

**Practice Specification
Fence (Code 382)
Barbed Wire, Woven Wire or Suspension Fence**

SCOPE

The work must consist of constructing the fence, including any associated gates, water gaps and other related items as required by the construction plans or job sheets.

LOCATION

Fence location is the responsibility of the landowner/user. Legal surveys may be needed for proper fence location.

The location of the fence must be as shown on the Fence Job Sheet (JS382ne) or identified on a project map, and as staked in the field.

SITE PREPARATION

All trees, stumps, brush and debris must be removed from the fence construction site and disposed of so that they will not interfere with construction or proper functioning of the fence. Removed material must not be deposited or buried in a draw.

Remove and properly discard all broken fencing material and hardware. All necessary precautions should be taken to ensure the safety of construction and maintenance crews.

MATERIALS**Fence Wire and Fasteners**

All wire must have Class III galvanization.

For barbed wire, each line wire will consist of 2 twisted strands of 12½ gauge wire, or Hi-Tensile strength wire of 15½ or 14 gauge. The barbs shall be either 2-point barbs on approximately 4-inch centers, or 4-point barbs on approximately 5-inch centers. 4-point barbs provide more deterrent to grazing animals.

Barbed wire is not to be electrified or insulated for electrification. For woven wire, top and bottom strands of standard and Hi-Tensile woven wire must be 12½ gauge or heavier, and 14½ gauge wire, or heavier, for intermediate strands.

For smooth Hi-tensile wire to be installed in conjunction with woven wire, the wire must be 12½ gauge, single strand, minimum tensile strength of 140,000 PSI, and 1,078 lbs. minimum breaking strength. Refer to 382 Fence (Electric Fence) Construction Specification. Staples must be of 9-gauge Class III galvanized steel or heavier with a minimum length of 1½ inches for softwoods and a minimum length of 1 inch for close-grained hardwoods. Wires must be attached to steel posts by use of manufacturer's clips or by two turns of 14-gauge Class III galvanized wire.

Posts and Stays

Posts and stays must conform to the size and material specifications in Table G, except as noted below.

Use of landscape timbers is prohibited in any part of a fence.

Used pipe such as 'drill stem' pipe and used railroad ties or utility poles may be used as posts if they are whole, sound, free from decay, have not been previously used as fence material, and so long as minimum diameter and length requirements are met for the type of fence to be constructed. Used red cedar, black locust and Osage orange can be used as long as the posts are whole, sound and free of decay and are one inch larger in diameter than designated in Table G.

Wood post will be treated with the materials and treatment levels as required in Table F. Untreated wood used for posts will consist of black locust, red cedar, Osage orange and red wood. Posts of these species are referred to as "native wood" posts in this standard.

Metal pipe posts of equivalent strength to the wood posts specified for corner, gate, end or pull assemblies, and brace posts may be substituted if a suitable means of attaching wires and braces to the posts is available.

Live trees must be allowed for bracing or line posts only when application of standard wooden posts or steel posts is impractical because of restrictive soil depths due to parent material (rock, shale, etc.) and cannot be set or driven to the minimum depths required by the standard and specification. At no time must live trees constitute more than 10 percent of line posts used.

Live trees used for bracing and line posts must have a diameter breast height (DBH) equal to or greater than those prescribed for normal wooden posts.

CONSTRUCTION

Wire Placement

The top of all wooden posts must be 2 to 4 inches above the top wire of the fence to prevent splitting when attaching insulators.

All posts materials other than wood must be at least 1-inch higher than the top wire of the fence.

Fence height must be defined as the average height from ground to top of wire at each fence post. Fence height of exterior/property line fences must be at least 54 inches unless a lower height is allowed by law and as shown on the construction plans/job sheet. In no case will the height of the exterior/property line fence be lower than 48 inches.

Fence height of interior fences must be at least 42 inches.

Wire must be attached to wood posts by staples. Drive staples in diagonally to the wood's grain and at a slight downward angle, (upward if pull is up) to avoid splitting post and loosening of staples. Space should be left between the staple and the post to permit free movement of wire. For suspension fences, special manufactured fasteners specific to the purpose may also be used.

Wires must be placed on the side of the post located closest to the livestock. Wire must be placed on the outside of the post(s) in a curve in the fence for structural stability.

Joining of wires will be achieved by way of approved splices such as "Western-Union Splice," square knot, or lap splice with three crimping sleeves or equivalent. "Figure eight knots" may be used for joining of Hi-Tensile wires.

When using live trees as posts, protection will be provided between the tree and wire by:

1. Using strips of treated wood, red cedar, Osage orange, black locust, fiberglass or rigid plastic. Strips should be at least 3½ inches wide and 6 inches in length and placed 3 inches above top and 3 inches below bottom of wire to prevent splitting or cracking; or
2. Using a 3/8 inch by 8-inch eye or "J" screw fastened directly to the tree to the depth of the threads. Then install an end or corner insulator assembly to the eye or "J" screw.

In-line strainers/wire tighteners will be installed on each smooth Hi-Tensile wire placed above woven wire to obtain/maintain the correct tension. In-line strainers/wire tighteners will be installed in the center of wire pull sections, except in fence stretches shorter than 600 feet. Where Hi-Tensile wire is placed above woven wire, the tension on each wire must be maintained according to type of grazing animal or season. A tension spring will be used on at least one wire strand as a guide in maintaining proper tension. Tension of wires will be approximately 200–250 pounds.

Number and Spacing of Wires

Barbed wire fences must be a minimum of 4 wires for exterior/property line fences. A minimum of 3 wires will be used for interior fencing. Wires must be spaced approximately equal distances apart. The bottom wire must be 12 to 18 inches above the ground level. Wires must be spaced no more than 12 inches apart.

Woven wire exterior/property line fences with woven wire height equal to or less than 32 inches must have at least 2 barbed or smooth wires above the woven wire, spaced evenly (10 to 12 inches) between the top of the woven wire and the top fence wire. All other woven wire fences must have at least 1 barbed or smooth wire above the woven wire spaced at 10 to 12 inches above the top woven wire, with the following exceptions: Woven wire fences that are 5 feet tall, or taller, typically installed for sheep goats, alpacas and llamas or woven wire fences 8 feet tall for deer/game, will not require a single barb or Hi-tensile wire above the woven wire.

Woven wire fences for containment of livestock, where needed to protect livestock from predators, for livestock management, and for animal safety, must be constructed with the base of the woven wire placed within 2-4 inches above the ground surface. If desired, a barbed wire may be placed between the woven wire and ground surface on the outside of the posts for aid in predator control.

Suspension fences must have a minimum of 4 barbed wires spaced approximately an equal distance apart, and wire stays must swing free of the ground. To allow for appropriate sway of the fence, tension on line wires must permit a maximum 3-inch sag in 100-foot span of fence in warm weather.

Post Placement

In undulating terrain, space posts and stays so that fence height is maintained.

Posts in depressions must be constructed so that they will not pull out of the soil. Two-inch diameter or smaller posts will be anchored or wooden posts set to three feet and tamped with CA-6 or driven,

Where topography in a section of fence abruptly changes, additional bracing may be needed where installed line posts may lean or pull. Install a double "H" pull assembly with wire tied off to the middle post, single 7-inch diameter post driven 5 feet in the ground with wires tied off in each direction, or install end brace assembly at beginning and end of each land slope change.

Set or drive posts to the depth as specified on plans or as outlined for the type of post in Table E.

Backfill around posts must be earth or Illinois Department of Transportation Gradation No. CA-6 coarse aggregate. The backfill must be placed in layers no thicker than 4 inches; each layer will be thoroughly tamped, and the posthole will be completely filled up to the ground surface.

Spacing of line posts and stays for permanent non-electric fence is dependent on type of fence. Maximum spacing must be as follows:

- Standard barbed wire (class III galvanized) fences have line posts spaced up to 20 feet with no stays or up to 30 feet with stays every 15 feet.
- Standard woven wire (class III galvanized) fences have line posts spaced up to 15 feet apart.
- Hi-Tensile woven wire fences have line posts spaced up to 20 feet apart.
- Suspension barbed wire fences have line posts spaced up to 100 feet with stays placed every 15 feet.

Corners and Braces

Bracing is required at all corner, gate, pull, and end assemblies in a fence. Notching of treated wood posts to retain wires or braces is prohibited in any part of a fence and is discouraged on native wood posts.

Brace assembly will be installed for water gaps separate from end assembly bracing for exterior fence.

End bracing will be installed at locations where the fence ends and on both sides of the gate openings when a gate is located inline.

"H" Braces, Double "H" Braces, or Angle Braces must be used in all fences. Refer to applicable IL NRCS Fence standard drawings for specifications on corners, angles, or brace assemblies.

Double "H" assemblies are required for all 8-foot high game fences.

Double "H" assemblies are required for all fences that have greater than 6 strands of wire.

Double "H" assemblies are required where sandy loams and coarser textured soils, or sites with restricted soil depth of less than 36 inches exist, a "dead-man", or a screw-in anchor applied against the direction of pull. Refer to Web Soil Survey: soil reports, soil physical properties, and engineering properties.

For corrosive soils, screw anchors may be used in place of a dead-man, loop brace wire through eye of installed screw anchor. Refer to Web Soil Survey: soil reports, soil qualities and features, soil features

Pull assemblies must be spaced at intervals not to exceed 1,320 feet (80 rods) for barbed wire fences and 660 feet (40 rods) for woven wire fences. Tie off all wires at pull assemblies and start new wires for the next section of fence.

For pull assemblies with brace (H assembly), wire must be tied off at pull assembly to the post opposite the direction of pull. (Refer to standard pull assembly drawing IL ENG-810.)

Dug brace assemblies that are supporting gates must have an additional brace wire to support the gate, resulting in brace wires making an "X".

The horizontal brace member must (as a minimum) be the equivalent of a 4-inch diameter post or standard weight (schedule 40) galvanized steel pipe of at least 2 $\frac{3}{8}$ -inch outside diameter installed in the upper 1/3 of the posts and below the top wire.

The horizontal brace member length must be between 8 foot and 2.5 times the height of the top fence wire. As a minimum, 3/8-inch diameter, Class I, Class II or Class III galvanized pins will be used to hold horizontal brace in place.

Schedule 40 galvanized steel pipe 2 $\frac{3}{8}$ -inch (OD) diameter, can be used for end, corner and braces posts, and follow standard drawings.

Steel pipe will be primed and painted as an alternative to galvanizing.

Tension member (brace wire) composed of 2 complete loops of Class III galvanized 9 gauge smooth wire or Class III galvanized 12 $\frac{1}{2}$ -gauge Hi-Tensile strength smooth wire may be used.

Methods to tighten brace wires are: strainer/wire tightener, twist stick, or the use of a lap splice with three crimping sleeves.

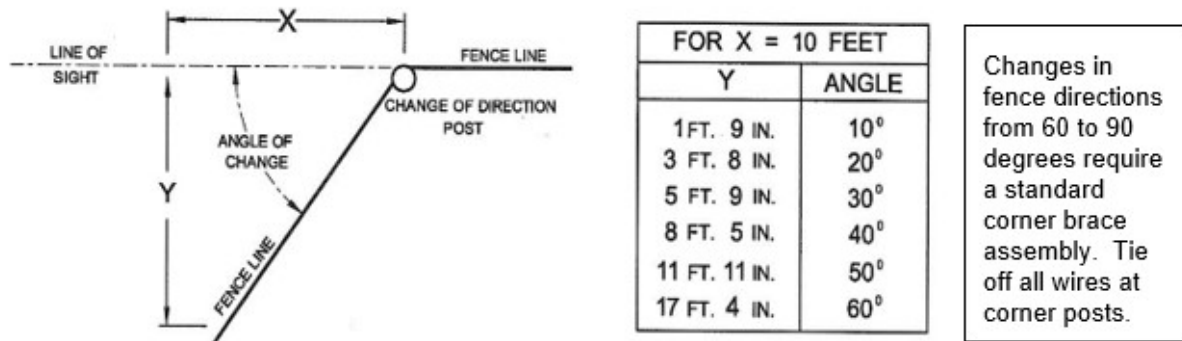
A single 7-inch minimum diameter driven post may be substituted for end, corner, vertical change bracing, and pull assembly. The post must be driven a minimum of 5 feet into the ground. A single 7-inch minimum diameter post driven 5 feet deep must not be substituted for double H bracing.

A single "H" brace assembly consisting of 7-inch diameter posts driven 5 feet in the ground with a 4-inch wood or 2 3/8 inch OD pipe by 9 ft. minimum cross member may be substituted for double "H" brace assembly.

Changes in fence directions greater than 20 degrees, but less than 60 degrees require change of direction bracing as shown in standard drawing IL ENG-823, option 1. Tie off all wires at corner and end posts. Do not pull barbed or woven wire around corner posts.

The diagram below illustrates the angle of change concept and provides a table that can be used to determine / plan angles of change. Example: measure along fence line (X) 10 feet from post where direction changes, then measure out to fence line (Y). If distance to Y is 4 ft., then according to Figure 1, change of direction is slightly over 20 degrees.

Figure 1 Estimating Fence Line Angle of Change



Do not pull wire around corner posts.

Driven series of single posts should be used on a maximum of 10-foot centers when rounding a long, gradual fence curve greater than 20 degrees. Driven single posts must have a minimum diameter of 6 inches and be driven at least 4 feet into the ground with a 4 inches lean toward the outside of the curve.

Gates and Water Gaps

On hinged gates, set hinge pins to hold gate in place so gate cannot be lifted off pins. When using gates of substantial weight, provide support to the free end of gates, when open or closed, to relieve constant pressure applied to post on hinged end of gate.

Gate height must equal the height of the installed fence.

Gates constructed with barbed or woven wire must equal/or exceed the number of horizontal wire strands in the fence.

Fencing across areas of concentrated flow should include water gaps or flood gates. For areas with very little water and only occasional flooding, a breakaway fence or water gap will be sufficient. Areas with regular flooding will require floating gates or panels, or water gates. Refer to applicable IL NRCS Fence standard drawings for more detail on water gaps and floodgates.

For depressions less than 16 feet wide, install fence across the depression with no braces.

For depressions over 16 feet wide, construct a fence that will breakaway only in the depression and leave the rest of the fence undamaged. Construct brace assemblies on each side of the depression. Construct a fence in the depression with single end posts 6 inches from the brace assemblies, which allows the depression fence to breakaway without damaging the main fence. Attach the breakaway fence section to the main fence with light gauge wire. Refer to applicable IL NRCS Fence standard drawing for more detail on fencing across a depression.

If the depression has regular flooding, use a swinging or floating panel. The panel must be free to swing when water comes through. Construct horizontal cross braces on the down-stream side of the vertical panel(s) in order to provide for a smooth edge for debris to slide by on the upstream side. Using only wire livestock panels will result in debris catching on the panel and clogging the panel, resulting in failure. Refer to standard drawings for floodgates or picket fence across stream.

An electrified floodgate may be used in lieu of a non-electrified gate if desired. The electrified floodgate is constructed by stretching an electrified wire across the drainage above high water flow level. Attach droppers of 12½-gauge Hi-Tensile fence wire, 9-gauge wire class III galvanized, or drop chains from the electrified wire at a horizontal spacing of 6-inches, stopping above average normal water level. Use crimping sleeves or spacers to ensure drops stay in position. Connect gate to power source or to electric fence with double-insulated cable through a cut-off switch and floodgate controller. Refer to applicable IL NRCS Fence standard drawings for more details about electric floodgate.

UTILITIES

The landowner and/or contractor must be responsible for locating all buried utilities in the project area, including drainage tile and other structural measures

Prior to all digging and soil disturbance landowner and/or contractor will call Julie.

SAFETY

Consider all safety recommendations and cautions from suppliers, distributors, manufacturers, installers, dealers, power companies, electricians, and other professionals, when constructing fences. Remove and properly discard all broken fencing materials and hardware. All necessary precautions should be taken to ensure the safety of construction and maintenance crews.

TABLE F. Allowable pressure treatment for wood posts. Pressure treatment must conform to American Wood Preservers Association (AWPA) Standard U1, Use Category 4 (UC4) or higher

Treatment Type	Pressure Treatment Level
Pentachlorophenol (PCP)	UC4 = 0.4 lbs/ft ³
Creosote and creosote solutions	UC4 = 6.0 – 8.0 lbs/ft ³
Chromated Copper Arsenate (CCA)	UC4 = 0.4 lbs/ft ³
Alkaline Copper Quat (ACQ)	0.4 lbs/ft ³
Micronized Copper Quaternary (MCQ)	UC4 = 0.34 lbs/ft ³
Micronized Copper Azole (MCA)	UC4 = 0.15 lbs/ft ³
UC4 = A – Ground contact or fresh water. B – Ground contact, fresh water or important construction components. C – Ground contact, fresh water or critical structural components.	

TABLE G: Acceptable post materials and installation depths for non-electrified fence

Function	Material Type	Minimum Diameter Inches	Notes
Line Posts and Stays (All Wood Posts must be set or driven at least 24 inches in the ground.) Except for 8 foot deer fences. (See note for depth of T posts)	Black locust, red cedar or redwood. ^{1,2}	3	At least one-half of the diameter of the red cedar or redwood post must be heartwood.
	Osage orange. ^{1,2}	2 1/2	
	Pressure-treated pine or other wood of equal life and strength. ¹	3	Pressure treatment must be according to Table F.
	Standard “T,” “Y,” or “U” shaped steel posts (hot dip galvanized, painted with high-grade weather resistant steel paint, or enameled and baked).	*	* Weight must be at least 1.33 pounds per foot of length with the weight of the anchor plate. Posts must be new. Posts must be set solidly in the ground so that at least the top of the anchor plate is below the ground surface. Minimum post depth 24 inches for deer fences.
Posts for 3 to 6 wire corners, gates, end or pull assemblies, and brace post assemblies	Wood posts, including black locust, red cedar, redwood, Osage orange, pressure-treated pine or other wood of equal life and strength with appropriate knee, deadman, angle, or “H” brace. ^{1,2}	5 (3 wires)	Posts for “H” assemblies must be driven or set at least 36 inches deep or below the frost line.
		6 (4 – 6 wires)	
		6 (3 wires)	Single post driven 5 foot into the ground.
Double H bracing required for all 8 foot deer fence. Corner, gate, end, pull assembly and brace post assemblies	Wood posts, including black locust, red cedar, redwood, Osage orange, pressure-treated pine or other wood of equal life and strength with appropriate knee, deadman, angle, or “H” brace. ^{1,2}	6	All wood posts need set or driven 4 foot into the ground. This includes both line and brace posts.
¹ At least one-half of the diameter of the red cedar or redwood post must be heartwood. Pressure treatment must be according to Table G.			
² Used red cedar, black locust and Osage orange can be used as long as the posts are whole, sound and free of decay and 1 inch larger in diameter than designated in Table G.			

Specific Site Requirements