

**NATURAL RESOURCES CONSERVATION SERVICE
MONTANA CONSERVATION INTERIM PRACTICE SPECIFICATION
LIVESTOCK CONFINEMENT FACILITY (FEET)**

CODE 770

TIMBER, STEEL PIPE, MANUFACTURED PANEL, CABLE OR GUARD RAIL

SCOPE

The work shall consist of furnishing and installing permanent livestock confinement fences to confine animals for calving, backgrounding, feeding and/or animal management. Fencing includes all components required for achieving the objectives of the practice and meeting site conditions. All material used in construction of confinement-type fences, shall have a life expectancy of 10 years. This specification is not intended for windbreak type corral fences which require special design for posts and members.

MATERIALS

Fences shall be constructed of new materials, or pre-approved used materials. All used materials (e.g., railroad ties, guard rail, cable, and drill stem, sucker rod) shall be pre-approved by the NRCS Area Engineer and meet or exceed the minimum criteria for extent, strength, and durability set in this specification. Used wood posts shall be sound and free from decay. Used steel members shall be free from heavy pitting or visible holes.

Pipe quality shall be either new, #1 condition used or new reject oil field tubing, casing, or drill pipe. Number 1 quality means cosmetically satisfactory, adequate wall thickness and no heavy pitting or holes visible. Oil field pipe that has been used in a hydrogen sulfide (H₂S) environment is unacceptable as the life span of the material has likely been dramatically reduced.

FENCE POST SPACING AND DEPTH

For panel, steel tubing or timber fences, the post spacing should be less than or equal to 10 feet. For continuous sucker rod (rail), cable and guard rail fences, the posts spacing should be less or equal to 8 feet. A top rail is recommended to tie the posts together and increase the strength of the structure. When large diameter (>4") steel pipe is used for posts and a top rail is not installed, caps or other closure should be considered to limit bird and other animals from accessing the interior of the post. Steel tubing used for line, brace and corner posts shall be a minimum of 2-3/8 inches in diameter. Wood line, brace and corner posts shall be a minimum of 6 inches in diameter.

Securely set posts into the ground by mechanical means. Earth backfill around the posts shall be compacted to the density of the surrounding soil. Thoroughly tamp layers no thicker than 4 inches and completely fill the post hole to the ground surface. Line, brace and corner posts shall be set solidly in the ground a minimum of 36 inches. Concrete backfill shall be rodded into place in layers not thicker than 12 inches and shall completely fill the post hole to ground surface. Backfill, either earth or concrete, shall be crowned up around the posts at the ground surface. See Table 1 for minimum criteria for fence materials, embedment and length.

Specification MT770-2

Table 1. Material, diameter, embedment and length

	MINIMUM DIAMETER	MINIMUM BURIED DEPTH	MINIMUM LENGTH	NOTES
<u>Line/Brace/Corner post</u> Wood-round treated post.	6 in.	3 ft.	Buried depth + height of fence + 6 in. (8 ft. min.)	None
<u>Gate Post</u> Wood-round treated post.	8 in.	4 ft.	10 ft	If top rail is to be added include additional length to achieve desired height
<u>Line Post</u> Steel, Round	2- ³ / ₈ in.	3 ft.	8 ft.	Minimum wall thickness 0.188 in.
<u>Gate Post</u> Steel, Round	2- ⁷ / ₈	4 ft.	10 ft.	Additional length needed if top rail is attached. Minimum wall thickness 0.188"
<u>Wood</u> Rail Road Tie	8 in. x 8 in.	3 ft.	8 ft.	
<u>Gate Post</u> Rail Road Tie	8 in. x 8 in.	4 ft.	9 ft.	
<u>Concrete</u>	10 in. x 10 in. with four #4 bars, Grade 60	4.5 ft.	8.5 ft.	See Figure F below.
<u>Rails</u>	Sucker rod or cable: ¾, 7⁄8 or 1.0 in. Steel tubing: 1-¼ to 1- ⁵ / ₈ in.		As needed	Minimum 14 ga. Top rail shall have same diameter as post.

NOTE: Chromated Copper Arsenate (CCA)-treated wood posts shall not be used where treated wood may come into contact with water sources (wetlands, streams, high water tables, etc.). Other chemically-treated and pressure-treated wood posts may be used in these areas (EPA 2002).

GUARD RAIL or CABLE FENCE

Line, brace, gate or corner posts can either be steel or wood. Wood posts can include railroad ties. All material used in construction of this type of fence shall comply with the requirements of this specification.

Guard rail fence material may be obtained in used condition. Clear spacing between horizontal guard rail members shall be determined by the type of livestock confined, but should be less than or equal to 10 inches. The bottom members shall not make contact with the ground. Securely attach all guard rail sections to posts with tack welds, carriage bolts on steel posts, lag or carriage bolts on wood posts, or approved equal. All bolts and other hardware used in construction shall be galvanized, or zinc coated; all bolts (lag bolt excluded) shall penetrate the diameter of the post. See Figure A for typical construction of guard rail fence.

Cable fences can be constructed and included with guard rail fence or as a stand-alone fence. Spacing of horizontal cable members shall be determined by the type of livestock confined, but should be less or equal to 12 inches. Cables shall be loose fitted to each line post and double tied to the end post or corner post. U-shape anchor bolts or approved equal can be used to attach cable loosely to the posts. Loose cables allow expansion or contraction of cable without stressing the posts. See Table 1 for minimum cable diameters used in construction. See Figure B for typical construction of cable fence.



Figure A. Guard rail with railroad tie posts.



Figure B. Cable fence with drill stem post.

DRILL STEM, MANUFACTURED PANEL FENCE or CONTINUOUS RAIL

Fences constructed with steel posts and steel tubing, or continuous rail can be fabricated on site. If welding and fabricating on site, fire suppressant equipment shall also be on site. Any steel, manufactured panel or rail-type members shall meet the minimum criteria set in Table 1. Clear spacing of horizontal members shall be determined by the type of livestock confined, and should be less than or equal to 12 inches. The bottom rail shall not be in contact with the ground. Steel tubing (sucker rod) horizontal members should be either spot welded or screwed into the next member to give the fence a continuous look. No exposed end or sharp edges shall be allowed. A minimum of one stay between posts is required on manufactured panel and tubing fences. All steel fencing shall be connected by welding or bolting to posts used in construction. A top rail used in steel fence construction, shall be equal in size to the post and welded to the top of each post to add strength to the fence. See Figure C for an example of a continuous fence constructed from sucker rod. See Figure D for an example of a fence constructed with manufactured panels. See Figure E for typical construction of steel fence.

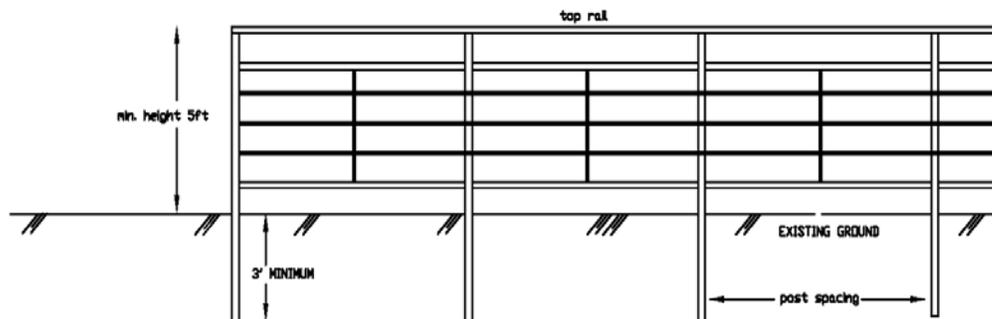


Figure C. Sucker rod continuous rail fence.

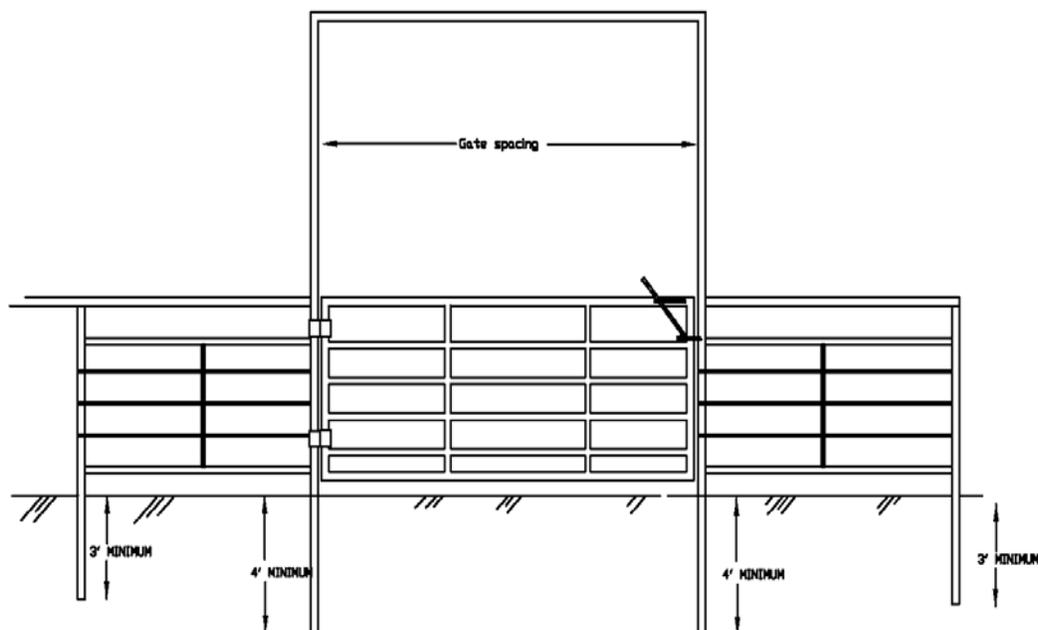


Figure D. Manufactured panel fence with steel post.

Specification MT770-4



FENCE DETAIL



GATE DETAIL

Figure E. Typical steel post with steel tubing rails.

TIMBER FENCES

Timber constructed fences shall have 2" x 10" (nominal) horizontal timbers, staggered to each post. Posts shall be constructed of wood or steel. Use Table 1 for minimum criteria for fence members. Horizontal timbers shall be attached to each post with nails, screws or other fasteners. All hardware shall have galvanized, zinc or cadmium coating. Minimum nail size shall be 30-d for 2-inch stock.

Use BOARD FENCE cadd drawing if this type of fence is chosen:

<http://www.mt.nrcs.usda.gov/technical/eng/drawings.html> – MT-SD-382.120

GATES

Gates should be heavy-duty steel with heavy duty hinges to minimize sagging. It is suggested that a top rail of steel tubing be installed overhead from one gate post to the other; this will add stability to the gate. Gate posts should have concrete placed around them when gates of 14 feet or larger are used and overhead steel

tubing is not installed. Gate posts shall have a set minimum depth of 48 inches into the ground, and a minimum of 2-7/8 inch diameter if steel. Wood gate posts shall have a minimum diameter of 8 inches.

BRACING AND ALIGNMENT

If bracing is needed, follow this section of the specification.

HORIZONTAL BRACES

Horizontal brace members shall be 1 foot (minimum) longer than the anchor post is above the ground. Example: A 6 ft. tall post (aboveground) will require a 7 ft. horizontal brace.

Horizontal brace members shall be at least 6 ft. in length and notched into the top third of wooded anchor posts or spot welded to steel posts. Steel dowels, spikes, welding, can be used, rather than notching, to attach horizontal braces.

CONCRETE BRACE AND CORNER POSTS

Reinforced concrete posts may be used, but are specifically recommended in areas where the soils are corrosive or highly corrosive (Electrical Conductivity (ECe) of the soil is ≥ 8 mmhos/cm). They can be used as line posts, corner posts (with bracing described below), or as brace posts without brace members (stand alone post).

All concrete posts shall use 3,000 psi air-entrained concrete and shall be reinforced with a minimum of four #4 grade 60 rebar that run the length of the post minus 3 inches at top and bottom (e.g., 8.0-foot rebar length in a 8.5-foot long post). Each rebar shall be located 2.5 inches from the nearest outside edges of the post. The posts shall be a minimum of 10-inch x 10-inch diameter for the entire length of the post (see Figure F).

Rebar Reinforcement in Concrete Posts:

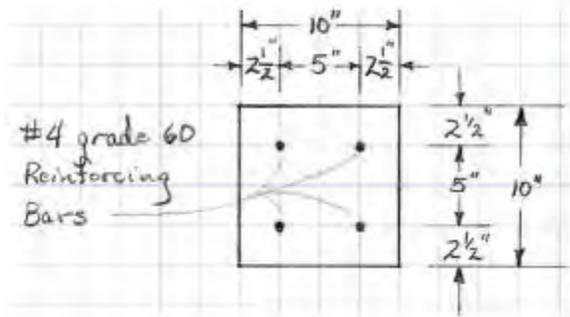


Figure F. Rebar reinforcement in concrete posts.

Bracing of concrete corner posts shall be accomplished using a minimum of 2 anchor wires, double wrapped, connected to the concrete post 6 inches from the top of the post and connected to a buried deadman. The deadman shall be rigid, with minimum diameter of 12 inches, set into the ground at a minimum of a 4-foot depth. Earth backfill on top of the deadman shall be thoroughly tamped in layers not thicker than 4 inches and shall completely fill the hole to the ground surface. Connect the anchor wires to the deadman in approximately a 45-degree angle from the post (resulting in deadman location being approximately 4.5 feet away from the post). To improve the visibility and service life of the anchor wire, PVC or HDPE pipe should be slit lengthwise and slipped over the wire throughout its exposed length.