PASTURE AND RANGE FENCES

The attached information on pasture and range fences are to supplement the Standards and Specifications for Fencing 382.
PASTURE AND RANGE

FENCES

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
PASTURE AND RANGE FENCES

I. INTRODUCTION

The sketches in this technical note are to supplement the Fencing Standards and Specifications #382 dated May 1981. Copies of individual sheets can be reproduced by the District Conservationists for handouts to contractors, farmers or ranchers as needed.

Sources of Information used in the preparation of this Technical Note:

U.S. Forest Service
U.S. Dept. of Interior Bureau of Land Management
Soil Conservation Service Specifications
Technical Notes from California and Arizona
Pasture and Range Fences, Mountain States Publication No.2R March 1967.
Michael A. MoNames & etal.
ASAE Engineering Practice ASAE EP250.3
How to Build Fences With USS Mez-ten 200 High-Tensile Fence Wire.
(a source not used, but is available from the area office.)
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II. Breaking force of post

- 3" wood post
  - Breaking force required: 400 - 700 pounds.

- 4" wood post
  - Breaking force required: 800 - 1500 pounds.

- 5" wood post
  - Breaking force required: 1400 - 2700 pounds.
III. Barbed Wire Design

4-WIRE BARBED

Max spacing

- 20' w/o stay
- 25' w/one stay
- 30' w/two stays

a. In antelope country bottom wire can be replaced with smooth wire.

b. No stays should be used for antelope fence.

3-WIRE BARBED

Max spacing

- 20' w/o stays
- 25' w/one stay
- 30' w/two stays
II. Woven Wire Design

On deer and elk range use this spacing.

a. Net-wire fences are generally barriers to antelope and therefore, their construction on antelope ranges is discouraged.

b. If grazing management dictates the building of a woven wire fence, antelope crossings shall be considered.
I. Suspension Fence Design

a. Where antelope are a consideration, the bottom wire shall be 16" above the ground.

b. Where antelope are a consideration, the bottom barbed wire may be replaced with smooth wire to minimize physical injuries.

c. Corner and brace posts and line braces will require different specifications than a regular fence. Refer to specification part on suspension fences for details.
II Alignment

A. Change in Alignment

- Dowel
- Barbed wire
- Cross-brace wires, two complete loops No. 9 galv. smooth wire or double loop of 12 1/4 ga. galv. barbed wire.
- Posts - 5" ø min.
- 4"x4" or 3½" dia. timber brace.
II. Alignment (cont.)

B. Change in Vertical

Post 5" Ø min., Creosote treated

Double strand No. 9 galv. smooth wire brace if deemed necessary by the Engineer.

Line Post
3" dia. min.

3-5'-3'-5'-3'-5' min.

12" x 12" x 12" Concrete deadman anchor

Post 5" Ø min., Creosote treated

Double strand No. 9 galv. smooth wire

C. Post Anchor for Low Spots

POST ANCHOR
For gently sloping low spots (no scale)
III. Crossing Arroyos Fence Designs

PROFILE

END DETAIL

When revetment is not specified
VIII. (cont.)

**VIEW LOOKING UPSTREAM**

**SHOWING SUSPENSION DIRECT FROM DEADMAN**

**SHOWING DEADMAN SUSPENSION THRU CORNER POST**

**SWINGING TYPE WATER GATES**

![Diagram of swinging type water gates]

**ALTERNATIVE GATE HANGERS**

**NOTES:**
Swinging gate to be even with or downstream from fence, never upstream from fence. Crossbars on downstream side of gate panels. If round poles are used, top dia. to be 3" minimum, size to depend on length and weight of panel. When round or split poles are used, wire together instead of nailing.
VII. (cont.)

**BREAKER TYPE WATER GATE**
*for shallow arroyo*

**BREAKER TYPE WATER GATE**
*for deep arroyo*
VIII. Brace Post and Corner Post Design

A. Brace Wire Attachment

Steps in attaching brace wire to a corner brace
VIII. (cont.)
B. Pull Post Assembly

Second Brace
Optional

1. Wooden Diagonal Braces - Steel Horizontal Braces

Corner post 5 in. top dia., 7 ft. long
Second post takes load 5 in. top dia.
4 in. Short lengths of Wire
Wrap ends To Stretcher
VIII. (cont.)

Note: 2" dia pipe diagonal brace may be used in place of horizontal timber brace and diagonal wires. 6'0" min - not to exceed 10'0".

- Brace post 5'4" min
- Dowel
- 1" x 4" or 3½" dia timber brace
- Barbed wire
- Double strand No 9 galv smooth wire or double loop of 12½ gauge barbed wire.

Tie all wires at one brace post.

Place in fence line so that maximum distance between braced posts does not exceed 80 rods.

LINE BRACING
C. (cont.)

[Diagram of alternating steel braces]

D. Deadman Brace

[Diagram of deadman brace system]
VIII. (cont.)

D. Deadman Brace

**ANGLE GUY WITH DEADMAN**

- Guy wire guard
- Deadman
- Brace

**END GUY WITH DEADMAN**

- Dead end line wires
- Wrap once around post & back on line wire
- Dap into post
- Shallow notch
- Twist stick
- Obl. strands galv.
- Grade
- Do not wrap around post

Approx. 100 lb. stone
6" x 3" durable pole
Bar out guy wire slot

**PLAN**

Note: This is a good brace for plains country and for set-down type fence.
VIII. (cont.)

E. Steel brace and corner post assemblies

Post min of 2.5 x 2.5 x 0.25 inches angle and 4.10 pound per foot

See VIII E. for post size.
VIII. (cont.)

E. Welded Steel Corners

\[ 8'0'' \]

\[ 4'' \]

\[ 3'0'' \]

\[ 12'' \]

E. (cont.) Steel fence line brace

\[
\begin{array}{ccc}
\theta & \ell & \delta \\
30^\circ & 21'' & 42'' \\
45^\circ & 36'' & 51'' \\
\end{array}
\]

See VIII e for post size

Note: Angle brace to be bolted or welded to the vertical post.
VIII. (cont.)

F. Brace for deflection angles

Wire to be fastened to outside of curve

Inside of curve

Log or stone

BELOW GROUND BRACING (for deflection angles 6°-12°)
II. Steel Posts

"U" Bar

Studded "Y"

Staple Gripper

Studded "T"
XI. Staples and Attachment of Wire

Wrap splice for splicing barbed wire

SPLICING BARBED WIRE

Wire "A" Wire "D" Wire "A" Wire "C"

Wire "B" Wire "C" Wire "B" Wire "D"

Commercial fence splice sleeves are available and will give neat, non-slipping splices. Special tools are necessary to compress the sleeve.

SPLICING SMOOTH WIRE "WESTERN UNION"

Wire "A" Wire "B"

Wire "B" 6 wraps Wire "A" 6 wraps

SPICING TOOL

SPICING WOVEN WIRE OF UNEQUAL HEIGHT
(a) U-shaped staple
(b) New L-shaped deformed shank staple

DRIVE STAPLES AT ANGLE

DO NOT DRIVE STAPLES PARALLEL TO SIDE OF POST

LEAVE WIRE LOOSE IN STAPLE

Tie wire — Approx. 1 1/2 x 2 1/2" Stay

Tie wire — Approx. 1 1/2 x 2 1/2" Stay

Tie to each line in barbed wire fence

No. 9 wire to rock weight
XI. Stretching Woven Wire

Here's how the hump looks in woven wire:
Before stretching.

Stretched too tight.

Tension curves on woven wire show when wire is properly stretched:
After Proper Stretching.
III. Line Jack Designs
III. Gate Fasteners

Diagram showing:
- 5" dia. gate post
- 4' x 4' wood brace
- 2" gate bar
- No. 9 galv. wire loop stapled to gate post
- Barbed wire

Dimensions:
- 7'
- 8'
- 9'
- 4'
- 10'
- 2'
XIII. Gate Fasteners (cont.)

Top View
Lever down

Side View
Lever about half open

Bill of Materials

1-pc. 1/4" x 1 1/4" x 21"  
1-pc. 1/4" x 1 1/4" x 26"  
1-pc. 1/4" x 1 1/4" x 27"  

2-Angle clips-1 1/2" x 1 1/2" x 1"  
6-3/8" screw hd. stove bolts  
3-Log screws-5/16" x 2"

2" x 4" Gate bar  
8" x 4" Gate Post  

Borbed wire  

Borbed wire  

4" x 4" Timber brace  
Dip posts 3/4" for timber brace  

No. 9 galv. wire loop stapled to gate post  
(Ground line)
**Gate Assemblies**

![Diagram of gate assembly with dimensions and materials listed in a bill of material.]

**Detail of Hinge**
- 

**Detail of Latch**

**NOTE:** All joints to be welded. All pipe in gate to be 1/2" minimum diameter.

**Bill of Material**

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 yd. gravel</td>
<td>1 pc.</td>
</tr>
<tr>
<td>1/4&quot; sand</td>
<td>1 pc. 1 1/2&quot; Steel Pipe x 7'-8&quot;</td>
</tr>
<tr>
<td>3 sacks cement</td>
<td>1 pc. 10&quot; x 10&quot; x 8'-0&quot; S45</td>
</tr>
<tr>
<td></td>
<td>1 pc. 1&quot; x 3&quot; x 3'-0&quot; S45</td>
</tr>
<tr>
<td></td>
<td>1 pc. 2&quot; Steel Pipe x 10'-2&quot;</td>
</tr>
<tr>
<td></td>
<td>1 pc. 1&quot; x 6&quot; long</td>
</tr>
<tr>
<td></td>
<td>1 pc. 1/4&quot; x 6&quot; = 26&quot;</td>
</tr>
<tr>
<td></td>
<td>2 pc. 1/4&quot; x 1 1/2&quot; Strap Iron (detail)</td>
</tr>
<tr>
<td></td>
<td>2 pc. x 6'-0&quot;</td>
</tr>
<tr>
<td></td>
<td>3 pc. x 4'-0&quot;</td>
</tr>
<tr>
<td>3 pc. 3/4&quot; x 3&quot; Eyebolts</td>
<td></td>
</tr>
<tr>
<td>75 ft. 6 ga. wire</td>
<td></td>
</tr>
</tbody>
</table>
XIV Gate Assemblies (cont.)

**Bill of Material**

1 pc. 2" x 6" x 5' #2 Com.
2 pc. 1" x 6" x 10" #2 Com.
3-4 pc. 1" x 4" x 12'-16' #2 Com.
20 3/8" x 2 1/2" carriage bolts
20 3/8" washers

**Bill of Material**

1 pc. 3" x 4" x 8' #2 Com.
2 pc. 1" x 6" x 12'-16' #2 Com.
4 pc. 1" x 4" x 12'-16' #2 Com.
1 pc. 1" x 4" x 14'-18' #2 Com.
1 pc. 1" x 4" x 14' #2 Com.
2 pc. 1" x 4" x 12' #2 Com.
30 3/8" x 3" carriage bolts
1 1/4" x 3" carriage bolts
30 3/8" cut washers
2 1/4" cut washers
1 pr. gate hinges
III. Gate Assemblies (cont.)

![Diagram of gate assemblies with dimensions and annotations]

- Metal strap
- Bearing block
- 13'-0"
- 12'-0"
- 3'-0"

---

30
III. Gate Assemblies (cont.)

No. 9 wire

Gate to have same number of wires as fence line.
A standard device essential in areas where open range country is adjacent to park access roads or where areas must be divided into grazing and non-grazing sections. An access gate, for controlled animal passage, may be provided in the fence which adjoins this cattleguard.

A portion of the grill is made removable so that the space beneath may be kept clean of debris. Railroad rails may be used as crossbars, if they are available.
A sound design for a boundary line cattle guard. Pit should be well drained; section of decking should be removable to permit periodic cleaning. A standard gate might be installed in the abutting fence to the right or left of the guard to permit controlled passage of animals. Railroad rails or heavy pipe may also be used as cattle guard decking.
IV. Cattleguard Assemblies (cont.)

If cattle guard cannot be drained or can be constructed on a rock or earth fill to form the pit.

French drain

SECTION A-A

SECTION AT E OF ROAD
III Cattleguard Assemblies (cont.)

Antelope pass is half of a normal cattle guard and should be located in a fence corner or offset.
XIII. Buck & Pole Fence Design

POST & POLE

POLE & WIRE

DETAIL OF STRAP HINGE

SIDE VIEW

PLAN

CONCRETE FOOTING
Buck & Barbed Wire Fence

NOTE: Put Guy Wires on every 10th buck on level ground and every 5th buck on steep ground.
**MATERIALS**

Poles and bucks to be peeled or stripped on 3 sides, be sound and free of knots. Min. top dia. of poles 3", of braces 4", and of buck sticks 6". Buck sticks to be mortised to provide tight joint.
Logs to be 8" in dia. at small end

10'-0" to 16'-0"

Wire top logs to either block or log below.

Rock footing

Logs may be notched to seat on rock.

Note: Number of logs dependent on size used. Fence shall not be more than 42" inches high in elk and deer areas.

Cross blocks 8" dia. min.

Blocks to have narrow notch on top and bottom side.

5" dia. min.

8" spikes

Note: Smaller logs & blocks to be used only when logs of specified size not available.
Angle of buck should not be less than 60°. Angle should be 80° on untimbered terrain where fence will be subjected to high winds.

Note:
Both buck sticks to be cut the same.
DETAIL OF END OF STRAP
(MAKE BOTH ENDS THE SAME)

OUTSIDE VIEW OF GATE

BOLT OR SPIKE

DOWEL FOR PIVOT POST

CONCRETE FOOTING
Note: Tie post may be eliminated where heavy logs are used and logs will remain in place without tie posts; otherwise, tie posts are necessary.
Let-Down Fences

Stay Let-Down Fence

NOTE: Wire should be between post and stay, so when laid down, the wires are on top of stay. Prevents wire pulling loose when picking up fence.

Staple Let-Down Fence

NOTE
Steel posts may be used.
Deadman brace may be used in lieu of deep set post. When used, deadman wire should end in back of post. Guy wire and ¼" cable hook into this loop, and are not wrapped around post.

Use of ¼" cable prevents breakage and is adjustable as needed.

Place cable on uphill side of post to facilitate laying down the fence.

Loop line wires twice around post and twist back on line wire.

End stay is of post size to take strain.

Line fence.
Note: Nicola-Press sleeves may also be used to advantage in splicing loops or fence.

Clamp in \( \frac{1}{2} \)" chuck of electric drill. Apply about 15 lb. pressure while twisting wire. Device will free itself.

One man can make about 300 loops per day using this system. They will be uniform in size and shape.

\( \frac{1}{2} \)" x 3" Carriage

Two complete twists

\( \frac{3}{4} \)" holes, bevel with \( \frac{1}{4} \)" bit to prevent binding

FIGURE 2
METHOD USED TO TWIST WIRE

FIGURE 3
METHOD USED TO FINISH WIRE

1. Cut number of wires needed, length depending on size of loop wanted. Usually 32"
2. Cut a 1" galv. pipe the same length as wire wanted, cap one end.
3. Clamp pipe in vise.
4. Place wire in pipe all the way to pipe cap. Cut wire at pipe entrance. One man can do job.

FIGURE 1
METHOD OF CUTTING WIRE TO UNIFORM LENGTH
Space stays equally between posts

Wire loop, stapled to post.

NOTE: Staple lower loop to post and allow upper loop to hang free.

DETAIL

Wire or 1½" staple
Barbed wire

Top of Post

Bolt head washer

Top loop staple

Bottom loop staple

Pull
Occasionally, stiles and special gates are necessary for park administration or maintenance. Here are a few which might fit a variety of requirements.
Somewhat sturdier than the pole gate shown in DESIGN sheet P-2411 this one features both a rod hanger and a knee brace. Especially recommended for longer spans.
A park entrance of pleasing proportions submitted by the Texas State Parks Board. While appropriate for most non-urban parks it would be most proper for plains type areas where a low silhouette is to be desired. The cedar rails give a rustic character to otherwise semi-formal masonry.
A variation of the pole gate with post clusters. Preservative treatment is strongly recommended in this type of construction.

The turn post rides on a steel pin in a concrete footing; top is guided by strap anchored to two permanent posts.
A rustic entrance gateway, constructed of peeled, treated logs, and joined with hardwood dowels. The turnposts swing on steel pins imbedded in either side. Unobtrusive in its setting, yet effective, this gate should serve for many years with a minimum of care.
Here is an "old stand-by" type of gate—neat in appearance and thoroughly practical—but with a new twist. Instead of the rail post pivoting on a base pin, this one swings on two in-line brackets hung on each 12x12" columns. Should move freely in all weather. Locking may be by hasp or chain where the rails meet.
This gateway can be built from finished lumber or from peeled logs. When finished lumber is used, a 5/8" guy rod supports the gate. A chain supports the gate when peeled logs are used.

Relatively inexpensive yet versatile, simple and practicable, this barrier is nice enough for most rustic settings.
A service road barrier so simple and unobtrusive it could fit into almost any setting. Two barrier posts (or more) on either side discourage motorists from driving around the ends when the road is closed. Barriers are set to permit pedestrian access. A similar post should be located so that the barrier can be locked open when necessary. A piece of reflectorized metal should be hung from the pipe arm warning drivers that the road is closed.
This road barrier is designed to prevent vehicular flow when necessary and yet never interfere with pedestrian travel.

It used 4" steel pipe with a section buried underground and hinged section attached on top.

To prevent vehicles from entering a road, the barrier is stood upright and, by use of a hinged locking tongue inside the pipe, is locked in that position. To allow vehicular flow, the lock is removed and the pipe swiveled to its down position, where it will be easy for any vehicle to clear it simulating, in this position, the familiar "speed bumps."

A metal plate welded to the locking tongue inside the pipe serves as a guide and prevents the tongue from improper positioning, insuring that the device will remain a locking device.

To make the pointed end of the top, cut 4 spade-shaped sections out of the pipe and bend the remaining points together, welding them shut. After assembly, a slit is torch-cut into the top to allow exit of the locking tongue.
This plan gives the pertinent details for a simple, but effective, road closing barrier. It was provided DESIGN by Park Engineer Jim Bowman of Cape Cod National Seashore.
Two types of entrance gates of generally good design. TYPE A is of a heavier and more permanent design in which the gate proper pivots on its own axis with the weight directly upon the concrete foundation. In TYPE C, the weight of the gate rests entirely upon the upright post. Either type of mounting may be employed for either the single, or the double swing gate. Pipe may be used if desired, but wooden gates should be made of pressure treated materials.
III Electric Wire Fences
"HOT" Wire Fence is most common and works well with soil that is sufficiently moist to provide good conductivity back to ground rod and fence charger when animal completes circuit between wire and ground.

"HOT" and "GROUND" Combination Fence is used to assure good electrical shocking effect in dry soil conditions when animal completes circuit between ground wire and hot wire. This system is recommended in arid climates where annual rainfall is 20 inches or less. The "HOT" and "GROUND" style fence may also be preferred for sheep or goats.

Adequate grounding cannot be overstated. Unit must complete the electrical circuit from the hot wire through the animal and back to the ground rod through the soil.

- Install one to four rods of 3/4" galvanized pipe a minimum of 8 feet into moist soil or an area of water runoff. In areas of high soil moisture (22" rainfall or more), one rod is adequate. In dry areas, use up to 4 rods.
- Ground to old well casing, if available.
- Do not ground near utility pole ground rods.
III Electric Wire Fences

8 feet deep—3/4" galvanized pipe. Install in area of good moisture runoff. Fasten wire securely to pipe with clamp connector. Drill several holes in ground pipe so it can collect moisture for better conductivity.

Ground rods 8 feet deep—3/4" galvanized pipe set 6 feet or more apart—in area of water runoff.
Curve or contour fence shall have maximum post spacing as follows:

<table>
<thead>
<tr>
<th>Fence Curvature</th>
<th>Post Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>in.</td>
<td>cm.</td>
</tr>
<tr>
<td>4 or less</td>
<td>10</td>
</tr>
<tr>
<td>5-6</td>
<td>13-15</td>
</tr>
<tr>
<td>7-8</td>
<td>18-20</td>
</tr>
<tr>
<td>9-14</td>
<td>23-36</td>
</tr>
<tr>
<td>15-20</td>
<td>38-51</td>
</tr>
</tbody>
</table>

1. Curvature shall be measured in inches from a stake along the proposed fence line, to a string connecting two other stakes along the fence line each 14 feet away from the first post.

2. Post spacing shall be measured horizontally.

3. Posts shall lean outward from the curve approximately 2 inches at the top, and fencing shall be applied to the side of the posts outside the curve and stretched to straighten the posts approximately 1 inch.