Fence (382) Construction and Restoration

For ECP and EQIP, use Kansas NRCS Conservation Practice (382) Fence Construction Specifications (dated 2014) found at: https://efotg.sc.egov.usda.gov/#/state/KS
Fence (382) Construction and Restoration Wire

S - 382 - 2

a. Wire. All wire will be of new galvanized material, and in accordance with criteria outlined in Table 2, that follows American Society of Testing and Materials (ASTM) Standard A116 and A584.

Galvanization is critical to rust protection of wire and different classes of galvanization provide different levels of protection.

Most wire manufacturers include wire specifications on fence tags. If information is not provided or known, lab testing may be needed to determine strength of wire.

Barbed wire
• The barbs will be 14-gauge or heavier.
• The barbs will be 2-point barbs on approximately 4-inch centers or 4-point barbs on 5-inch centers.

Installation of wire. Wire will be attached on the side of the fence post receiving the most pressure.

Fence wire will be stretched to sufficient tension to allow minimal sag prior to being fastened to posts. Temperature variations must be considered (wire will tighten in cold weather and expand in hot weather) when determining the amount of tension to use.

• Suspension fence—Wire tension is critical and wires should be stretched to allow no more than 3 inches of sag between posts set at 100 feet apart and 1 1/2 inches of sag between posts set at 50 feet apart.
• Electric fence—Wire tension will be stretched to allow no more than 3 inches of sag between posts.

All wire fences except woven wire
• Top wire heights will be based on the intended use according to Table 1.
• Bottom wire heights will be 12 to 18 inches above the ground surface.
• Middle wires will be spaced at equal intervals between top and bottom wire.
• Fences considered as “Wildlife-Friendly” for big game traffic areas, the top two wires shall be at least 12 inches apart. For areas where antelope crossing is a concern, bottom wire heights shall be 18 inches from the ground.

Woven wire fences
• The bottom wire of a woven wire fence will be placed near ground level.
• Woven wire fences will have at least 1 barbed or smooth wire placed above the woven wire. The maximum height of the barbed or smooth wire will be at least 44 inches above the ground.
• Woven wire is not recommended where enhancing wildlife movement is a planned objective.
Fence (382) Construction and Restoration Wire

1. Attaching wire to line posts: The following criteria will be followed for attaching wires to line posts:
   - Staples—
     - 9-gauge steel with a minimum length of 1 1/2 inch for soft woods and 1 inch for hardwoods.
     - Drive staples diagonally to the wood grain at a slight downward angle (upward, if pull is up) to avoid splitting the post.

2. Attaching wire to anchor/pull posts:
   - Standard wire fences—wires will be attached to anchor (pull) posts by 2 complete wraps around post, stapled (wood posts), or wired (pipe posts) and ends tightly wound and closely spaced around stretched wire at least 8 times.
   - Woven or mesh wire fences—wires will be attached to anchor (pull) posts by 2 complete

Fence (382) Construction and Restoration Posts

1. Posts: Type, height, size, and spacing of posts will be used that best meets the needs for the style of fence required and is best suited for the topography of the landscape. See Table 3 for line post concrete and Table 4 for tower assembly criteria.
   - Wood posts
     - Must be new, sound, and free from decay
     - The post will be reasonably straight with limbs trimmed flush or nearly flush with the body of the post.
     - Except the Ogee shape, all wood posts shall be treated with a preservative which is approved by either Federal specification TT-W-113 or the American Wood Preservers Association (AWPA).
     - Minimum length shall allow the required buried depth and fence height plus at least 2 inches of post above top wire.

   - Steel pipe posts
     - Posts will be capped, or enclosed to prevent intrusion from entering post.
     - Must "T" or "U" shaped posts
       - Shall be new materials
       - Shall be of high quality, stock, resulting not less than 1.25 pounds per foot of length.
       - Will have an anchor plate and be embedded, welded, or pinned for concrete foundation.
       - Will be galvanized, enamelled and tacked, or painted with weather resistant steel paint.
       - Minimum length shall allow the required buried depth and fence height plus at least 2 inches of post above top wire.

   - Setting posts: Posts will be set according to maximum depths provided in Tables 3 and 4.
     - For 30% shall ensure that adequate fence height is maintained based on its purpose (see Table 1).
     - One standard wooden post will be set in the line in the top of a slope where the horizontal pull of the stretched fence is excessive.
     - Wood posts will be set in earth only or driven.
     - Steel pipe posts may be driven or set.
     - Steel "T" or "U" shaped posts will be driven unless the technician specifies otherwise.
     - Posts to be backfilled with soil will be centered in a hole at least 8 inches larger in diameter than the diameter or side dimensions of the post and thoroughly tamped in 4-inch lifts up to ground level.

   - Part of pipe posts to be backfilled with concrete will be centered in a hole that is measured at 12 inches in diameter. Posts will be backfilled with 4 to 6 inches of thoroughly tamped soil. Concrete backfilled around the post will be added into place in layers not thicker than 12 inches. The hole will be completely filled and tamped (packed) at post base with concrete to prevent water from pooling around post at ground level. The concrete will be proportioned as follows: 1 part cement, 2 parts sand, 1 part gravel (minimum sieve size 1/2 inch). Diffusion wire will be added to obtain a gap between 3 and 5 inches. The concrete will be placed around the post within 1 hour of mixing. No stones will be applied to the post until at least 24 hours after the concrete has been placed.
Fence (382) Construction and Restoration Bracing

k. Bracing.

Anchor/pull posts: brace — brace of anchor (pull) posts is required at all corners, gates, and fence ends, at certain specified distances, and at definite slope and alignment changes in the fence line.

Special area fences will not exceed 600 feet between anchor (pull) posts.

3-Post Corner Brace Assemblies

3-Post Corner Brace Assemblies are required at all points where the fence alignment has a change of 15 degrees or more and the pull is from two directions.

A 3-Post Corner Brace Assembly consists of an anchor (pull) corner post and 1 brace post extending in each direction of pull.

Refer to “Corner Assembly” of fence details for standard livestock fence for additional information.

Note: Within any 2 and 3-post pull assembly, there is one anchor/pull post, and brace post(s). Wires should be tied off to anchor post ONLY. Under no circumstances should wires be tied off to brace post, even if there are multiple horizontal members welded between anchor and brace posts.

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Fence (382) Construction and Restoration Bracing

2-Post End Panel Brace Assemblies

2-Post End Panel Brace Assemblies are required where fences end and on both sides of gate openings where the pull is from only one direction.

A 2-Post End Panel Assembly consists of an anchor (pull) end post and 1 brace post extending in the direction of pull.

Refer to “End Panel” of fence details for standard livestock fence for additional information.

3-Post In-Line Brace Assemblies

3-Post In-Line Brace Assemblies consist of an anchor (pull) post and 1 brace post extending in each direction of pull, in line with the fence line.

• 3-Post In-Line Brace Assemblies are required in straight sections of the fence line where the distance between anchor (pull) posts of corner brace assemblies and/or end panel brace assemblies exceeds 1,320 feet for standard fences or 600 feet for special area fences.

• 3-Post In-Line Brace Assemblies are also required where an upward angle will require additional embankment to properly anchor the upward pull of the stretched wire. Changes in slope exceeding 10 percent are to be considered for this type of brace assembly. The center post of this brace assembly will be set as near the point where the slope breaks as possible.

Refer to “Pull Post Assembly” of special area fence details for additional design information.
Fence (382) Construction and Restoration Bracing

**Horizontal Compression Brace Member**
Refer to Table 5 for horizontal compression brace member criteria and specifications.

- Placement of horizontal brace members will be a minimum of 3 feet above the ground and 8 inches from the top of the post when placed at a 90 degree angle to the anchor or pull posts.
- Placement of brace members at an angle from the anchor post (corner) to the brace post shall not exceed 30 degrees downward from horizontal nor exceed a length of twice the height of the anchor post above ground.
- In sands and wet areas, the length of the horizontal compression brace member will be increased from the minimum 7 feet to a length of 9 to 10 feet.

Fence (382) Construction and Restoration Bracing

**Steel and Angle Iron Compression Brace Members**
- Steel and angle iron compression brace members may be used on wood or steel brace and anchor post assemblies.

**Diagonal Tension/Brace (guy) Wire (for Wood Corner and Brace Post Assemblies)**
The diagonal tension/brace wire will consist of 2 complete loops of 9-gauge smooth wire or 2 complete loops of 12 1/2-gauge double strand barbed or smooth wire, or a single loop of 12 1/2-gauge high tensile, smooth wire.

The tension/brace wire will be stapled at quarter points to the brace post at a height of 4 to 6 inches above the brace member and stapled to the anchor (pull) post at a point approximately 4 inches above the ground level.

The tension/brace wire consisting of 2 complete loops will be twisted or strained to provide necessary rigidity with a twist rod that should be 18 to 24 inches long and will remain in place approximately midway along brace wire.

The tension/brace wire consisting of a single loop of 12 1/2-gauge high tensile, smooth wire will be tightened to provide the necessary rigidity with an in-line stainer placed approximately midway along the brace wire.
Fence (382) Construction and Restoration

Table 1.

<table>
<thead>
<tr>
<th>Intended Use</th>
<th>Fence Type</th>
<th>Minimum Number of Wire or Cross Members</th>
<th>Average Height of Top Wire or Cross Member (in)</th>
<th>Max. Line Post Spacing w/o Stay (in)</th>
<th>Max. Line Post Spacing w/Stay (in)</th>
<th>Max Stay Spacing (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>Standard barbed wire</td>
<td>6</td>
<td>16</td>
<td>61/2</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Suspension</td>
<td>6</td>
<td>16</td>
<td>61/2</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Smooth, high tensile, non-energized</td>
<td>5</td>
<td>16</td>
<td>61/2</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Smooth, high tensile, energized</td>
<td>5</td>
<td>16</td>
<td>61/2</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Confined dangers area and #</td>
<td>4</td>
<td>16</td>
<td>61/2</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Special uses barbed wire</td>
<td>4</td>
<td>16</td>
<td>61/2</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Woven wire (addition of 1 to 2 barbed wires, must be added to achieve total height)</td>
<td>4</td>
<td>16</td>
<td>61/2</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Goats/ Sheep</td>
<td>Standard barbed wire</td>
<td>6</td>
<td>16</td>
<td>61/2</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Smooth, high tensile, non-energized</td>
<td>5</td>
<td>16</td>
<td>61/2</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Smooth, high tensile, energized</td>
<td>5</td>
<td>16</td>
<td>61/2</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Horses</td>
<td>Standard barbed wire</td>
<td>6</td>
<td>16</td>
<td>61/2</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Smooth, high tensile, non-energized</td>
<td>5</td>
<td>16</td>
<td>61/2</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Smooth, high tensile, energized</td>
<td>5</td>
<td>16</td>
<td>61/2</td>
<td>15</td>
<td>10</td>
</tr>
</tbody>
</table>

Fence (382) Construction and Restoration

Table 2.

<table>
<thead>
<tr>
<th>Wire Type</th>
<th>Minimum Wire Size</th>
<th>Minimum Protective Coating</th>
<th>Breaking Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard double-strand barbed wire</td>
<td>11 1/2 gauge</td>
<td>Class 3 galvanized per ASTM A 121</td>
<td>Conforms to the requirements of ASTM A 121</td>
</tr>
<tr>
<td>Standard smooth double-strand wire</td>
<td>12 1/2 gauge</td>
<td>Class 3 galvanized per ASTM A 121</td>
<td>Conforms to the requirements of ASTM A 121</td>
</tr>
<tr>
<td>Standard smooth single-strand wire</td>
<td>11 gauge</td>
<td>Class 3 galvanized per ASTM A 121</td>
<td>Conforms to the requirements of ASTM A 121</td>
</tr>
<tr>
<td>High-tensile smooth single-strand wire</td>
<td>12 1/2 gauge</td>
<td>Class 3 galvanized per ASTM A 121</td>
<td>Conforms to the requirements of ASTM A 121</td>
</tr>
<tr>
<td>Special area double-strand barbed wire</td>
<td>11 1/2 gauge</td>
<td>Class 3 galvanized per ASTM A 121</td>
<td>Conforms to the requirements of ASTM A 121</td>
</tr>
<tr>
<td>Standard woven wire</td>
<td>Diameter: 11 gauge intermediate and 1 gauge</td>
<td>Class 1 zinc coating or equivalent</td>
<td>Conforms to the requirements of ASTM A 116</td>
</tr>
<tr>
<td>High-tensile woven wire</td>
<td>Diameter: 14 gauge intermediate</td>
<td>Class 3 zinc coating or equivalent</td>
<td>Conforms to the requirements of ASTM A 116</td>
</tr>
<tr>
<td>Mesh wire, such as horse-net</td>
<td>Diameter: 10 gauge intermediate and 1 gauge</td>
<td>Class 1 zinc coating or equivalent</td>
<td>Conforms to the requirements of ASTM A 116</td>
</tr>
</tbody>
</table>

At least 48 inches high, less than or equal to 2-inch by 4-inch mesh spacing.
### Fence (382) Construction and Restoration

#### Table 3.

<table>
<thead>
<tr>
<th>Line Post Type</th>
<th>Minimum Diameter/Weight</th>
<th>Minimum Setting Depth (inches)</th>
<th>Rocky Soils</th>
<th>Sandy Soils</th>
<th>All Other</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood</td>
<td>3 inches</td>
<td>18</td>
<td>10</td>
<td>24</td>
<td>Posts will have appropriate treatment for root and determination. Minimum lengths for standard bar fences will be 5 1/2&quot; and 6 9/16&quot; for special bars.</td>
<td></td>
</tr>
<tr>
<td>Standard steel &quot;T&quot; or &quot;U&quot;</td>
<td>1.38 pounds per foot of length, exclusive of anchor plates</td>
<td>18</td>
<td>10</td>
<td>24</td>
<td>Posts will have appropriate treatment for root and determination. Minimum lengths for standard bar fences will be 5 1/2&quot; and 6 9/16&quot; for special bars.</td>
<td></td>
</tr>
<tr>
<td>Steel pipe</td>
<td>2 inches outside diameter (OD) weighing 1,61 lb. ft. or 9 gauge</td>
<td>18</td>
<td>10</td>
<td>24</td>
<td>Posts will have appropriate treatment for root and determination. Minimum lengths for standard bar fences will be 5 1/2&quot; and 6 9/16&quot; for special bars.</td>
<td></td>
</tr>
<tr>
<td>Fiberglass &quot;T&quot;</td>
<td>1.8 inches or 2.5 inches cross section</td>
<td>18</td>
<td>10</td>
<td>24</td>
<td>Posts will have appropriate treatment for root and determination. Minimum lengths for standard bar fences will be 5 1/2&quot; and 6 9/16&quot; for special bars.</td>
<td></td>
</tr>
<tr>
<td>Fiberglass round</td>
<td>1.8 inch</td>
<td>18 inches or depth recommended by manufacturer, whichever is deeper</td>
<td>Posts will have appropriate treatment for root and determination. Minimum lengths for standard bar fences will be 5 1/2&quot; and 6 9/16&quot; for special bars.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Table 4.

<table>
<thead>
<tr>
<th>Brace Post Type</th>
<th>Minimum Diameter/Weight</th>
<th>Minimum Setting Depth (inches)</th>
<th>Rocky Soils</th>
<th>Sandy Soils</th>
<th>All Other</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood-braced</td>
<td>4 inches top diameter (corners, ends, gates) 5 inches top diameter (in line pull assemblies)</td>
<td>6 feet</td>
<td>8 inches</td>
<td>Ends with high shear potential tend to push posts up and set. Placing posts at a depth of at least 42 inches will minimize this potential as well as strengthen the post assembly. Posts will have appropriate treatment for root and determination.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel, round pipe-braced</td>
<td>Minimum 3-inch nominal standard weight as per ASTM A 572 pipe measures 3/4&quot; in O.D., 2 7/8&quot; oil field pipe DOES NOT Qualify</td>
<td>6 feet</td>
<td>8 inches</td>
<td>Ends with high shear potential tend to push posts up and set. Placing posts at a depth of at least 42 inches will minimize this potential as well as strengthen the post assembly. Posts will have appropriate treatment for root and determination.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Fence (382) Construction and Restoration Tables 5. and 6.

Table 6. Criteria for Installation of 3-Post In-Line Brace Assemblies

<table>
<thead>
<tr>
<th>Brace Type</th>
<th>Distance Between Holes (in.)</th>
<th>Red Corner Brace Assembly</th>
<th>3-Post In-Line Brace Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>2.400 Steel brace assembly</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Special</td>
<td>2.400 Steel brace assembly</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Barbed wire</td>
<td>600-1300 Single brace assembly</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Elctric steel wire</td>
<td>6.000 Single brace assembly</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Barbed wire</td>
<td>1.000 Single brace assembly</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Wire</td>
<td>0.600 Single brace assembly</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Note: These criteria should be used as a general guide and may need to be adjusted based on local conditions.

Sand or Wet Areas
Foundation for brace length 9 - 10 ft.
(Refer to pg.7)
Local Conservation Districts and NRCS will have a fence construction meeting, January 3, for producers and contractors.

Questions?