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Disaster Relief and Program Information

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1

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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

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382-CPS-1

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CONSERVATION PRACTICE STANDARD

FENCE

CODE 382

(ft)

DEFINITION

A constructed barrier to animals or people.

PURPOSE

Utilize this practice to accomplish one or more of the following purposes:

- This practice facilitates the accomplishment of conservation objectives by providing a means to control movement of animals and people, including vehicles

CONDITIONS WHERE PRACTICE APPLIES

This practice may be applied on any area where management of animal or human movement is needed. Fences are not needed where natural barriers will serve the purpose.

S - 382 - 1

NATURAL RESOURCES CONSERVATION SERVICE
CONSTRUCTION SPECIFICATIONS

FENCE

1. General Specifications

Procedures, technical details, and other information listed below provide additional guidance and supplement the requirements and considerations of selected components of Conservation Practice Standard 382, Fence.

2. Fence Types

Standard Post and Wire Fences are the most common fence type used for controlling all types of livestock. They are suitable as permanent fences in areas that receive moderate to heavy pressure from livestock. They are typically barbed wire or double strand smooth wire.

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2

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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.

Note: For Standard barbed wire fences, wire shall be 12.5 gauge or heavier. The barbs themselves will be 14 gauge or heavier.

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3

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Fence (382) Construction and Restoration Wire

e. **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 minimum 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.

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4

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Fence (382) Construction and Restoration Wire

f. **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.

g. **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

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5

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Fence (382) Construction and Restoration Posts

b. **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 criteria and Table 4 for brace 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 o the post.
- Except for Osage orange, all wood posts shall be treated with a preservative which is approved by either Federal Specification TT-W-571 or the American Wood Preservers Association (AWPA).
- Minimum lengths will allow for 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 rainfall from entering post.

Steel "T" or "U Section" posts

- Shall be new material.
- Shall be of high carbon steel weighing not less than 1.33 pounds per foot of length.
- Will have an anchor plate and be studded, embossed, or punched for wire attachment.
- Will be galvanized, enameled and baked, or painted with weather resistant steel paint.
- Minimum lengths will allow for required buried depth and fence height plus at least 2 inches of post above top wire.

c. **Setting posts.** Posts will be set according to minimum depths provided in Tables 3 and 4. Installation shall ensure that adequate fence height is maintained based on its purpose (see Table 1).

- One standard wooden post will be set in the fence line at the top of a slope where the downward 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 Section" posts will be driven unless the technician specifies otherwise.
- Posts to be backfilled with soil will be centered in a hole at least 6 inches larger in diameter than the diameter or side dimension of the post and thoroughly tamped in 4-inch lifts up to ground level.
- Steel or pipe posts to be backfilled with concrete will be centered in a hole that is a minimum of 12 inches in diameter. Posts will be backfilled with 4 to 6 inches of thoroughly tamped soil. Concrete backfill around the post will be rodded into place in layers not thicker than 12 inches. The hole will be completely filled and crowned (mounded) at post base with concrete to prevent water from ponding around post at ground level. The concrete will be proportioned as follows: 1 part cement, 2 parts sand, 3 parts gravel (maximum size 1 1/2 inch). Sufficient water will be added to obtain a slump between 3 and 5 inches. The concrete will be placed around the post within 1 hour after mixing. No stress will be applied to the posts until at least 24 hours after the concrete has been poured.

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6

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Fence (382) Construction and Restoration Bracing

k. Bracing.

Anchor/pull posts bracing—bracing 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 660 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 posts(s). Wires should be tied off to anchor post ONLY. Under no circumstance should wires be tied off to brace post, even if there are multiple horizontal members welded between anchor and brace posts.

NRCS, KS
March 2014

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7

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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 660 feet for special area fences.
- *3-Post In-Line Brace Assemblies* are also required where an upward angle will require additional embedment 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.

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8

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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.

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9

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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) Wires** (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.

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10

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Fence (382) Construction and Restoration Table 1.

Table 1. Criteria for Selection and Installation of Fences. Fence design and construction must meet or exceed these minimum criteria.

Intended Use	Fence Type	Minimum Number of Wires or Cross Members	Average Height of Top Wire or Cross Member	Max Line Post Spacing w/o Stays	Max Line Post Spacing w/Stays	Max Stay Spacing (feet)
Cattle	Standard barbed wire	3	38	16 1/2	30	10
		4	44	20[1]	30	10
	Suspension	4	44	NA	100	20
	Smooth, high tensile, non-energized	5	44	20	30	10
	Smooth, high tensile, energized	3	38	75	150	50
		4	44	75	150	50
	Confined feeding area[2] and [3]	4	48	12	NA	NA
	Special areas barbed wire	4	48	16 1/2	NA	5 1/2
	Woven wire (addition of 1 to 2 barbed wires may be added to achieve total height)	NA	44	16 1/2	NA	NA
Goats/ Sheep	Woven wire (caution with horned goats)	NA	38	20	NA	NA
	Standard barbed wire	7	38	20	30	10
	Smooth, high tensile, non-energized	7	38	20	30	10
	Smooth, high tensile, energized	5	36	50	150	30
Horses	Woven mesh	NA	48	20	NA	NA
	Standard barbed wire	4	48	16 1/2	30	10
	Smooth, high tensile, energized	4	48	75	150	50
	Smooth, high tensile, non-energized	5	48	20	30	10

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11

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Fence (382) Construction and Restoration Table 2.

Table 2. Minimum Criteria and Specifications for Wire

Wire Type	Minimum Wire Size	Minimum Protective Coating	Breaking Strength
Standard double-strand barbed wire	12 1/2 gauge	Class 1 galvanized per ASTM A 121	Conforms to the requirements of ASTM A 121
Standard smooth double-strand wire	12 1/2 gauge	Class 1 galvanized per ASTM A 121	Conforms to the requirements of ASTM A 121
Standard smooth single-strand wire	11 gauge	Class 1 galvanized per ASTM A 121	Conforms to the requirements of ASTM A 121
High-tensile smooth single-strand	12 1/2 gauge	Class 3 galvanized per ASTM A 121	Conforms to the requirements of ASTM A 121
Special areas double-strand barbed wire	12 1/2 gauge	Class 3 galvanized per ASTM A 121	Conforms to the requirements of ASTM A 121
Standard woven wire	Top and bottom wires: 11 gauge intermediate and stay wires: 14 1/2 gauge	Class 1 zinc coating or equivalent	Conforms to the requirements of ASTM A 116
High-tensile woven wire	14½ gauge	Class 3 zinc coating or equivalent	Conforms to the requirements of ASTM A 116
Mesh wire: such as horse-no-climb	Top and bottom wires: 10 gauge intermediate and stay wires: 12½ gauge	Class 1 zinc coating or equivalent	Conforms to the requirements of ASTM A 116 At least 48 inches high, less than or equal to 2-inch by 4-inch mesh spacing

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12

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Fence (382) Construction and Restoration Table 3.

Table 3. Minimum Criteria and Specifications for Line Posts

Line Post Type	Minimum Diameter/ Weight	Minimum Setting Depth (inches)			Other
		Rocky Soils	Sandy Soils	All Other	
Wood	3 inches	18	30	24	Posts will have appropriate treatment for rust and deterioration—Minimum lengths will allow for minimum setting depth and fence height, plus at least 2 inches of post above top wire.
Standard steel "T"or "U"	1.33 pounds per foot of length, exclusive of anchor plates	Anchor plate must be fully into and below ground surface (minimum length for standard area fences will be 5 1/2' and 6.0' for special area fences)			
Steel pipe	2 inches outside diameter (OD) weighing 3.65 lb /ft, or equivalent	18	30	24	
Fiberglass "T"	1-inch cross section	18 inches or depth recommended by manufacturer, whichever is deeper			Electric fences only
Fiberglass round	3/8 inch				

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13

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Fence (382) Construction and Restoration Table 4.

Table 4. Minimum Criteria and Specifications for Posts used in Brace Assemblies (corners, ends, gates, and in-line pull assemblies)

Brace Post Type	Minimum Diameter/Weight	Minimum Setting Depths	Other
Wood-braced	5 inches top diameter (corners, ends, gates) 5 inches top diameter (In-line pull assemblies)	3 feet 6 inches	Soils with high shrink-swell potential tend to push posts up and out. 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 rust and deterioration.
Steel, round pipe-braced	Minimum 3-inch nominal standard weight as per ASTM A 53	3 feet 6 inches set in 12-inch diameter hole with concrete	
	Minimum 4-inch nominal standard weight as per ASTM A 53	3 feet 6 inches, driven	

Note: steel pipe sizes refer to a nominal size, NOT O.D. (3 in nominal ASTM A53 pipe measures 3.5 in O.D.) "2 7/8" oil field pipe DOES NOT Qualify

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14

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Fence (382) Construction and Restoration Tables 5. and 6.

Brace Member Type	Minimum Diameter/Weight	Minimum Length	Other
Wood	3 inches	7 feet	Brace member will have appropriated treatment for rust and deterioration.
Steel, round, pipe	1 1/2 inch	7 feet	Standard weight, ASTM A 120.
Steel, galvanized angle iron	2 1/2-inch x 2 1/2-inch x 1/4-inch	7 feet	

Sand or Wet Areas
brace length 9 - 10 ft.
(Refer to pg.7)

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

Fence Type	Distance Between Anchor (pull) Posts (ft.)	End/Corner Brace Assembly	3-Post In-line Brace Required
Standard and suspension—barbed or smooth wire	0–660	Single brace assembly	No
	660–1320	Single brace assembly	No
	> 1320	Single brace assembly	Yes
Special area barbed wire	0–660	Single brace assembly	No
	660–1320	Single brace assembly	Yes
Energized electric—smooth wire	0–660	Single brace assembly	No
	660–2000	Single brace assembly	No*
	> 2000	Single brace assembly	Yes
Woven (net) wire	0–200	Single brace assembly	No
	200–660	Single brace assembly	No*
	> 660	Single brace assembly	Yes

* Not required/may be recommended by the technician.

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15

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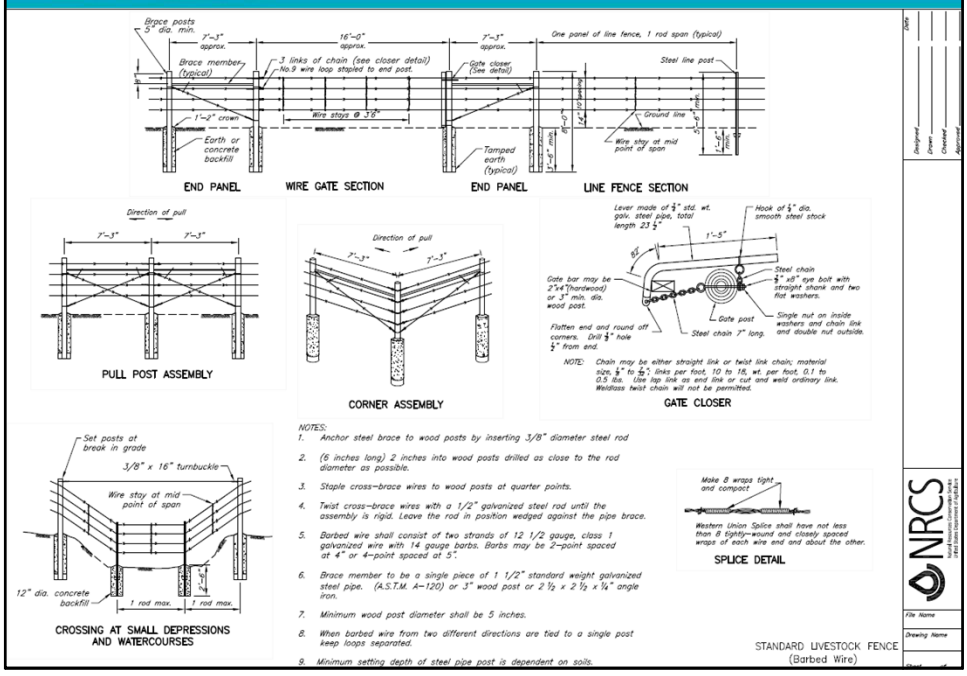

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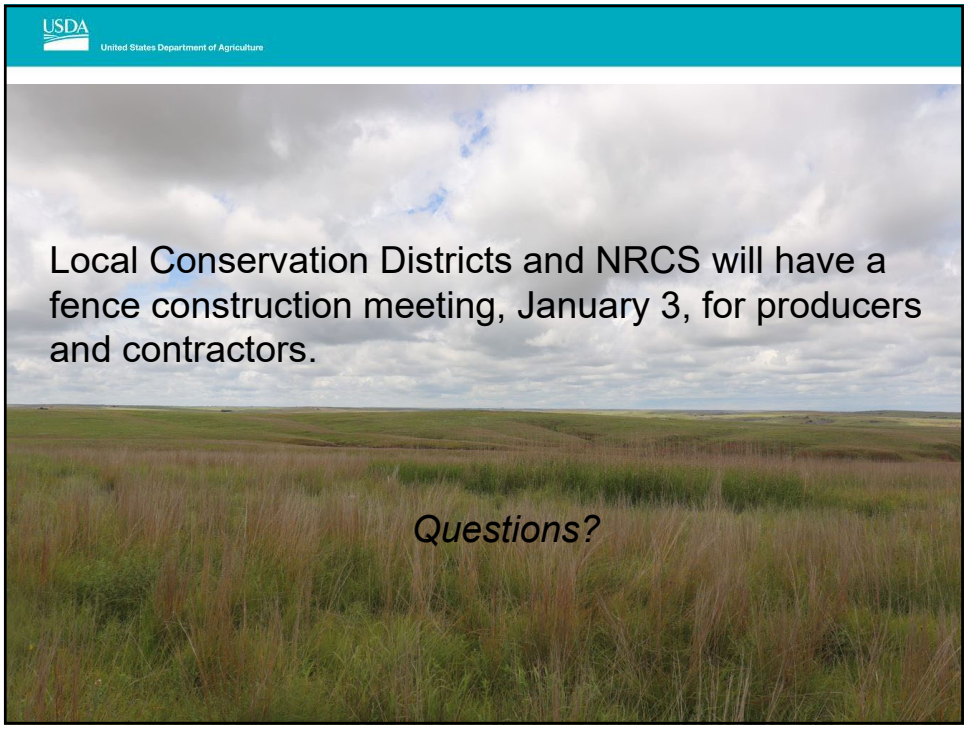
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Local Conservation Districts and NRCS will have a fence construction meeting, January 3, for producers and contractors.
Questions?