**NATURAL RESOURCES CONSERVATION SERVICE**
**CONSTRUCTION SPECIFICATION**

# FENCE

# (Barbed Wire, Woven Wire or Suspension Fence)

## SCOPE

The work shall 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

The location of the fence shall be as shown on the Fence Job Sheet (JS382e) or identified on a project map, and as staked in the field.

## SITE PREPARATION

All trees, stumps, brush and debris shall 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 shall 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 shall 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 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.

For woven wire, top and bottom strands of standard or Hi-Tensile woven wire shall be 12½ gauge or heavier, and 14½ gauge wire, or heavier, for intermediate strands.

For smooth wire to be installed in conjunction with woven wire, the wire shall be 12½ gauge, single strand, minimum tensile strength of 140,000 PSI, and 1,078 lbs. minimum breaking strength. All wire shall have, as a minimum, Class III galvanization.

Staples shall be of 9-gauge Class III galvanized steel or heavier with a minimum length of 1 1/2 inches for softwoods and a minimum length of 1 inch for close-grained hardwoods. Wires shall 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 shall conform to the size and material specifications in Table E, except as noted below.

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

Reinforced concrete or metal 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 shall 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 shall live trees constitute more than 10 percent of line posts used.

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

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

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

## CONSTRUCTION

### Wire Placement

Fence height shall be defined as the average height from ground to top of wire at each fence post. Fence height of exterior/property line fences shall 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 shall the height of the exterior/property line fence be lower than 48 inches.

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

Wire shall 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 shall be placed on the side of the post located closest to the livestock. Wire shall be placed on the outside of a curve in the fence when required for structural stability.

Joining of wires will be by way of approved splices such as “Western-Union Splice,” square knot, or lap splice with 3 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 may be fastened directly to the tree to the depth of the threads and then an end or corner insulator assembly attached 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.

The tension on each wire shall 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.

Placement of a single strand of barbed wire at ground level on the opposite side of the post from woven wire will assist in protecting livestock from predators.

**Number and Spacing of Wires**

The number of wires and spacing shall be as shown on the job sheet.

Barbed wire fences shall be either four (4) or five (5) wires for exterior/property line fences. A minimum of three wires shall be used for interior fencing. Wires shall be spaced approximately equal distances apart. The bottom wire shall be 12 to 18 inches above the ground level. Wires shall 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 shall 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 shall have at least 1 barbed or smooth wire above the woven wire spaced at 8 to 12 inches above the top woven wire.

Suspension fences shall have a minimum of four barbed wires spaced approximately an equal distance apart, and wire stays shall swing free of the ground. To allow for appropriate sway of the fence, tension on line wires shall 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 shall 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 sufficient depth to resist pull out.

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 shall be earth or Illinois Department of Transportation Gradation No. CA-6 coarse aggregate. The backfill shall be placed in layers no thicker than 4 inches, each layer shall be thoroughly tamped, and shall completely fill the post hole up to the ground surface.

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

- Standard barbed wire 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 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. The horizontal brace member shall (as a minimum) be the equivalent of a 4-inch diameter post or standard weight (schedule 40) galvanized steel pipe of at least 2⅜-inch outside diameter installed in the upper 1/3 of the posts and below the top wire. Steel pipe may be primed and painted as an alternative to galvanizing. The horizontal brace member length shall be between 8 foot and 2.5 times the height of the top fence wire. At a minimum 3/8-inch diameter, Class I, Class II or Class III galvanized pins will be used to hold horizontal brace in place. A tension member (brace wire) composed of 2 complete loops of Class III galvanized 9 gauge smooth wire or Class III galvanized 12½-gauge Hi-Tensile strength smooth wire may be used. "H" Braces, Double "H" Braces, or Angle Braces shall be used in standard fences. Refer to applicable IL NRCS Fence standard drawings for specifications on corners, angles, or brace assemblies.

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

Changes in fence directions greater than 20 degrees, but less than 60 degrees require change of direction bracing as shown in standard drawings. Tie off all wires at corner posts. Do not pull wire around corner posts.

Changes in fence directions from 60 to 90 degrees require a standard corner brace assembly. Tie off all wires at corner posts. 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 ft. into the ground with a 4 in. lean toward the outside of the curve.

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

On sandy loams and coarser textured soils, or sites with restricted soil depth of less than 36 inches, "deadman", a screw-in anchor applied against the direction of pull, or a double "H" assembly is required.

For double post 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.)

Pull assemblies shall 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.

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

A single 7-inch minimum diameter driven post may be substituted for end panel, corner, and vertical change bracing, and pull post assembly for 6 strand barbed wire or less. The post shall be driven a minimum of 5 feet into the ground.

**Gates and Water Gaps**

On hinged gates, set hinge pins to hold gate in place so gate cannot be lifted off pins.

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 flood gates.

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 panels will result in debris catching on the panel and clogging the panel, resulting in failure. Refer to standard drawings for flood gates or picket fence across stream.

**UTILITIES**

The landowner and/or contractor shall 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.

**TABLE E:** Acceptable post materials and installation depths for non-electrified fence.

| Function | Material Type | Minimum Diameter in Inches | Notes |
|---|---|---|---|
| Line Posts and Stays<br><br>(All Posts must be set or driven at least 24 inches in the ground.) | Black locust, red cedar or redwood. | 3 | At least one half of the diameter of the red cedar or redwood post shall be heartwood. |
| | Osage orange. | 2½ | |
| | Pressure-treated pine or other wood of equal life and strength. | 3 | Pressure treatment shall 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 the top of the anchor plate is below the ground surface. |
| Wood posts for corners, gates, end or pull assemblies, and brace post assemblies. | Wood posts, including black locust, red cedar, redwood, osage-orange, or pressure-treated pine or other wood of equal life and strength, with appropriate knee, deadman, angle, or "H" brace. | 6 | At least one half of the diameter of the red cedar or redwood post shall be heartwood. Pressure treatment shall be according to Table F. Posts must be set at least 36 inches deep or below the frost line. |

**TABLE F:** Allowable pressure treatment for wood posts. Pressure treatment shall 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/ft3 |
| Micronized Copper Azole (MCA) | UC4 = 0.15 lbs/ft3 |

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.