Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

FENCE

CODE 382

(ft)

DEFINITION

A constructed barrier to animals or people.

PURPOSE

This practice is used to accomplish the following purpose–

- 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.

CRITERIA

General Criteria Applicable to All Purposes

Fencing materials, type and design of fence installed shall be of a high quality and durability. The type and design of fence installed will meet the management objectives and site challenges. Based on objectives, fences may be permanent, portable, or temporary.

Fences shall be positioned to facilitate management requirements. Ingress/egress features such as gates and cattle guards shall be planned. The fence design and installation should have the life expectancy appropriate for management objectives and shall follow all federal, state, tribal, or local fencing codes, laws, or regulations.

Height, size, spacing and type of materials usedwill provide the desired control, life expectancy,and management of animals and people ofconcern.

Fences shall be designed, located, and installedto meet appropriate local wildlife and landmanagement needs and requirements.

Manufacturer's guidelines shall be adhered to during installation and meet the minimum construction specifications of each type of fence to ensure proper component assembly.

All State of Michigan permits will be secured prior to installation. Local Drain Commissioners may require permits when fence crosses a county drain.

The Wildlife Conservation Order under Act 256 of the Public Acts of 1988 mandates that passage for wildlife in known travel lanes shall be accommodated by using perimeter fencing less than 52 inches in height and the bottom of the fence is spaced at least 4-inches above the ground. Alternatively, constructing passage areas 40 feet wide, 52 inches or less in height, and no more than 660 feet from the next passage will allow wildlife passage. This order does not apply to an exclusion structure which does

not kill, harm, capture, trap, or collect animals and which is constructed to deter or prevent damage by wild animals to private property, including but not limited to fences to protect livestock, poultry, and other birds, including captive-reared game birds; farm crops; orchards; and gardens.

A permit for temporary enclosure of wild, free- ranging deer, elk, bear, or moose is needed when constructing fence greater than 52 inches in height above the adjacent grade anywhere along its length and the total length of the constructed structure is more than 1/4 mile and does not contain passages constructed in such a manner as to ensure passage of wildlife. The permitting agency is the Michigan Department of Natural Resources.

When the intended use of the fence systems is to restrict and discourage access by people and animals to safety hazards, the fence and gates shall be a minimum of 48 inches above grade and shall not pass larger than a 6-inch sphere between any fence or gate member. The maximum distance between the bottom of the fence or gate and the ground shall be 6-inches. All fence openings shall have gates that can be shut and securely fastened. All materials shall have sufficient durability and strength for the intended use. Additional safety features may be required depending on the hazard classification and site conditions.

Refer to Michigan Standard Drawings for Fence for design details.

Construction and maintenance safety is a primary concern. Wire that is overstretched may break and recoil. Eye and hand protection should be worn.

Place warning signs on electric fences bordering public thoroughfares spaced every 100 feet.

1. Posts
Refer to Table 1. Fence Materials and Installation Requirements for specifications applicable to posts.

Wood posts shall be set in holes and backfilled with tamped earth or shall be driven unless otherwise specified. Steel and fiberglass posts shall be driven unless otherwise specified. Post holes shall be at least 6 inches larger than the maximum diameter or side dimension of the posts.

When live trees are used as line post, avoid short-lived or disease susceptible species (e.g., elm, ironwood, dogwood). Also, avoid species that are considered valuable for timber production (e.g., black walnut, oak, etc.).

Live trees used for line posts shall have a diameter breast height equal to or greater than those prescribed for normal wooden posts.

Some alignment variation shall be allowed. Wire or insulators will not be fastened directly to live trees.

At no time shall live trees constitute more than 10% of the line posts used.

Landscape timbers are not allowed.

2. Brace Assemblies
Refer to Table 1. Fence Materials and Installation Requirements for brace specifications on permanent fencing. Refer to Table 3 Interior Permanent Fence for Lanes, Walkways, Stream Crossings, Surface Water Access and Exclusion for brace specifications needed in those situations.

Brace assemblies, or equivalent single 12 foot long, 6 inch diameter deeply buried posts as allowed in Table 1 and in Michigan standard drawings are needed for woven wire, barbed wire, high tensile, and any combination of woven, barbed, and high tensile wire fence.

All standard brace structures shall maintain a minimum of a two to one (2:1) ratio of brace length to height of the top wire.

Use brace and dowel pins to secure the horizontal member to the vertical posts. Pins will be 3/8 inch diameter and 4 inches minimum for the brace post and minimum10 inches long on the corner or end post.

When using wooden line posts, a single brace is needed for high tensile wire with 3 to 6 strands. Double span assemblies shall be used for 7 or more strands of wire.

Combination single and double brace spans shall be used on rolling land.

3. Gates
Refer to Table 1. Fence Materials and Installation Requirements for gate posts specifications.

Gates shall be designed to accommodate the landowner's objectives.

Commercial metal or steel, painted or galvanized, or aluminum gates are allowed.

Gates should be constructed of durable material that equals or exceeds the quality of the adjoining fence.

All wood members must be of durable wood or pressure treated with a preservative.

Panel gates shall be of equivalent quality and shall be fitted with at least two hinges and a latch or galvanized chain for fastening.

Gate hinges shall be attached directly to an end post.

Gates for energized fences shall be installed in accordance with the manufacturer's instructions.

Electrified gates may be constructed of a single straight wire, galvanized cable, or polytape with a spring-loaded insulated handle, or an expandable, coiled, high tensile wire attached to an insulated handle. The number of wires shall be determined by the fence objective. The gate shall be constructed so that it is non-electrified when the gate is open.

Overhead or underground transmission lines will be used to carry electricity past the gate to the remainder of the fence.

Flood gates will be designed with provisions that allow passage of driftwood and debris. Refer to conservation practice standard Stream Crossing 578 for construction requirements.

4. Fasteners and Connectors
Nails used for wooden fence shall be hot dip galvanized. Steel fasteners shall be hot dip galvanized or stainless.

Staples should be of 9 gauge galvanized wire with a minimum length of 1.25 inches. Select length based on the type of wood. Drive staples at a diagonal. Staples shall be set to allow for wire movement.

The type and size of fastening clips shall meet the manufacturer's requirements for attachment of the wire.

The type and size of insulators shall meet the requirements to fasten electric fence materials to a post. Insulators shall be of high quality and designed to last as long as the wire and posts.

Join wire with commercially available connectors, such as splice sleeves, applied with a tool designed for the purpose, or by Western Union, figure eight, square knot or thread- through knot or manufacturer-recommended tying methods.

5. Wire Fence
Refer to Table 2. Permanent Perimeter Livestock Fence Criteria for minimum wire numbers and spacing by livestock species.

Barbed Wire
Shall consist of two twisted strands of 12.5 gauge wire, or high tensile strength wire of 15.5 gauge. Barbs shall be spaced no more than 5 inches apart and shall be of 14 gauge or heavier wire with at least two points. Barbed wire should **never** be electrified.

Woven Wire
Will consist of 9 gauge top and bottom wires of the woven wire, or heavier, and the line and stay wires shall be 12.5 gauge or heavier. High tensile woven wire line and stay wires will be a minimum gauge of 12.5.

Use 1 to 2 strands of barbed or high tensile wire, polybraid, polyrope or polytape above woven wire to obtain needed fence height and deter animals form bending down the top of the woven wire.

High Tensile
Will consist of 12.5 gauge, minimum tensile strength of 110,000 psi, and type III galvanized.

Each wire will be tensioned to a minimum of 200 pounds and maximum of 250 pounds after being installed on the posts. Ratcheting type in-line strainers will be used on each wire to maintain the proper tension. Compression springs will be installed when the fence length is less than 200 feet. Springs will be on each wire to absorb the shock of animal impact with the fence.

Polywire/Polytape
Shall have a minimum of 6 stainless steel, copper, or aluminum strands, or one 12.5 gauge high tensile wire running through the fabric.

6. Energized High Tensile Wire
Electronic energizers or power fence controllers will be powered by a 12-volt battery powered system, solar cell, or household main electric current.

Energizers must have a lightning arrestor.

Energizers will be high power, low impedance with a 5000 to 6000 volt peak output and have a high impact, weather-resistant case.

All energized fence must be grounded. Follow the manufacturer recommendations on feet of ground rod needed per joule of energizer output. Minimum ground rod is 3 feet of rod for each joule of output. More ground rods may be needed for the system to function properly, especially in sandier soils. Ground rods shall be 6 to 8 feet long galvanized pipe or rod 5/8 inch or larger and driven into the ground. Space ground rods at least 10 feet apart.

Connections between the energizer, connecting wire, and ground rods shall be of high quality materials, adequately sized, and designed to accommodate a change in metals if applicable.

Do not put ground rods near milking barns, water pipes, or any other metal items leading into the barn or working area. Lightning arrestors should be placed no closer than 10 feet from the energizer.

When using electric fence, training areas should be used to condition livestock to the fence.

Select a well-fenced area and construct an electric fence across, or around, the area to allow animals to come in contact with the electric fence.

7. Wooden Fence
Boards and Rails
The boards or rails shall be treated with a wood preservative, or be a rot- resistant species such as cedar. Boards shall have nominal dimensions of 1 inch by 6 inches in width with lengths of 16 feet whenever possible. Refer to Table 2. Permanent Perimeter Livestock Fence by Livestock Type for construction requirements.

8. Chain Link Fence

Chain Link

Fence, including fittings and gates, shall conform to the requirements of appropriate ASTM Specifications for residential, commercial, or industrial fence, as appropriate (ASTM A 121, A 392, ASTM F 1043 and F 1083). The wire fabric shall be a minimum of 4 feet high and be manufactured from a minimum of 11 gauge wire. Fittings and gates shall conform to the requirements of ASTM F 626 “Standard Specification for Fence Fittings” and ASTM F 900 “Standard Specification for Industrial and Commercial Swing Gates.”

Fencing fabric shall be stretched taut and securely fastened, by means of tie clips, to the posts at intervals not exceeding 15 inches and to the top rails or tension wires at intervals not exceeding 2 feet. Tension should be equalized on each side of each post.

Additional Criteria To Control Animal Movement when Implementing Prescribed Grazing

Improve resource management by locating fences to separate areas with differences in forage seasons of growth and palatability, use, topography, or production potential.

Pasture/paddock divisions shall be consistent with grazing needs as projected by a grazing plan developed under Michigan Conservation Practice Standard Prescribed Grazing 528, Conservation Sheet for Prescribed Grazing and the Michigan Grazing Technical Note #3 Designing a Planned Grazing System.

Paddock division **temporary** fencing should have adequate number of wires for animal confinement. Woven wire, electric twine or ribbon, and electric net may be used for division fencing. Posts to support fencing may be of fiberglass, plastic, or steel. Division fencing may attach to the permanent perimeter fence directly or on a secured reel.

Locate fences to control livestock access to water and handling facilities.

Any permanent fencing for grazing livestock should allow flexibility to facilitate implementation of the prescribed grazing plan and permit land management activities such as nutrient application, pest control, forage harvest, and other appropriate practices.

Additional Criteria For Control of Deer Access to Pastures and Feeding Areas and Feed Storage

Depending on deer density, select from construction requirements listed.

Vertical electric fence will reach a height of 58 inches.

Vertical 5 strand electric high tensile wire installed as vertical 5 strands, spaced at 10, 22, 34, 46, and 58 inches above the ground.

Vertical 7 strand vertical 7 strands spaced at 10, 18, 26, 34, 42, 50, and 58.

Slanted 7 strand electric high tensile wire spaced at 10, 22, 34, 46, 58, 70. and 82 inches from the base. Slanted fence will reach a height of 48 inches and cover a 6 foot horizontal width.

When feed storage or feeding area security is at risk to disease transfer refer to Michigan Standard Drawing MI- 223- B for construction specifications of a 9 to 10 foot high woven wire feed security fence.

CONSIDERATIONS

The fence design and location should consider: topography, soil properties, livestock management and safety, livestock trailing, wildlife class and movement, location and adequacy of water facilities, development of potential grazing systems, human access and safety, landscape aesthetics, erosion problems, moisture conditions, flooding potential, stream crossings, and durability of materials. When appropriate, natural barriers should be utilized instead of fencing.

Diamond mesh wire and chain link fences are excellent choices for containment of livestock; however, the cost is usually prohibitive. Such fence materials may be necessary for livestock of high value or to restrict access to dangerous or sensitive areas by livestock and people.

Consider wildlife movement needs when locating fences. Fence wire height may require adjustments to repel predators or avoid entanglement.

Consider livestock management, handling, watering, and feeding when locating fences.

Consider the livestock and machinery pressure applied to gates.

Where applicable, cleared right-of-ways may be established which facilitate fence construction and maintenance. Avoid clearing of vegetation during the nesting season for migratory birds.

Where applicable, fences should be marked toenhance visibility as a safety measure foranimals or people.

Fence design and location should consider ease of access for construction, repair, and maintenance.

Fences across gullies, ravines, or streams may require special bracing, designs, or approaches.

Fence construction requiring the removal of existing unusable fence should provide for the proper disposal of scrap materials to prevent harm to animals, people and equipment.

Consider needs for improved future grazing management and the development of potential grazing systems, especially before installing permanent interior fence.

A 10 or 12 foot gate is usually adequate for the movement of livestock. If the gate will be regularly used for truck or farm machinery, consider installing 14 to 16 foot gates. A 4 foot wide swinging wood or metal gate similar to the larger gates is often desirable in a fence for use by people and small equipment.

Consider stiles and walk-through passageways to provide passage for people that limit animal passage.

Consider raising lower wire of fences located in the floodplain.

For deer exclusion, keep the fence charged throughout the year. Uncharged fences may be broken or ignored. When lower wire or wires become buried in snow, consider disconnecting them.

Consider the potential effects of installation and operation of fence on the cultural, archeological, historic, and economic resources.

PLANS AND SPECIFICATIONS

Plans and specifications are to be prepared for all fence types, installations and specific sites. Requirements for applying the practice to achieve all of its intended purposes shall be described using Michigan NRCS Fence 382 Conservation Sheet and/or Fence Estimator spreadsheet.

The conservation plan will include the following items:

- A statement of purpose for the fence.
- A map showing the location and alignment including gates and lanes, of the fence.
- List of permits required.

The case file will include:

- Design modifications recorded on the field map for as-built documentation and on the Standard Drawing with as-built documentation.

- Us the appropriate Standard Fence Drawing number.
- Use of the Michigan Conservation Sheet for Fence or the Fence Estimator spreadsheet.
- Operation and maintenance requirements will be included with a fence plan.

The landowner will call MISS DIG to locate underground utilities in compliance with the NRCS national and state utility safety policy.

Construction specifications are described in NRCS-MI-170-1.

OPERATION AND MAINTENANCE

Regular inspection of fences should be part of an ongoing maintenance program. Operation and Maintenance (O&M) includes the following:

A Schedule for regular inspections and after storms and other disturbance events.

Maintenance activities:

- Timely repair as needed, including tree/limb removal and water gap replacement.
- Repair of eroded areas as necessary.
- Repair or replacement of markers or other safety and control features as required.
- Remove and properly discarding of all broken fencing material and hardware. All necessary precautions should be taken to ensure the safety of construction and maintenance crews.
- Clearing of brush from fence lines to reduce voltage loss. Vegetative control can be achieved by herbicides applied per the manufacturer's label.
- Maintaining proper tension on the fence wires.
- Regular checking of electric fences to determine the voltage on the fence. If voltage is not sufficient, determine the cause and correct.
- Application of water to soil around ground rods during dry weather.
- Maintenance of and clearing of debris around electrified floodgates. During extended flooding periods, switch off the floodgates.

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