PRACTICE SPECIFICATIONS

FENCE

1. SPECIFICATIONS

THERE ARE FOUR DIFFERENT TYPES OF FENCES: Structural Protection (used around ponds, embankments, ag waste storage structures or other structures), Standard, Suspension, and Permanent Electric.

The specifications for the different types of fences are as follows:

2. STRUCTURAL PROTECTION FENCES

Plans and specifications for construction shall be in keeping with the standard for this type of fence and shall describe the requirements for proper installation of the practice to achieve its intended purpose.

Applicable Nebraska Construction and Material Specifications found in Appendix 2 of the Engineering Field Handbook include:

- Type 4 and 6 Fence Details (5,E-22, 500.2-1)
- Type 4N Fence Details (5,E-22, 500.2-4)
- Structural protection for embankment structures shall be at least 4 barbed wires.

3. STANDARD AND SUSPENSION FENCES

Applicable drawings include (available online at www.ne.nrcs.usda.gov):

- 3 strand standard post and wire fence (NE500-10-001)
- 4 strand standard post and wire fence (NE500-10-002)
- Woven wire fence (NE500-10-003)
- Suspension fence (NE500-20-001)

A. Wire

Fences shall be constructed of “smooth,” “barbed,” “woven and smooth,” or “woven and barbed” wire.

All wires and/or barbs shall be coated with Class I zinc coating (0.30 oz. minimum).

(a) Smooth

A smooth wire fence shall have a minimum of four wires.

(b) Barbed Wire

A barbed wire fence shall have a minimum of either 3 or 4 barbed wires, depending upon post spacing. The strands shall be spaced approximately an equal distance apart with the top wire between 40 to 48 inches above the ground level at each post. The bottom wire shall be approximately 14 to 18 inches above the ground level.

(c) Woven Wire

Fence with woven wire less than 32 inches high shall have a least 2 smooth or barbed wires above the woven wire. Fences with woven wire 32 inches or higher must have at least one smooth or barbed wire above the woven wire.

B. Wire Attachment to Posts

Applicable staple and wire attachment is shown on the drawing (NE500-60-001) (available online at www.ne.nrcs.usda.gov).

The wire shall be stretched and attached to posts as follows:

(a) Standard Fence

The wire shall be placed on the side of the post opposite the area being protected, except on curves.

The wire shall be placed on the outside of curves.

Each wire shall be fastened to each end post, corner post, and pull post by wrapping each horizontal strand around the post and tying it back on itself with not less than three tightly wound wraps.

Each wire shall be fastened to wooden line posts by means of staples or tie wire. Woven wire fencing shall be attached at alternate horizontal strands. Each strand of barbed wire shall be attached to each post. Staples shall be driven diagonally with the grain of the wood at a slight downward angle and shall not be driven so tightly as to bind the wire against the post.

Each wire shall be fastened to steel, concrete or wood line posts with either two turns of 14-gauge galvanized steel or soft iron wire or the post manufacturer's special wire fasteners.

Wire shall be spliced by means of a Western Union splice or by suitable splice sleeve applied with a tool designed for the purpose. The Western Union splice shall have not less than 8 wraps of each end about the other. All wraps shall be tightly wound and closely spaced. Splices made with splice sleeve shall have a tensile strength no less than 80 percent of the strength of the wire.

Fence crossings will be installed appropriately. Examples of applicable barbed wire fence crossings are shown on the attached drawing NE-500-50-001.

C. Construction Guidelines

Applicable drawings for wire fence braces are shown on drawings (NE500-40-001, NE500-40-002, and NE500-40-003)(available online at www.ne.nrcs.usda.gov).

(a) Standard Fence

Each corner or gatepost shall be anchored with a "deadman" or by using brace posts (see NE-CPA-1). The "deadman" shall be set at least 4 feet deep in the ground.

Spacing in straight line sections of the fence as follows:

- Anchor or pull posts shall be spaced at intervals not to exceed 1,320 feet (80 rods).

- Any straight section of fence more than one-half mile long (80 rods) shall have a minimum of 2-line anchor or pull post assemblies. The pull post assemblies shall be equally spaced along straight sections.

Brace wires used with horizontal bracing shall be double stand, 9-gauge galvanized, smooth wire, or equivalent to a double strand of new barbed wire.

All posts, except driven steel or wood posts, shall be back filled with suitable materials and thoroughly tamped. Wire shall be stretched and attached after all

the posts and anchors, if used, are properly set and back filled.

(b) Suspension Fence

Directional changes in the line shall be by definite angles.

Bracing shall be required at all corners, gates, and definite angles.

Spacing in straight line sections of the fence as follows:

- Anchor or pull posts shall be spaced at intervals not to exceed 1,320 feet (80 rods).

- Any straight section of fence more than one-half mile long (80 rods) shall have a minimum of 2-line anchor or pull post assemblies. The pull post assemblies shall be equally spaced along straight sections.

Fences shall have a minimum of 4 strands of barbed wire. The strands shall be spaced approximately an equal distance apart with the top wire between 40 to 48 inches above the ground level at each post. The bottom wire shall be minimum of 12 to 18 inches above the ground level. The barbed wire will be tightened so that it is springy to the touch in warm weather. (NOTE: This is approximately a 3-inch sag in the wire between posts, which permits maximum sway in fence).

All stays shall swing free to sway when contacted by animals.

D. Gates

Wire gates shall be the appropriate types shown on drawing 5,E-22, 500.2-4, entitled type 4N Fence Details in Appendix 2 of the Engineering Field Handbook. They shall be constructed in accordance with the specifications and to the dimensions shown on this drawing. The materials shall conform to the kinds, grades, and sizes specified for fences, and shall include the necessary fittings and stays. (Note: The gate opener design examples shown on drawings (NE500-60-002 and NE500-60-003) are optional and other appropriate designs may be used)(available online at www.ne.nrcs.usda.gov).

4. PERMANENT ELECTRIC FENCES

Applicable drawings for permanent electric fences are shown on drawing (NE-500-30-01) (available online at www.ne.nrcs.usda.gov).

A. Wire

Outside perimeter fences or structural protection fences will be constructed of at least 4 wires.

Conservation plan fences can be constructed with a minimum of 2 wires.

B. Posts

LINE POSTS

Fiberglass posts will be a composite of marble, fiberglass, and polymer resins which have been treated to protect them from ultraviolet light, or high density wood posts specially designed for permanent electric fences.

A wood line post should be used on all high and low points. A “deadman” may be needed at all low points.

Pull posts shall be constructed as an “H” brace or as a single post deadmanned in both directions.

CORNER, GATES AND BRACE POSTS

All corner gate and brace posts shall be wooden, structural metal or other material of equal strength and durability. All wood shall be treated with preservative as described for wood posts.

Corner and gateposts shall have a minimum top diameter of 4 inches described for standard fences and 5-inch diameter for structure protection fences or whenever there is a 15-degree or more change in the fence direction of fence.

Each corner or gatepost shall be anchored with a “deadman” and set at least 4 feet deep or an “H” brace post assembly shall be installed.

Brace assemblies will be spaced at intervals no greater than 4,000 feet providing the fence is not stretched more than 2,000 feet from a well anchored brace assembly.

HORIZONTAL BRACING

Brace wire shall be double strand 9-gauge galvanized, smooth wire, or a double strand of barbed wire, or high tensile 12-gauge wire.

C. Energizers

Energizers shall be Underwriters Laboratory (UL) listed. Installation shall be in accordance with manufacturer recommendations. The length of electrified wire shall not exceed capacity of the energizers. A portable voltmeter is desirable to monitor voltage on the line.

Electric energizers or electric fence controllers are to meet the following minimum specifications:

- High power, low impedance with 5,000-volt peak output, 2.3 millicoulombs charge, and a pulse that is finished within 300-millionths of a second or less, and 54 to 60 pulse per minute.
- High impact weather resistant case.
- Snap-in circuit panels.
- Full power in, with reduced power on output.
- Safety pace fuse.
- Lightning arrester.
- 110-volt and 220-volt; 6-volt and 9-volt solar powered chargers; or 12-volt battery powered system capable of operating 3 weeks without recharge.

D. Fence Fasteners

Fence fasteners or “clips” are to be galvanized and fastened to allow fence wire to flow or slide past line posts as necessary. A 10-gauge galvanized wire tied in a loop and fastened to the fiberglass post may be used in lieu of the specially designed manufacturer’s clip. An alternative to fasteners is to drill properly spaced holes in the fiberglass posts. The holes should be of adequate size that wires can slide when tightened. Insulators of porcelain ceramic or high quality black polypropylene plastic must be used on steel or wood posts or holes drilled in wood posts using PVC hose for the insulator.

E. Ground

All permanent electric fences must be grounded. Energizer ground wire must be connected to a galvanized pipe or rod ½ inch or larger, driven into the ground a minimum of 6 feet. If soil depth prohibits this 6-foot depth, use two or more galvanized pipes or rods. Ground wires in the fence must also be connected to a galvanized pipe or rod. The ground wire attached to the fence may be located anywhere along the fence where a 6-foot depth can be obtained for the galvanized rod or pipe. Ground shall be in accordance to manufacturer recommendations. As a minimum, 20 feet for ground rod (optimum 3 8-foot rods) with 10 feet between.

F. Stays

Fiberglass stays will be a composite of marble, fiberglass and polymer resins, which have been treated for protection from ultra violet light, or high density wood stays especially made for electric fences.

G. Gates

Wire gates shall be the appropriate types shown on drawing 5,E-22, 500.2-4, entitled type 4N Fence Details in Appendix 2 of the Engineering Field Handbook. They shall be constructed in accordance with the specifications and to the dimensions shown on this drawing. Refer to drawing NE500-30-001 (available online at www.ne.nrcs.usda.gov) for additional details on for gates. The materials shall conform to the kinds, grades, and sizes specified for fences, and shall include the necessary fittings and stays.

H. Lightning Protection

Lightning can cause damage to the energizer. Most energizers are poorly protected from lightning strike. External lightning arrestors and an induction loop (lightning choke) should be installed for added protection. Lightning arrestor grounding rods should be placed at least 65 feet from those of the energizer.

Install an additional set of ground rods and attached to a lightning arrestor. Use at least 1 more ground rod on the arrestor than was used on the energizer. Attach the lightning arrestor to the wires of the fence. Install a lightning choke in the fence line immediately between the lightning arrestor and the energizer. The lightning arrestor ground must be better than the energizer ground for it to function properly, because lightning will seek the least resistance route to ground.