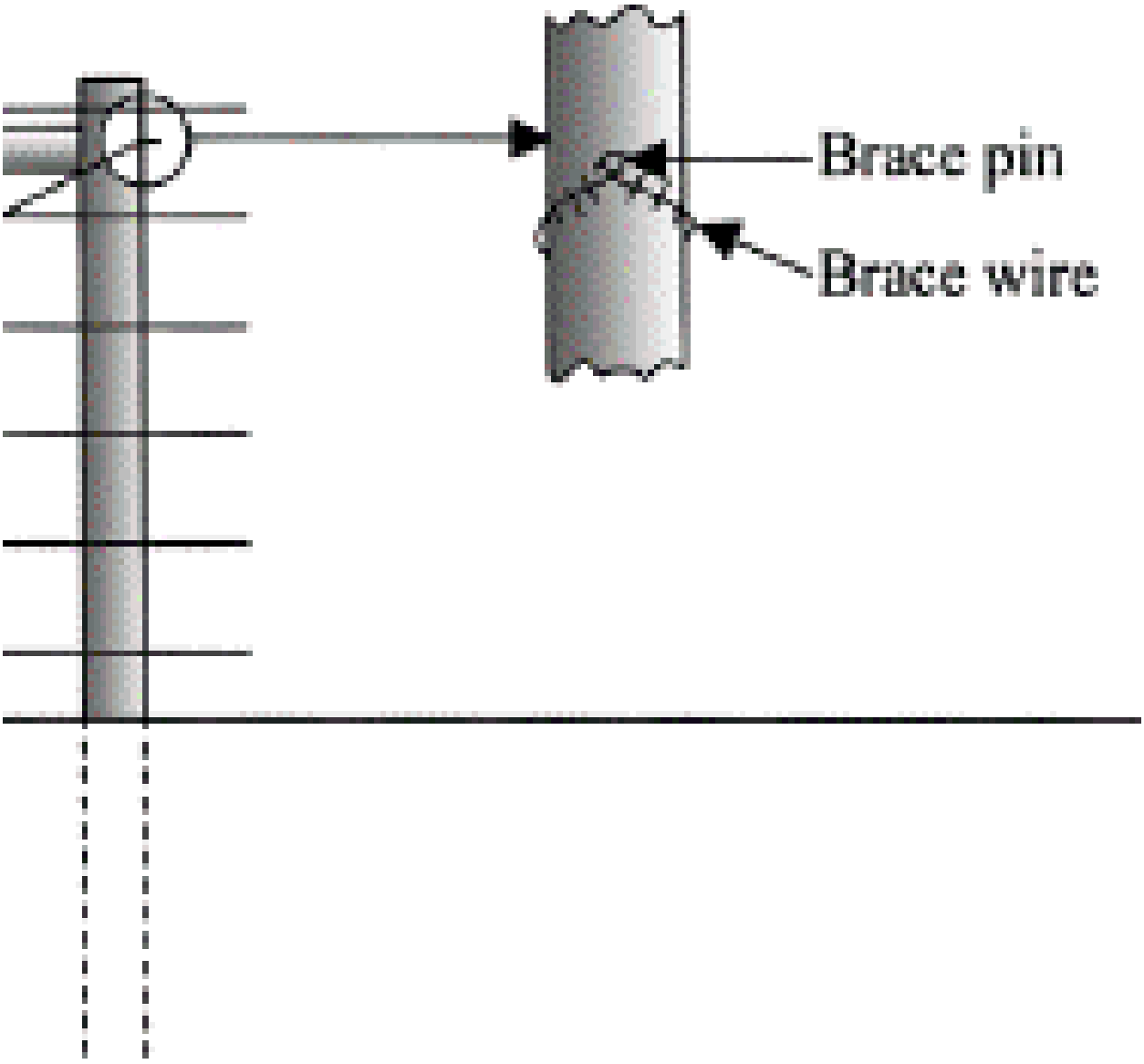


ROCK JACK – SIDE

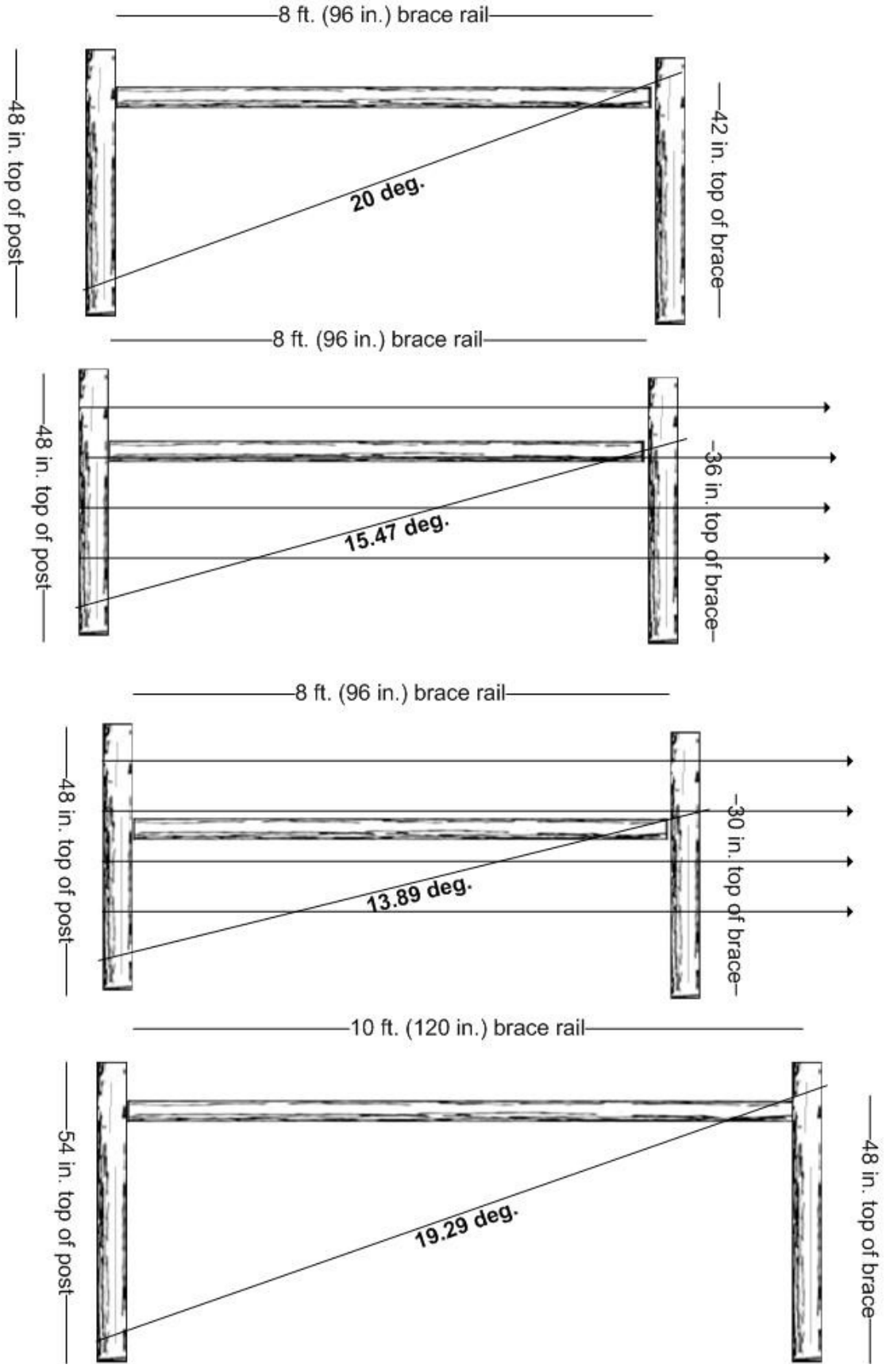
HORIZONTAL BRACES

Wood horizontal brace members (compression braces) shall be at least 8 feet in length and fastened to the brace and anchor post using one of the following two methods:

- Notching and nailing: The brace and anchor posts are notched (1/4 to1/2 inch deep) with a saw and the brace is placed in the notch. Once the brace is in place it is fastened to the posts with a good nail; such as six inch, tempered steel, galvanized, ring shank nail, commonly called a pole barn nail.
- Brace Pins: Steel dowels, spike, etc., can be used, rather than notching, to attach brace member between anchor post and brace post. Brace pins are usually 3/8 inch diameter pins (re-bar) about 6 inches long. A hole is drilled in the end of the brace and the side of the post and the pin is slipped into the two holes.



The brace member will be in the top 1/3 of the post no closer than 6 inches from the top of the post. The assembly is strongest when place at lower heights; e.g. at 30 inch height on a 48 inch high post (for a 42 inch high top wire).


8 ft. (96 in.) brace rail
48 in. top of post
42 in. top of brace
20 deg.
8 ft. (96 in.) brace rail
48 in. top of post
36 in. top of brace
15.47 deg.
8 ft. (96 in.) brace rail
48 in. top of post
30 in. top of brace
13.89 deg.
10 ft. (120 in.) brace rail
54 in. top of post
48 in. top of brace
19.29 deg.

BRACING WIRE

Brace wires (or guy wires) shall be formed from **two complete loops**of:

1. No. 9 gauge smooth wire, single strand;
2. No. 12-1/2 gauge double-strand smooth or barbed wire.
3. A single strand - No. 12-1/2 gauge high-tensile smooth wire.

Brace wires shall extend from a point in line with the horizontal brace to as close to ground level as possible on the anchor post (2 inches above ground to reduce corrosion) and attached in-line with the top of the brace member). The brace is strongest when the angle between the brace wire and the horizontal brace member is less than or equal to 20 degrees. The brace wires shall be double-wrapped around each post, stapled and spliced together. A twist stick (stick, pipe, etc., about 18 to 24 inches long), is placed mid-way along the brace wires, and all four wires are twisted together so the brace wires tightly secure the compression brace and provide needed functionality. The twist stick is nailed or securely wired to the horizontal brace member. An in- line strainer can be used for high-tensile wire in lieu of twisting wires.

ROCK-JACKS USED AS BRACE POSTS

Table 2 Rock Jack Requirements (Brace Posts)

ROCK-JACK COMPONENTS	MINIMUM DIMENSIONS	LENGTH
Anchor Post	4 inches x 4 inches dimensional-treated lumber or 5 inches diameter post	4.5 feet
Diagonal Braces (legs)	2 inches x 6 inches dimensional-treated lumber or 4-inch round posts or 5-inch split poles	9 feet
Ground Piece	2 inches x 6 inches dimensional-treated lumber or 4-inch round posts or 5-inch split poles	8 feet
Flooring	2 inches x 6 inches dimensional-treated lumber	6 feet , 5.5 feet, 5 feet, and 4.5 feet, 4 feet,3.5 feet, 3 feet and 2.5 feet

NOTE: Chromated Copper Arsenate (CCA)-treated wood posts should not be used where treated wood may come into contact with water sources (wetlands, streams, high water tables, etc.). Other chemically-treated and pressure-treated wood posts may be used in these areas. (EPA 2002)

ROCK-JACKS USED AS FENCE CORNERS AND GATES

Table 3 Rock Jack Requirements (Corners & Gates)

ROCK JACK COMPONENTS	MINIMUM DIMENSIONS	LENGTH
Anchor Post	6 inches x 6 inches dimensional-treated lumber or 5-inch diameter post	4.5 feet
Diagonal Braces (legs)	2 inches x 6 inches dimensional-treated lumber, 4-inch round posts or 5-inch split poles	9 feet
Ground Piece	2 inches x 6 inches dimensional-treated lumber, 4-inch round posts or 5-inch split poles	8 feet
Flooring	2 inches x 6 inches dimensional-treated lumber	6 feet, 5.5 feet, 5 feet, 4.5 feet, 4 feet, 3.5feet, 3 feet and 2.5 feet

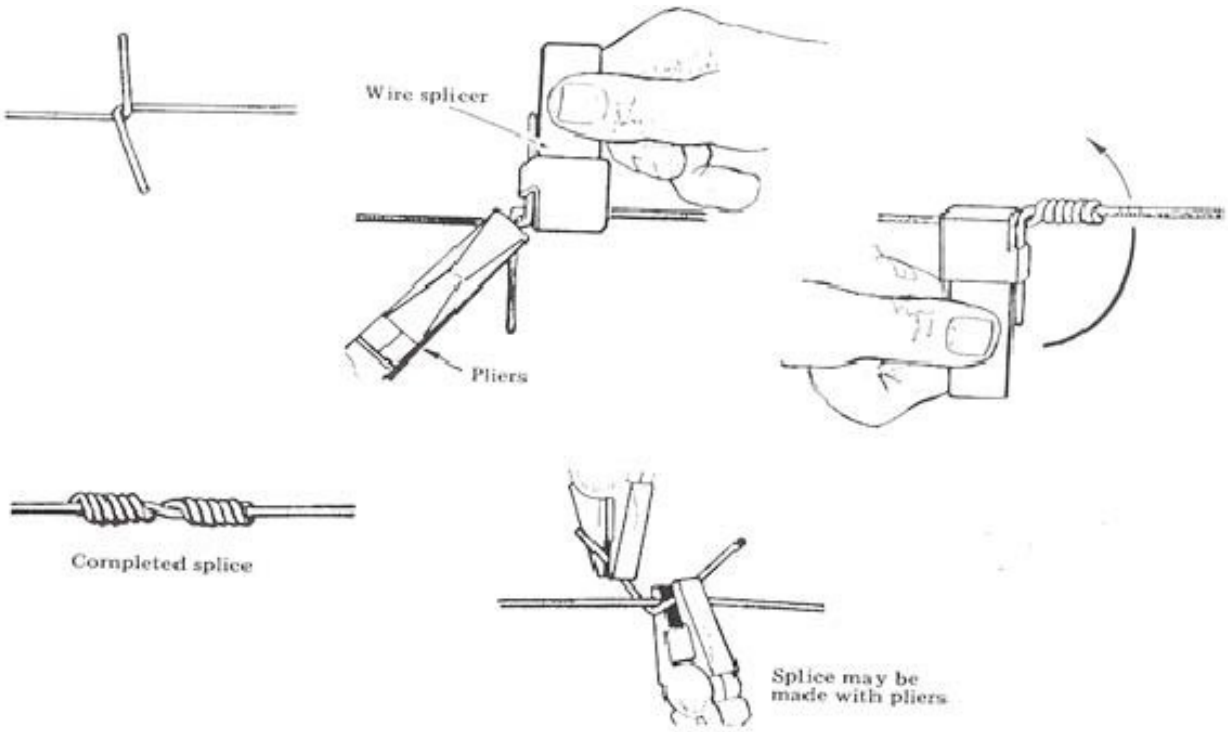
The anchor post is set 2-3 inches in the ground.

The floor of the Rock-jack shall be constructed of 2-inch x 6-inch boards. Do not nail the platform down. Once the Rock-jack frame is constructed and the floorboards are in place, rocks are placed on the Rock-jack floor.

Large rock weights will be placed at each joint with lesser-weight rock distributed evenly over the rock platform. Weight of rock on the platform is 2,000 pounds for a 3-wire fence and 2,700 pounds for a 4-wire fence. Line wires are stapled to the anchor post of the line Rock-jack.

SPLICING

When splicing of wire is necessary, use conventional wire-loop, “Western Union” splice or compression fittings



1

CLOVERLEAF KNOT

2

NICOPRESS SLEEVES

3

RELIABLE WIRE LINKS

4

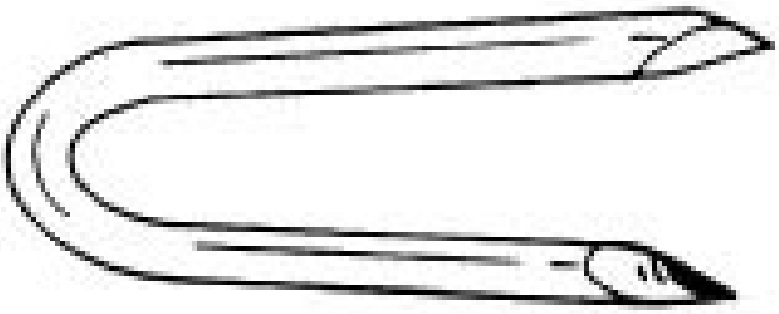
SQUARE KNOT

STAPLES AND FASTENER REQUIREMENTS

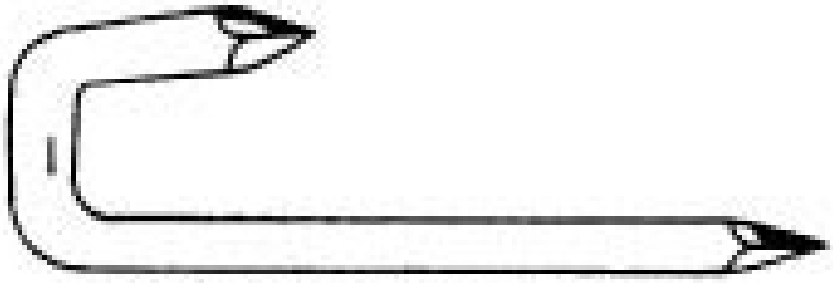
Staples shall be driven into the post at a 45-degree angle. Staples shall be driven just deep enough to snug the line wire without bending it.

U-shaped staple, conventional wire: No. 9 gauge galvanized wire or bright hard wire; at least 1 and 3/4-inchlong.
L-shaped deformed shank staple: No. 9 gauge galvanized wire or bright hard wire; at least 1 and 1/2-inch long.
Fence wire shall be fastened to steel posts using steel clips manufactured for the purpose of attaching wires, or 9 gauge smooth wires.
Other post types will use fasteners and methods recommended by the manufacturer.

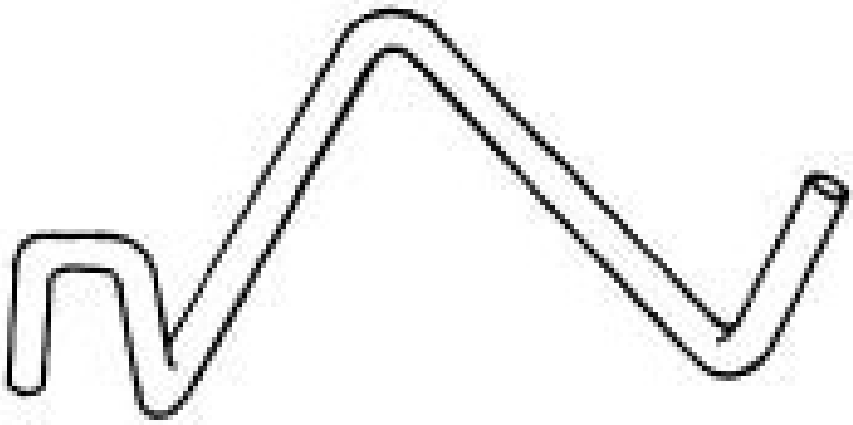
* Reference Standard Drawing LSK-0001 Staples and Wire Attachment



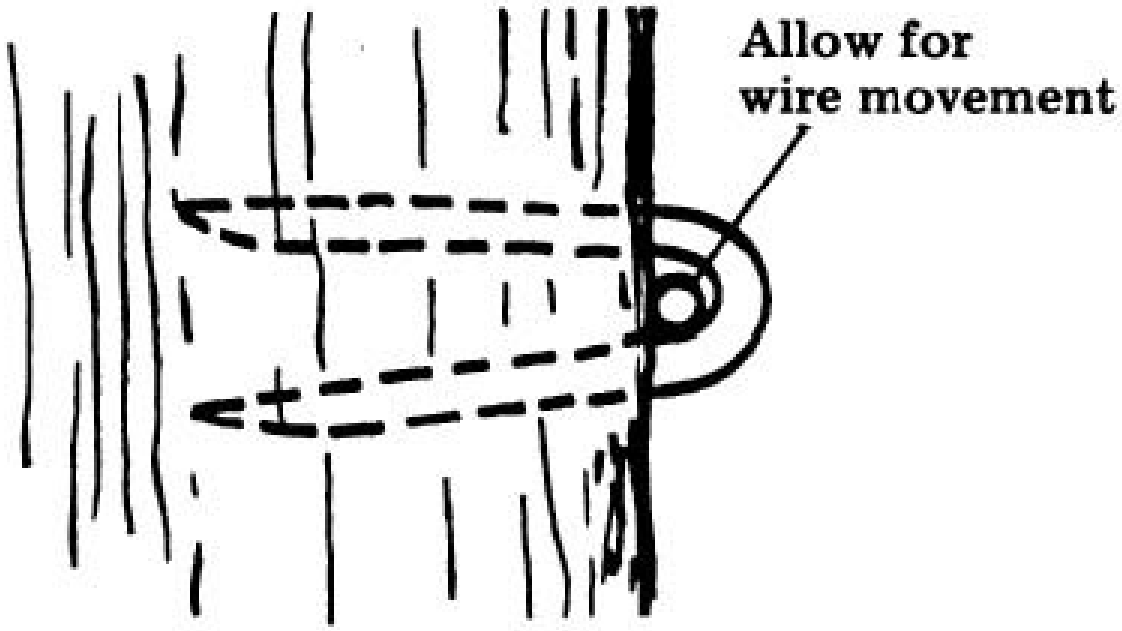
U-SHAPED STAPLE



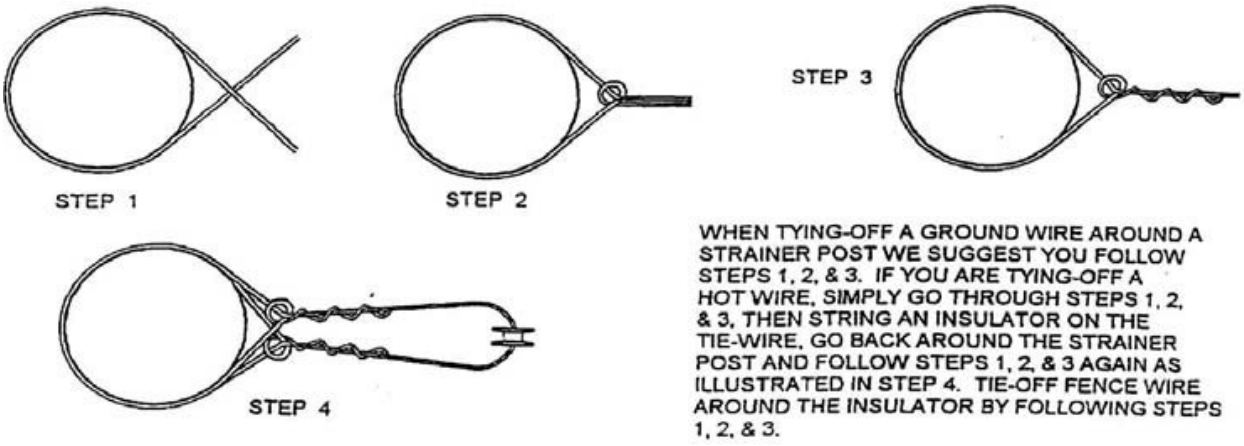
L-SHAPED STAPLE



WIRE CLIP



Staples should hold wire close to fence, but allow for expansion and movement of the wire.



BASIS FOR ACCEPTANCE

After the fence has been installed, a site inspection will be made to determine if the materials and the design and installation adhered to the site-specific specifications documented in the practice Jobsheet.

Specific Site Requirements