



CHIPPEWA/LUCE/MACKINAC CONSERVATION DISTRICT

2847 ASHMUN STREET SAULT STE. MARIE, MI 49783

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"Our mission is to assist with land use and management through education, community projects and services."

Request for Bids

Chippewa/Luce/Mackinac Conservation District (CLMCD)
Waishkey River Watershed Farmland Runoff Reduction Project
Bid Period Open: August 21st, 2025 through September 4th, 2025
Bid Opening: September 4th, 2025 at 9:01 AM

Waishkey River Watershed Farmland Runoff Reduction Project Site #2 – Fence

CLMCD invites qualified contractors to provide bids for Site #2 for a late summer 2025 installation.

1. SUMMARY

Professional contractors with experience and expertise in building livestock fence using standards from the Natural Resources Conservation Service (NRCS) are invited to submit a competitive bid for work associated with Waishkey River Watershed Farmland Runoff Reduction Project. The project site is located on South Maple Road, less than three miles from I-75 Exit 386. Contractors will need to comply fully with NRCS standards. This project will include the installation of approximately **5,800 ft of permanent perimeter fencing, constructed with four strands of high-tensile electric wire.**

Contractors completing this work will be expected to demonstrate a high level of flexibility and clear communication throughout the project. Communication with CLMCD will be essential to ensure that installation aligns with project specifications and property management objectives. Installers must be available to meet on-site with CLMCD staff as needed to review progress and make adjustments.

The Request for Bids does not constitute a contract for services performed or to be performed. Following the selection of the successful contractor, CLMCD and the contractor will negotiate a contract including a full scope of services. If there are any questions, contact Mr. Mike McCarthy at 906-635-1278 mike.mccarthy@macd.org or Mrs. Madeline Drent CLMCD Watershed Technician at 906-748-0837 madeline.drent@macd.org.

Contractors will be required to provide itemized invoices for all labor, materials, and associated costs. The contractors' services will consist of providing all necessary labor, equipment and materials for the completion of this project in accordance with the anticipated scope of service specifications in Section 2.

2. ANTICIPATED SCOPE

This project involves the removal of approximately 3,000 ft. of existing fencing, constructed with metal posts, followed by the installation of 3,000 ft of new fencing in the same location. The replacement fencing will integrate the existing four pastures on the property. Currently, these pastures are surrounded by interior-grade fencing, with one interior fence dividing two of



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the pastures; this division will need to be tied into the new perimeter fencing. Additionally, a new 2,800 ft section of permanent perimeter fencing will be constructed in an area of the property that does not currently contain any fencing or related infrastructure.

All fencing will be constructed using 4-inch diameter wood posts and four strands of high-tensile smooth electric wire. Braces will be installed at all corners, ends, and gate openings, following the specifications outlined in Table 1 of the attached documents. Where gates are required, existing livestock gates on the property will be reused to maintain functionality and reduce material costs.

3. SCHEDULE FOR COMPLETION

CLMCD is expecting to have the project completed by October 2025.

- Contractors should purchase materials and begin installation as soon as permitted. *If the contractor is not able to meet the timelines, the contractor bid should provide a timeline of their own to be considered.*
 - **Pre-construction meeting is required with CLMCD and landowner.**
- August - October 2025 – Contractor should complete the given project to NRCS standards provided by CLMCD. Finished project will be inspected for quality and quantity upon completion by CLMCD. Invoice should be submitted to CLMCD itemized by project within 30 days of completion.

Any bidder will be given the option to see the project area with CLMCD project staff before the bidding period ends. Bidders can request a to see the project area by contacting Madeline Drent, Watersheds Technician at 906-748-0837 or by email at madeline.drent@macd.org. **Site visits are highly recommended to fully understand the project.**

4. SUBMITTAL REQUIREMENTS

Please submit one electronic copy of your bid in .PDF format no later than **9:00 AM EST on September 4th, 2025** to Mr. Mike McCarthy at clmcd@macd.org

In the interest of fairness to all bidders and to facilitate timely review, any bids received after the scheduled receipt time stated above will be rejected and not reviewed. All bids received on time become the property of the CLMCD and will not be returned.

In compliance with CLMCD policy, all bids will be opened on **September 4th, 2025 at 9:01 am**. The bid will be opened by a CLMCD Staff member, analyzed and brought to the CLMCD Board for approval. All contractors may be present for the bid opening.

5. What to Submit

To facilitate review of the bids, the bidders are requested to organize the bid package as follows:

- 1-2 page 8.5" x 11" letter sized paper with company's name, address, telephone number, and email.



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- Brief paragraph providing experience for the type of project being bid on and using 3rd party standards, specifically NRCS standards.
- Bid price for the project with a breakdown showing the price of each component. See below for an example
- A timeline of when the project will be complete
- Date bid was submitted
- Signature of bidder.

Itemized List Example

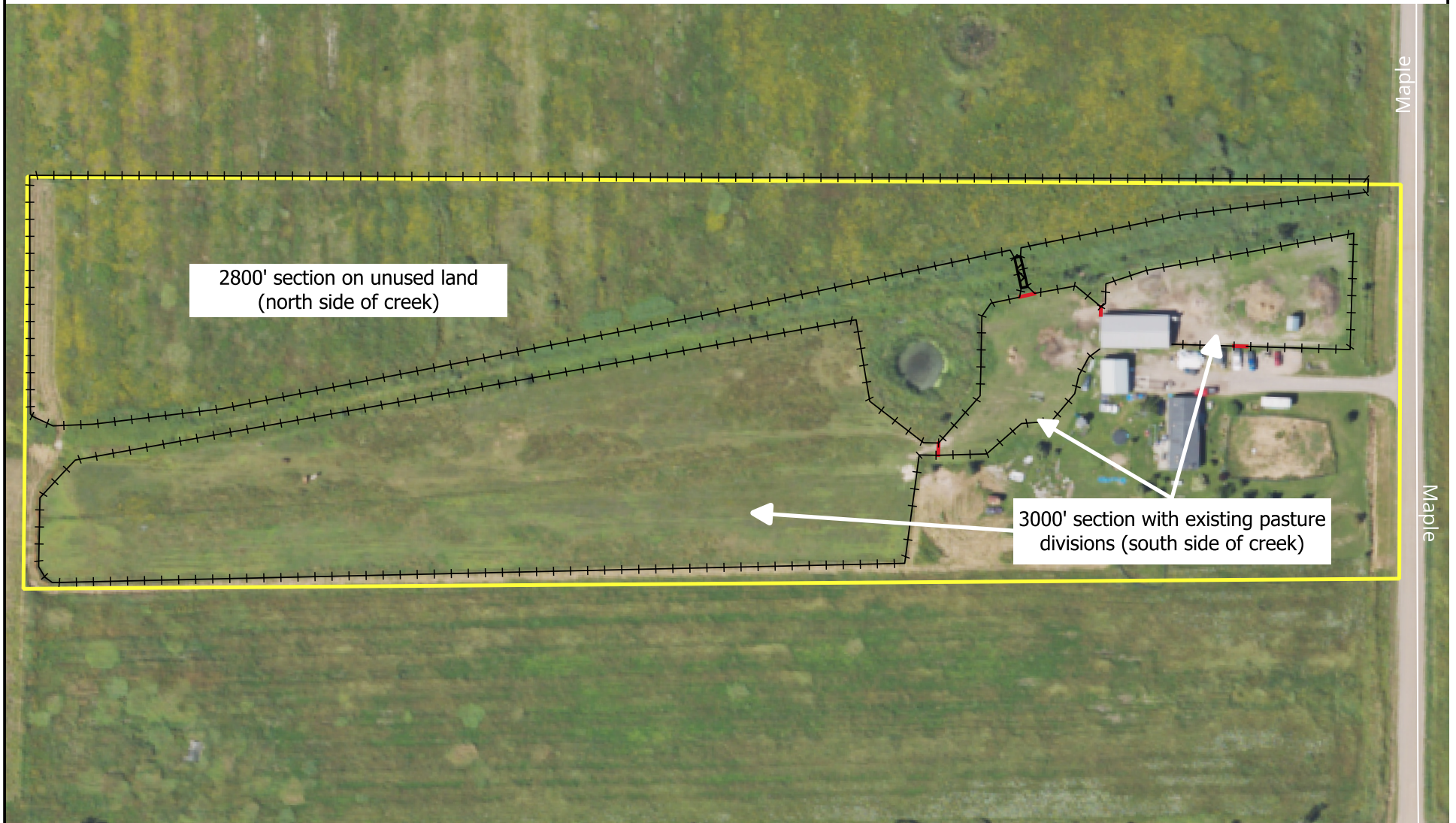
Values shown here are fictional and not expectations for real pricings.

Item	Quantity	Price	Cost
Fence Posts	200	\$12	\$2400.00
Labor - hours	45	\$32	\$1440.00
High Tensile Wire	2	\$200	\$400.00
Strainer	10	\$5	\$50.00
		Total Cost	\$4290.00

Attached: Map of Project Area, NRCS Fence Standard, and NRCS Standard Fence Drawing, NRCS Fence Standard Specification Table

This request for bid does not commit CLMCD to enter into agreement, to pay any costs incurred in the preparation of a proposal in response to this request or in subsequent negotiations, or to procure a contract for the project. CLMCD will require the selected bidder, if any, to participate in negotiations and to absorb such cost, technical and/or other revisions to the proposals as may result from negotiations. CLMCD reserves the right to perform all or some of the scope items listed herein with its own work force.

Site #2



2800' section on unused land
(north side of creek)

3000' section with existing pasture
divisions (south side of creek)

Maple

Maple



 Stream Crossing (construction in progress)

 Fence

 Gate

0 100 200 300 400 ft





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 used will provide the desired control, life expectancy, and management of animals and people of concern.

Fences shall be designed, located, and installed to meet appropriate local wildlife and land management 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 minimum 10 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 from 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 FenceBoards 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 to enhance visibility as a safety measure for animals 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.

- Use 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 discard 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.

REFERENCES

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Holechek, J.L., R.D. Pieper, and C.H. Herbel. 2001. Range management: principles and practices. Prentice Hall.

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Vallentine, J.F. 1971. Range development and improvement. Brigham Young University Press.



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TABLE 1. FENCE MATERIALS AND INSTALLATION REQUIREMENTS

Permanent Installation

Fence Type	Line Post Type, Size, and Spacing	Corner, End, Gate, and Brace Post Size ^{2/3/}	H-Brace Type and Intervals ^{4/}
Smooth Wire High Tensile- Non-Energized or Electric	<p>Type: Wood, Steel, PVC, Fiberglass, Insultimber or other materials. ^{1/} Untreated durable wood (e.g., red cedar, northern white cedar, redwood, pitch pine, or black locust) with bark removed. Sound and free of decay, with all limbs trimmed flush with the body. Non-durable wood that is preservative pressure treated. Heavy duty steel “T,” “U,” or “Y” posts galvanized or painted, with anchor plates.</p> <p>Size: Wooden posts: At least 4 inches in diameter or 4 inches square, and at least 7 feet long. Set 36 inches in the ground. Steel posts: Set in the ground to a depth that the flange is buried. Steel pipe posts: Minimum diameter of 2 inches nominal, Schedule 40, minimum 5 foot length. Set 36 inches in the ground. Fiberglass posts: Minimum diameter of 1 inch and 6 foot length. Set 36 inches in the ground.</p> <p>Spacing: ^{5/} Wood posts will be spaced no further than 100 feet apart. When spacing exceeds 50 feet, stays will be centered. Fiberglass post maximum spacing is 50 feet. Steel t-type or pipe posts spaced 16.5 to 50 feet maximum. A wooden post will be used every 165 feet when steel t-type line posts are used.</p>	<p>Size: Wooden and Synthetic: Corner or end posts – 6 inches, brace posts 5 inches in diameter; at least 7 feet long, placed 36 inches in the ground. See Note 2 at the end of this table.</p> <p>Steel posts - minimum 4 inch diameter, Schedule 40.</p> <p>Brace Members: Horizontal or diagonal member: Wood and Synthetic diameter a minimum of 3.5 inches. Steel pipe diameter a minimum of 2 inches. Brace length minimum of two times the fence height not more than 8 feet apart.</p>	<p>Required at all corners, gates, ends, and change in angle. Use a corner post assembly for fence alignment changes of 15 degrees or greater.</p> <p>For corners, gates, and ends: Single brace used when straight fence length is equal to or less than 660 feet (40 rods) of run and on fence with 4 to 6 wires. Double brace used when fence length is 660-1,320 feet (40-80 rods) of run and on fence with 7 or more wires.</p> <p>In-line pull assembly: ^{6/} Double H pull assembly used for stretches of fencing that exceeds the maximum run between corners, gates, and ends. Install in the fence line at intervals not to exceed 1320 feet.</p>
Woven and Barbed Wire	<p>Type: Same as above. Size: Same as above. Spacing: Maximum 16.5 feet (1 rod) apart, on center, for standard woven wire. Maximum 25 feet apart, on center, for high tensile woven wire. Maximum 25 feet apart for barbed wire. Set to a depth of at least 36 inches. A wooden post will be used every 165-feet when steel t-type posts are used.</p>	<p>Size: Same as above.</p>	<p>Required at all gates, corners, and ends. Corner bracing will be used when fence alignment changes 15 degrees or greater.</p> <p>For corners, gates and ends: A single brace assembly is required on straight section runs up to 660 feet (40 rods) for woven wire and barbed wire. Double brace shall be used when run of woven or barbed wire fence is greater than 660 (40 rods) feet.</p> <p>In-line pull assembly: Use double braces at tops and bottoms of hills, and to divide fence lengths where runs of fence are more than 1320 feet long between corners, ends or gates.</p>

TABLE 1. FENCE MATERIALS AND INSTALLATION REQUIREMENTS - Continued

Fence Type	Line Post Type, Size, and Spacing	Corner, End, Gate, and Brace Post Size ^{2/ 3/}	Brace Intervals ^{4/}
Wooden Board	<p>Rails - Well seasoned or kiln dried wood. Rails are a minimum of 1x6 inches and at least 8 feet long.</p> <p>Posts: Untreated durable wood with bark removed, OR non-durable wood that is preservative pressure treated.</p> <p>Heavy duty steel “T,” “U,” or “Y” posts, galvanized or painted with anchor plates.</p> <p>Size: Wooden post minimum of 4 inches in diameter or 4 inches square. Length sufficient to support desired height of fence and be set in the ground a minimum of 36-inches.</p> <p>Spacing: 8-10 feet apart.</p>	<p>Wooden posts with a minimum 6 inch diameter or 6 inch square set in the ground to a minimum depth of 36 inches. See Note 2 at the end of this table.</p> <p>Maximum spacing no further than 8 feet apart.</p>	Not applicable.

Table 1 Notes:

- 1/ PVC or other types of plastic line posts may be used as long as they are capable of providing support for the fence and are installed to the manufacturer’s recommendations.
- 2/ A single 12 foot long, 6 inch minimum diameter post may be substituted for end panel, corner, gate and vertical change bracing, and pull post assembly. The 12 foot long post shall extend a minimum of 7.5 feet into the ground and be backfilled with gravel.
- 3/ Where posts cannot be set to the specified depth, additional anchors or deadman applied against the direction of pull will be needed.
- 4/ The strongest brace assembly is the double horizontal (H) brace.
- 5/ Closer post spacing may be needed to accommodate certain situations such as steep landscapes, fragile soils, deer crossings and other concerns.
- 6/ Tie off wires at center post.

**TABLE 2. PERMANENT PERIMETER ^{4/} LIVESTOCK FENCE BY LIVESTOCK TYPE
AND MICHIGAN ENGINEERING STANDARD DRAWINGS**

Type of Livestock	Non-Electric High Tensile Smooth Wire MI-210-B	Electric High Tensile Smooth Wire MI-230-B	Woven Wire ^{5/} MI-220-B	Barbed Wire ^{1/} MI-200-B	Wooden Board
Beef-Steers, Cows and Calves	Minimum of 5 strands, spaced beginning 5 to 10 inches above the ground with a total height to top wire not less than 46 inches above the ground.	Minimum of 4 strands, equally spaced beginning at 10 inches above the ground.	Minimum of 42 inches high, plus 1 or 2 additional wires (either barbed or electrified smooth) at the top at least 4 inches above the woven wire and 1 inch below the top of the post.	Minimum of 4 wires spaced an equal 10 inches apart at 12-16, 22-26, 32-36, and 42-46 inches above the ground.	4 boards spaced on 16 inch centers; bottom board at 9 to 12 inches above the ground, with 8 to 9 inch spaces between board to a minimum height of 54 inches above the ground.
Dairy Cows and Heifers	Minimum of 5 strands, spaced beginning 5 to 10 inches above the ground with a total height to top wire not less than 46 inches above the ground.	Minimum of 4 strands, equally spaced beginning at 10 inches above the ground.	Minimum of 42 inches high, plus 1 or 2 additional wires (either barbed or electrified smooth) at the top at least 4 inches above the woven wire and 1 inch below the top of the post.	Minimum of 4 wires spaced an equal 10 inches apart at 12-16, 22-26, 32-36, and 42-46 inches above the ground.	4 boards spaced on 16 inch centers; bottom board at 9 to 12 inches above the ground, with 8 to 9 inch spaces between board to a minimum height of 54 inches above the ground.
Horses and Foals, Mules, Llama, Alpaca and Similar	^{2/} Minimum of 5 strands, spaced beginning 5 to 10 inches above the ground with a total height to top wire not less than 46 inches above the ground.	^{2/} Minimum of 4 strands equally spaced beginning at 10 inches above the ground.	Minimum of 42 inches high, plus at least 1 additional electrified smooth wire at the top at least 4 inches above the woven wire and 1 inch below the top of the post. Alternatively a wooden rail (board) plus an electrified smooth wire may be added at the top of the woven wire.	Not Recommended.	4 boards spaced on 16 inch centers; bottom board at 9 to 12 inches above the ground, with 8 to 9 inch spaces between board to a minimum height of 54 inches above the ground.
Goats and Kids, and Sheep and Lambs	Not recommended.	^{3/} Minimum of 5 strands (at least 2 electrified), spaced beginning at 5 to 6 inches above the ground with bottom 2 wires closer together than top 2 wires.	Minimum height of 42 inches. An additional barbed or smooth electrified wire may be used above the woven wire, spaced at least 1 inch below the top of the post.	Minimum of 5 wires spaced beginning at 5 to 6 inches above grade, continuing an equal 10 inches apart at 12-16, 22-26, 32-36, and 42-46 inches above the ground.	Not Recommended.

**TABLE 2. PERMANENT PERIMETER ^{4/} LIVESTOCK FENCE BY LIVESTOCK TYPE
AND MICHIGAN ENGINEERING STANDARD DRAWINGS - Continued**

Type of Livestock	Non-Electric High Tensile Smooth Wire MI-210-B	Electric High Tensile Smooth Wire MI-230-B	Woven Wire ^{5/} MI-220-B	Barbed Wire ^{1/} MI-200-B	Wooden Board
Hogs	Not recommended.	Minimum of 4 strands (at least 2 electrified), spaced beginning at 6 inches above the ground.	Minimum of 35 inches high.	Not Recommended.	Not Recommended.
Large Animals such as, Exotic Species, Captive Deer Herds, Bison, and Similar ^{6/}	10 strands spaced at equal intervals, a minimum of 46 inches and up to 96 inches above the ground determined by animal need.	Minimum of 8 strands spaced beginning at 6 inches, equally spaced to a minimum height of 56 inches above the ground.	Minimum height of 46 inches and up to 96 inches above the ground.	Not Recommended.	Not Recommended.

Table 2 Notes:

1/ Barbed wire fence should never be electrified.

2/ To increase fence visibility, substitute one or more strands of vinyl coated wire or high tensile polywire, rope or tape for the smooth wire.

3/ With kids and/or lambs present, adjust the spacing of wires to accommodate their height.

4/ Interior exclusion fence: the number of wire strands should be adequate to exclude livestock from the area of concern and may be less than required for perimeter fencing.

5/ Woven wire for cattle or horses comes in standard heights depending on the manufacturer. These vary in increments between 22 and 50 inches.

6/ Fence height will be based upon potential for animal escape or injury by the fence. Chain link or diamond mesh wire fencing of appropriate height can be used

TABLE 3. INTERIOR PERMANENT FENCE FOR LANES, WALKWAYS, STREAM CROSSINGS, SURFACE WATER ACCESS AND EXCLUSION

Fence Type	Line Post Spacing Maximum (ft)	Line Post Diameter and Length	Brace
<p>High Tensile Smooth – 1 to 3 wires</p> <p>Energized temporary fence will have at least 1 wire energized. Temporary fence may be attached to other permanent fence with its own grounding system as long as the permanent fence is properly grounded. All power fences must be grounded.</p> <p>Polycoated HT Smooth- 1 to 3 wires</p>	<p>Wood posts 50 ft or 100 ft with stays every 25 ft when more than 1 wire is used.</p> <p>Steel t-type: 10 to 50 ft.</p> <p>Fiberglass, Fiber rod or Insultimber: 30 to 50 ft.</p>	<p>Wood: 3 to 4 inch diameter, 5 ft long.</p> <p>Fiberglass, Fiber rod or Insultimber: 7/8 inch or greater, 3 ft length or longer to meet fence height needs.</p> <p>Steel t-type: as described in Table 1.</p>	<p>No brace required on paddock subdivision wires.</p> <p>1 or 2 wires: Anchor post assembly or deadman on wood posts 3-4 inches in diameter OR 5 inch diameter wood, steel pipe or fiberglass set to a depth equal to or greater than the height of the post above the ground; OR fiberglass posts diameter minimum 2 inches set 2 feet in the ground with appropriate angle or H-brace OR construct corner and end brace assemblies as described in Table 1. When 10 ft line t-post spacing is used, an angle brace with 2.5 x2.5x 0.5 inch steel or 2 inch steel pipe or tubing, 8 ft long can be used with a brace member of 2 inch angle, or 1.9 inch pipe or .75 inch tubing.</p> <p>3 wires: Single brace assembly used for fence lengths of less than 1320 feet. Use double assemblies for runs greater than 1320 ft and</p> <p>Use an in-line pull assembly for every 4000 ft of run between corners or ends.</p>
Barbed Wire- 1 to 3 wires	10 ft or up to 30 ft with stays every 10 feet	Same as above.	
Woven Wire- standard	16.5 ft	Steel t-type as described in Table 1. Use wood line post every 165 ft. Wood, Fiber rod or Insul-timber as described above.	When fence run is greater than 660 ft , use a double in-line brace assembly at intervals no greater than 660 ft.
Woven Wire- high tensile	Up to 20 ft	Same as for standard woven wire.	Same as for standard woven wire.
<p>Polytape, polyrope, polybraid- 1 to 3 wires</p> <p>Temporary fence may be attached to other permanent fence with its own grounding system as long as the permanent fence is properly grounded. All power fences must be grounded.</p>	Up to 30 ft	Same as for high tensile wire/	<p>No brace required on paddock subdivision wires.</p> <p>Same as for high tensile wire above.</p>
Adjoining Woven Wire Interior to Perimeter Fence			Must terminate in a brace assembly as required in Table 1.

TABLE 4. EVALUATION OF FENCE CONSTRUCTION MEETING THE SPECIFICATIONS								
Fence Type	Purpose of Fence			Line Post Spacing (Max)	Brace Type for Corners, Ends and Gates – wood posts only ^{2,3/}			
	Permanent Boundary Perimeter	Permanent Interior, Lanes, Stream Crossing	Use exclusion, Access control		Single H	Double H	Figure 4 or Angle	6 inch diameter 12 foot post
	Minimum Criteria			Feet	Minimum Criteria			
Barbed Wire- 2-3 strand	Does not meet	Meets	Exceeds	25	Meets	Exceeds	Meets	Exceeds
Barbed Wire 4-5 strand	Meets	Exceeds	Exceeds	25	Meets	Meets	Meets	Meets
Non Electric Smooth High Tensile wire 2-3 strands	Does not meet	Meets	Meets	100 ^{1/}	Meets	Exceeds	Meets	Exceeds
Non Electric Smooth High Tensile wire 4 strands	Does not meet	Meets	Meets	100	Meets	Meets	Meets	Meets
Non Electric Smooth High Tensile Wire 5 strands	Meets	Exceeds	Exceeds	100	Meets	Meets	Does not meet	Meets
Electric Smooth High Tensile 2-3 strands Wire	Does not meet	Meets	Exceeds	50-100	Meets	Exceeds	Meets	Exceeds
Electric Smooth High Tensile Wire 4 strands	Meets	Exceeds	Exceeds	100	Meets	Meets	Meets	Meets
Electric Smooth High Tensile Wire 5 strands	Exceeds	Exceeds	Exceeds	100	Meets	Meets	Does not meet	Meets
Woven Wire plus 1-2 top wires	Meets	Exceeds	Exceeds	16.5	Meets	Meets	Does not meet	Meets
High Tensile Woven Wire plus 1-2 top wires	Exceeds	Exceeds	Exceeds	25	Meets	Meets	Does not meet	Meets
Wood Board	Meets	Exceeds	Exceeds	8	NA	NA	NA	NA

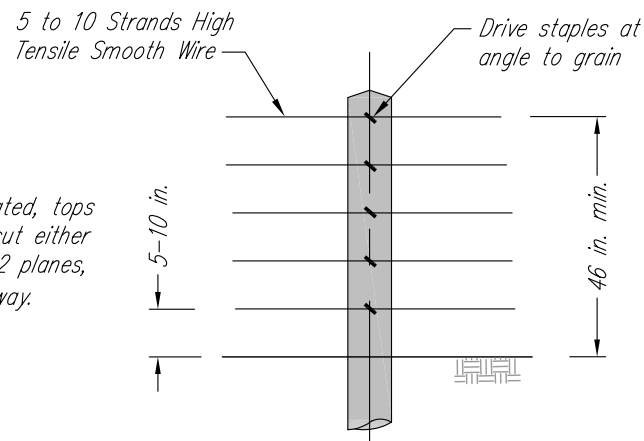
Table 4 Notes:

^{1/} Post spacing which exceeds 50 feet must use stays equally spaced between posts to maintain wire spacing.

^{2/} For brace specifications when steel pipe is used refer to Table 1.

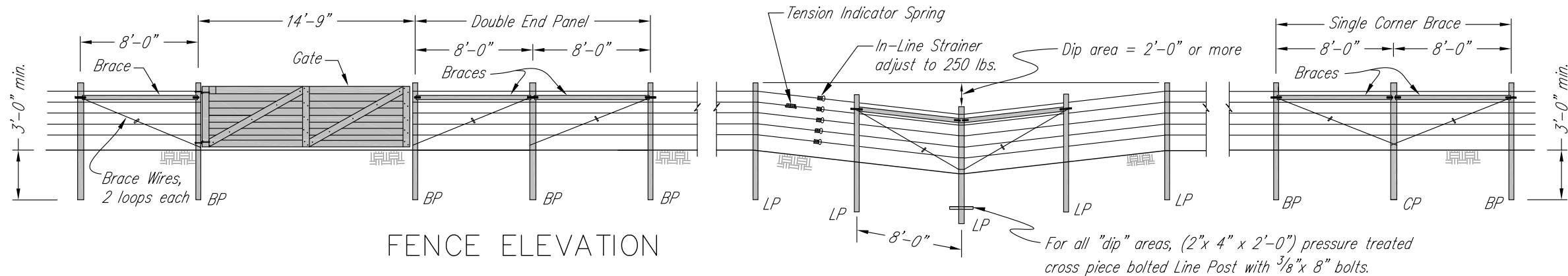
^{3/} Refer to Table 1 and Table 3 for specifications on when to use a single or double brace assembly.

OPTIONAL:
When pressure treated, tops
of posts may be cut either
flat or beveled in 2 planes,
4" per foot each way.



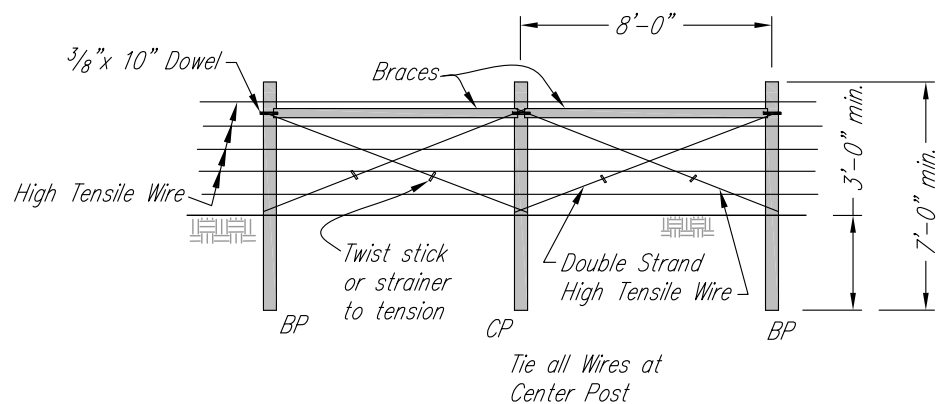
WIRE DETAIL
WOOD POST

Steel line posts shall be t-type,
with triangular shaped ground line
pressure plate. They shall be
driven into the ground to a depth
that the ground line pressure plate
is buried. Minimum weight per foot
1.33 lbs., exclusive of anchor plate.



FENCE ELEVATION

NOTES:



DOUBLE PULL POST ASSEMBLY

All dimensions in inches or feet-inches.

NOT TO SCALE

ESTIMATED QUANTITIES

ITEM	SIZE	LENGTH	APPROXIMATE QUANTITY
Corner Post (CP)	6" min.	7'-0" min.	
Brace Post (BP)	5" min.	7'-0" min.	
Line Post (LP)	4" min.	7'-0" min.	
Brace (see Note #13)	3 1/2" min.		
Dowel Pins (steel)	3/8" dia.	5", 10"	
High Tensile Wire, Galvanized	12 1/2 gauge	As required	
Brace Wire, Galvanized	9 or 12 1/2 gauge	As required	
Staples	9 gauge		
Treated Cross-Piece for LP (Dip Area)	2" X 4"	2"-0" min.	
Carriage Bolt for Cross-Piece (Dip Area)	3/8 in. dia.	8"	

HIGH TENSILE FENCE DETAILS

Co., Michigan
Township, T. —R., Sec.



File Name

Drawing Name

Sheet of

MICHIGAN ENGINEERING STANDARD DRAWING			
FILE NAME MI-210-B 9-09.dwg			
STANDARD DWG. NO. MI-210-B			
DATE 9-09	SHEET 1	OF 1	