NATURAL RESOURCES CONSERVATION SERVICE

SPECIFICATION GUIDE

FENCE

(Feet)

CONFINEMENT AREA FENCING
CODE 382

I. SCOPE

Purpose of this practice is to construct a barrier to animals or people and facilitate management practices and/or accelerated conservation practices.

The work shall consist of furnishing materials and installing fences for confinement/animal feeding areas at the location(s) shown on the plan map, and if needed, on the drawings or as staked in the field. Fencing includes brace assemblies, gates, cattle guards and other components required to meet site conditions and achieve objectives for practice application.

II. FENCE TYPES

Confinement Areas (Corrals) fence types are stout fences used to control livestock in smaller areas. Types of fence covered by this specification guide include:

- Prefabricated Steel Panels
- Welded Wire Panels
- Highway Guard Rails
- Conveyor Belt
- Steel Pipe
- Steel Cable
- Pole or Lumber Fences
- Special Fences

III. GENERAL SPECIFICATIONS

Design of an animal feeding/holding area needs to be done in cooperation with then livestock manager to achieve the intent of the practice but also the goals of the managers handling facility, to accommodate the type and behavior of the livestock.

Any alterations or additions to the practice design must be approved as a variance by NRCS State Resource Conservationist prior to modifying this specification guide and/or associated drawings or installation requirements. Follow procedure outlined in the standard.

Fences installed on state, federal, and tribal owned lands normally require a permit or approval. This permit/approval must be provided to NRCS prior to installation.

The NRCS assumes no responsibility for interference with private or public utilities.

State and federally protected plants, animal, cultural resources and historically significant properties shall not be harmed or destroyed during the installation of this practice. All Fish and Wildlife Service consultation documents (i.e. conference reports, biological opinions) will be referenced and planned accordingly into the fence design as applicable to the construction location.

Location of facility need to minimize, limit or avoid water runoff into waterways and protect waterways for nutrient run off. All work shall be done in a manner that minimizes soil and vegetation disturbance and the movement of sediment or other pollutants into streams and water bodies. Any engine oil, lubricants, or other chemical pollutants spilled during construction shall be safely collected and properly disposed.

Most fencing materials must be new. Used materials such as treated railroad ties, power or telephone poles, steel pipe or used well casing may be used with prior certification from NRCS Field Office personnel.

Old posts, wire, and other fence materials shall be completely removed from site.

Any existing structures, including the tie-in to other existing fences, used in constructing the new fence, must be approved by NRCS prior to construction. If the structural integrity of the new fence is dependent on existing practices, certification by NRCS will take into consideration structural integrity and lifespan of the existing structure(s).

Life expectancy of this practice is 20 years. Operation and maintenance of new and existing structures is required.

IV. ANCHOR AND BRACE ASSEMBLIES

Braces are needed for steel cable, conveyor belt, or other fence material types where it is necessary to pull tension. Brace assemblies shall be installed at all angles, corners, gates and ends of the fence, and at the base and summit of steep slopes as needed to properly stretch the fence wire. Bracing shall be designed to provide solid anchorage and increased strength. Type, age, and class of livestock will be considered when brace specification.

Fences shall be constructed in straight sections. Double span brace assemblies maybe required for sandy or wet soil conditions and/or areas with heavy animal pressure.

Anchor and line brace assemblies may be wood or steel. Wood braces are typically constructed as horizontal brace assemblies or horizontal brace assemblies with a double diagonal brace.

Steel angle iron or steel pipe braces shall be set in concrete. Steel and concrete brace assemblies shall be constructed as single or double span horizontal brace assemblies, or as a diagonal brace assembly. Steel angle iron or pipe shall be galvanized coated or painted. If painted, all rust or lose material shall be removed by wire brushing or other suitable material, treated with a rust inhibitor, primed with metal primer paint and then painted with two coats of high grade weather resistant epoxy or enamel paint.

Brace panels shall, as a minimum maintain a 2:1 ration of brace length to height of top rail.

V. ANCHOR AND BRACE POSTS

Wooden Assemblies

All end, corner, and brace posts must have a minimum diameter of 6 inches. Untreated juniper, oak, mesquite, black locust and redwood posts may be used. Pine and other softwoods must be pressure treated. Railroad ties in good condition are suitable for use as anchor and brace posts.

All anchor and brace posts shall be set in ground at least 36 inches. In sandy or loose soil, depth of 42 inches is recommended. Anchor and brace posts shall be long enough to extend approximately 2 inches above the top wire.

Posts shall be set in holes at least 4 inches larger than the diameter of the posts. The hole should be filled with dirt in 4 inch layers and tamped firm. The posts shall be plumb. The top of the dirt fill shall be mounded above the ground level such that water does not pond at the base of the post. If setting a wood post in concrete, use at least (1) 80 lb. bag of concrete for a 12 inch post hole to secure brace assembly.

Horizontal bracing between the corner and brace posts shall be a minimum 6.5 feet long. Standard “H” Brace assemblies should approximately maintain a 2:1 ration of brace length to height of top wire; maximum distance between brace posts shall be 10 feet. Horizontal brace shall be attached to the upper quarter of the anchor and brace post, approximately 35 inches from the ground. The horizontal bracing shall be a post with a minimum diameter of 4 inches.

Wooden diagonal braces shall be a minimum of 10 fett in length and a minimum of 4 inches in diameter. As length increases the minimum diameter needs to increase as well. Lengths 15 feet – 18 feet need to be 6 inches or greater diameter. Lengths greater than 18 feet need to be 8 inches or greater. Brace posts will have to increase in size corresponding to the diagonal brace size. Steel angle iron and pipe may also be used for horizontal or diagonal braces and meet the same diameter and dimensions as above. Steel horizontal braces shall be notched at least 2 inches but not more than 3 inches into wood anchor and brace posts.

Tension wires for all wooden brace assemblies shall be made from two complete loops of 9 gauge or heaver smooth galvanized single wire or two complete loops of 12.5 gauge double strand barbed or smooth wire. Tension wires shall be attached diagonally from approximately 4 inches below the top of the post and 4 inches above the ground, the tension wires shall be twisted together until the brace assembly is rigid.

Dowels may be used to attach wooden horizontal and diagonal braces to the wooden anchor and brace posts. The dowels shall be at least 6 inches long, and extend at least 3 inches into each piece. The dowels shall be made of 3/8” or larger steel, or 1 inch or larger diameter hardwood. Steel rebar can be used. Braces may also be notched into the brace post and secured to the post with 6 inches tempered steel, galvanized, ring shank nail or 6” galvanized lag screw.

For wooden diagonal braces, the ground end of the diagonal brace shall be set on a flat rock or rick. The end of the diagonal brace must be free to move forward when the fence wire is stretched and must not be blocked by a stake or post. The tension wire shall be wrapped from just above the ground of the brace post, to the ground end of the diagonal brace.

Steel and Concrete Anchor Brace Assemblies

Anchor and Brace posts may be made from steel angle iron that is at least 2.5 inches x 2.5 inches x 0.25 inches x 6.5 feet, weight at least 4.1 pounds per foot of length. Anchor and brace posts may also be made from new steel pipe that meets or exceeds the specifications for 3 inches pipe (ASTM A120, Sch 40).

Used steel pipe may be used provided that it is approved prior to construction by NRCS as being of good quality, relatively free of pits and scaling.

Steel angle iron and pipe may also be used for horizontal or diagonal braces and meet the same diameter and dimensions as above (in wooden assembly section). Steel horizontal braces shall be welded to steel anchor and brace posts.

The corner post shall be set a minimum of 36 inches deep in a concrete pier 12 inches in diameter; the concrete pier may be either a cylinder or a square. Corner posts set in sandy soils or soils that are “shrink-swell” clays should be set at approximately 42 inches deep. Diagonal braces shall be fastened to the corner with a positive connector such as a clamp or bolt, and shall extend 12 inches into the brace concrete block, which is 12”w x 24”l x 12”d. The bottom of the steel post shall be placed on a rock. The hole shall be filled with concrete in such a way as to allow the concrete to flow around the base of the post. The top of the concrete shall be mounded above the ground level and sloped away from the post to prevent water from ponding around the base of the post.

Steel pipe 5 inches in diameter or larger can be set to the same as wooden anchor and brace posts. Steel pipe posts less than 5 inches in diameter and angle iron posts shall be set in a concrete at least 36” deep and 12 inches in diameter.

Steel posts that are over 2 inches ID will be capped.

VI. LINE POSTS, STAYS AND FENCE SECTIONS

Line Posts

Wooden line posts will be a minimum of 5” top diameter. Untreated western red cedar, black locust, mesquite, western juniper or Osage orange, one seed juniper, Rocky Mountain and Utah juniper, may be used, Pine or other soft wood posts must be pressure treated or treated with a preservative

Railroad ties or telephone poles must be sound, free of decay and have not previously been used for as fencing material.

Line posts may be made from steel pipe that is a meets or exceeds the requirements for 3” nominal size standard steel pipe weighing 2.84 lbs per foot of length. Tops shall be capped. Used steel maybe used provided that it is approved by NRCS prior to construction as being of good quality and relatively free of pits and scaling.

Length of posts shall be as needed for the height of the fence plus the required depth in the soil

Depth of ling posts shall be set at a minimum of 36 inches deep.

Fence Sections

Spacing of posts shall be no greater than 6 feet for welded wire panels, conveyor belt, or cables. Spacing between posts for polls, lumber, guard rails, steel pipe or steel panels shall be no greater than 8 feet.

VII. FENCE MATERIALS

Fence materials will be installed on the livestock side (inside) of the posts for the enclosure.

Suitable fence materials will include the following:

- Lumber, planed or rough cut that is a minimum of 2”x6” minimum size
- Wooden poles will be a 3.5 inches minimum diameter
- Guard rails (CDOT highway quality), used guard rails may be used that are in good condition and galvanized or painted.
- Steel cables, minimum ½” diameter. Used steel cable is acceptable if it meets the minimum diameter and is not kinked, frayed or inflexible. There will not be brittle or rusted strands breaking when flexed at an acute angle.
- Steel pipe with a minimum 1.5” diameter
- Conveyor belts will have a minimum of 3/8” thickness and be fiber reinforced. Used conveyor belts must meet 3/8” minimum requirements and be free from holes larger than 2”. There should be no frayed edges or large areas where the fiber reinforcement is exposed.
- Welded wire panels
- Prefabricated commercial metal panels

Horizontal spacing between fence materials shall have a gap no greater than 16 inches. The bottom stringer will be no greater than 8 inches off the ground.

Commercial metal panels should have at least one post set in the middle to prevent warping, or more if the panel is longer than 16 feet (see spacing requirements for line posts). Panels should overlap on the posts at the ends so that any pressure is passes to the post.

Fence material will be permanently affixed to the posts with welding or new, high quality, durable hardware (i.e. bolts, clamps, turnbuckles, hinges, and latches) of adequate size to provide strength equal to the minimum requirements of the material. Bolts, or u-bolts, shall be of a minimum size of 5/16 inch. Bolts shall extend completely through the material and post and be secured with washers and nuts on the non-stock side of the fence. It is preferred that hinges on metal gates be welded to posts if possible.

Splices for most fence materials will be accomplished by overlapping at a post and permanently affixing both pieces to the post.

In enclosures where large livestock are worked (i.e. branding, docking, doctoring, loading, etc.), a means of escape for people inside the enclosure to get over the fence shall be provided. A continuous ‘step’ at least 3 inches wide and 2 feet from ground level will be affixed to the inside of the posts so that workers may jump over the fence to get out quickly if needed.

The ends of all fencing material and hardware have to be completely smoothed on the stock side of the fence so that there are no sharp edges that could injure an animal or person.

VIII. FENCE HEIGHT

Fence height needs to be planned for potential type of livestock and disposition of livestock being held. The top of the fence shall be no more than 3 inches from the top of the posts. Finished height of the fence shall be no less than 4.5 feet (52 inches) above the ground.

IX. GATES

Gates allow access from both sides of the fence and shall be placed in locations that consider existing and planned roads, ease of access for livestock management, intended prescribed grazing strategy to be implemented, and other necessary considerations for the planned area.

Gates shall equal or exceed the quality of the adjoining fence. They shall be adequate width to accommodate the intended purpose. They may be made of wood, aluminum, steel or wire. Commercial gates shall have a life expectancy equal to that of the rest of the fencing material of 20 years minimum.

If a heavy gate is attached to the anchor posts side of the end brace assembly, an additional tension wire running in the opposite direction will be necessary. The tension wire should only be tightened enough to offset the weight of the gate.

Lumber gates shall be constructed of 2 inch or larger dimensional lumber. Metal gates shall be constructed of 1.5 inch or larger galvanized or painted steel pipe.

Commercial gates shall be constructed of good quality and durable material and installed in accordance with the manufacturer's recommendations.

IX. FEED BUNKS AND WATER

Feed bunks must be constructed to meet the same durability and life expectancy of the corral fence. They must be constructed to prevent surface water and manure from entering. The design should prevent and discourage young stock from entering into the feed bunk with more than its head. The design should also include a concrete apron.

Permanent water must be provided if animals are to be held in facility for longer than 12 hours. Refer to Conservation Practice Standard 614 and specifications guides, and Range Tech Note 17 for planning and installing livestock water.

X. SIZE REQUIREMENTS

Size requirements for different types of feeding and handling facilities are shown in the table below.

Animal Feeding Facility Size Requirements		Feed Lot Size (sq ft/head)		Shelter/Resting Space (sq ft/head)		Holding/Working Pen (sq ft/head)		Feed Bunk Space, Limited Feeding (inches/head)		Feed Bunk Space, Free Choice Feeding (inches/head)		Water Access (# head per automatic bowl)		Water Access (# of head per foot of tank perimeter)		Lambing/Calving pens (sq ft)	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Unsurfaced	Ewes	25	40	10	12			16	20	8	12	40	50	15	25	14	20
	Ewe/Lamb pairs	25	40	12	16					9	14	40	50	15	25		
	Feeder lambs	15	20	6	8			9	12	3	4	50	75	25	40		
	Beef Calves	250	400	20	30	40	60	18	22	2	4	40	40	7	9		
	Beef Feeders	300	800	25	40	40	60	20	26	3	6	40	40	7	9		
	Beef Cows	500	1000	35	60	40	60	26	30	4	6	40	40	7	9		
Concrete	Beef Calves	35	55	15	25	40	60	18	22	2	4	40	40	7	9		
	Beef Feeders	40	75	25	35	40	60	20	26	3	6	40	40	7	9		
	Beef Cows	60	90	30	50	40	60	26	30	4	6	40	40	7	9		

References:

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http://www.tifton.uga.edu/eng/handbook/SECTG.htm
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USDA NRCS Missouri Watering Systems for Serious Graziers