

NH FENCE CONSTRUCTION SPECIFICATIONS

II. ELECTRIFIED HIGH TENSILE SMOOTH ALUMINUM WIRE

The work shall consist of furnishing and installing electrified high tensile smooth **aluminum** wire fence and related essential components. Refer to New Hampshire NRCS Field Office Technical Guide, Section IV, Standard 382, Fence, Table 1 for min. fence height.

Specifications are listed for a 48" and a 60" fence. The 48" fence includes fences with a top wire height from 42 - 48". The lifespan of this practice is 20 years. Consider using a professional to install the fence according to specifications to ensure that the fence is installed correctly and will last for 20 years.

"Electrified fence" or "electrified wire" describes a fence with an electrical pulse.

Barbed wired shall never be electrified or used with electrified fences.

1. Wire

All wire shall be new, 12.5 gauge high tensile aluminum alloy smooth wire with a minimum tensile strength of 48,000 psi.

Soft (low tensile) aluminum wire is not permitted.

High tensile aluminum alloy wire will bend or break more easily than high tensile steel. This particular high tensile aluminum alloy wire fence is not designed to be constructed in the exact same manner as a high tensile steel fence. If the wire is tensioned too tightly, or if the line posts are spaced too close together, the wire will break frequently.

Because aluminum wire is lighter than steel, this fence can be constructed with a wider line post spacing, and can be tensioned by hand using gripping-style joiners. The goal is make the fence flexible so that the wire will bend or stretch, rather than break, when it receives pressure/stress.

2. Hardware and Fasteners

Staples shall be of 9 gauge class 3 galvanized steel or heavier with a min. length of 1³/₄" for soft wood post or 1 inch for close grain hardwood posts. Barbed staples shall be used for pressure treated posts.

Manufacturer's clips or 14 gauge class 3 galvanized wire (or better) may be used to fasten wires to steel posts.

Brace pins shall be a min. of 3/8" x 5" for the end or corner posts and 3/8" x 10" for the brace posts.

Brace pins, in-line strainers, joiners/splices, and tension springs shall be class 3 galvanized, zinc coated, or better.

Ceramic rollers (gripping-style joiners and splices) are acceptable providing they match the size of the wire.

3. Wood

All wood posts shall be red or white cedar, black locust, or pressure treated. Red pine shall not be used if posts are mechanically driven into the ground. Pressure treated posts shall be treated with a min. of 0.40 lbs/cubic foot of chromated copper arsenate (CCA) Type A, B, or C; or ammoniated copper quaternary (ACQ) preservative by a method to ensure that complete penetration of the sap wood is obtained. Quality of treated wood shall provide sufficient strength and last the expected life of the fence (20 years). All bark shall be removed from cedar and black locust posts. At least half of the diameter of the cedar shall be heartwood.

Min. wood post diameter is measured on the smallest end of the post. For example, if the min. allowable diameter for a post is 4 inches, this means that the post will be at least 4 inches on the smallest end, and approximately 5 inches on the larger end. This post will commonly be labeled 4-5" or 4/5".

4. Line Posts

Line posts shall be wood, fiberglass, UV-protected reinforced plastic, composite, or other material that will be durable for the life of the fence (20 years). Steel posts shall not be used for electrified high tensile permanent perimeter fencing, except when the electrified wire is part of a woven wire fence (i.e. top or interior wire)

Wood

Diameter: 4 in.

Length: 7 ft. for 48" fence; 8 ft. for 60" fence

Depth: 3 ft. below the ground line

Spacing: 100 ft. maximum between posts with battens every 30-50 ft., or
30-50 ft. maximum between posts without battens

Fiberglass/Other

Diameter: 5/8 in. for 48" and 60" fence

Length: 6.0 ft. for 48" fence; 7.0 ft. for 60" fence

Depth: 2.0 ft. below the ground line

Spacing: 100 ft. maximum between posts with battens every 30-50 ft., or
30-50 ft. maximum between posts without battens

Other

UV-protected reinforced plastic, composite, or other material may be used based on manufacturer's recommendations, providing the material is equal or greater in strength and quality as above. Maximum spacing shall be the same as above.

Space posts closer together on uneven terrain.

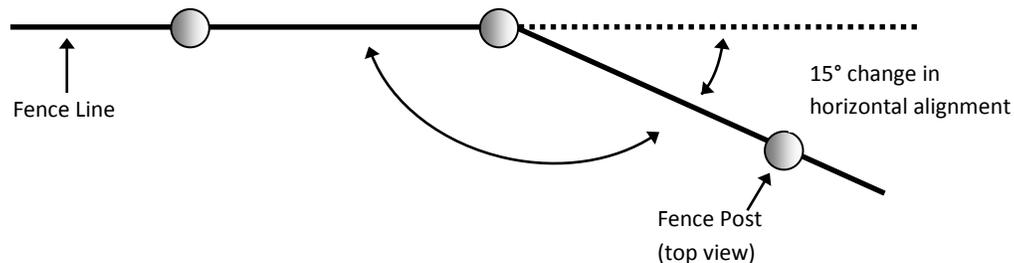
Depressions and Curves

Ensure that the proper fence height is maintained when crossing depressed areas. For minor dips or depressions attach a batten or fiberglass post to a duckbill, dip anchor or other type of anchor and pull the batten/post down to bring the wire to the appropriate spacing.

When crossing a ditch or a stream, follow manufacturer's instructions or attach an additional bottom wire to the fence and hang #1 small chain from the wire. Use an energy limiter to prevent shorted wire from draining current from the upper wires.

Lay fence line as straight as possible and avoid unnecessary curves. Place line posts closer together on curves to prevent wire tension from moving the posts.

A corner brace assembly shall be used when the horizontal alignment changes more than 15 degrees (depending on terrain).



5. Trees

Live trees may be used in place of posts or corners for smooth wire fences when shallow soil depth to ledge/bedrock or other extreme soil conditions do not allow posts to be embedded to the appropriate depth. Live trees used for corner, bracing, and line posts shall have a diameter breast height (DBH) equal to or greater than what is required for normal wooden posts. Wire shall not be fastened directly to trees.

A board or boards will be placed on the tree to keep the wire from contacting the bark. Wire shall not be wrapped around the tree. A CCA treated 2"x6" board, fiberglass strip, plastic strip, or an untreated cedar or white oak board with a min. size of 1"x4" must be securely fastened to the tree with at least three 40 lbs pole barn nails. Use an appropriately sized galvanized steel washer with each nail to prevent the nail from sinking into the board as the tree grows. The board must be long enough to accommodate the wire.

Wire may also be attached to the tree using a J-bolt. J-bolts shall be used primarily when the wire is located on the front of a tree, or when the tree is used as an end post. The J-bolts shall be inspected and backed-out every 5 years and must be removed when the fence is no longer attached to the tree.

Maintain the min. fence height from the ground when using trees.

6. Corner, End, Pull, and Gate Assemblies.

Bracing is required for all corners, ends, and gates. Use dip anchors when the vertical alignment (slope) changes is 20-30°. When the slope is greater than 30°, use a longer wooden line post with a larger diameter (at least 5 inches) and bury it at least 4 feet, or bury a dead weight to pull the fence to the proper position, or use a brace assembly.

Use a single H-brace for 6 or less wires (a single H brace may be used for 7 wires if the 7th wire is an untensioned ground). A double H-brace is required for more than 6 wires and recommended if posts are not mechanically driven or if posts are set in lighter, sandy soils or extremely wet soils. If the posts are not mechanically driven, attach a lug to the bottom of the brace post (2" x 4" x 8" treated wood attached with a 3/8" x 4" lag bolt).

H-Braces

Corner, end, brace, and gate posts:

Material: Wood

Diameter: 4 in.

Length: 8 ft. for 48" fence; 9 ft. for 60" fence

Depth: 4 ft. below the ground line

Cross members:

Material: Wood

Diameter: 4 in.

Length: 2 times the height of the brace posts (e.g. 8-10 ft. for a 48" fence), depending on placement of the cross member within the brace assembly.

Use 3/8" x 5" (min.) brace pins to set the cross member(s) to the end/corner post. Use 3/8" x 10" (min.) brace pins to set the cross member(s) to the brace post(s).

Leave at least 1" of the brace pin protruding from the outside of the brace post to hold the brace wire. Barbed staples shall be driven into the outside of the end post, approximately 3-4" above the soil line, to hold the brace wire.

Brace wire shall be wrapped around the brace assembly generally in a figure-8 fashion. Use at least 1 loop of 12.5 gauge high tensile steel, class 3 smooth wire or 2 loops of 9 gauge low tensile steel, class 3 smooth wire. The brace wire shall be tightened using a ratchet style in-line wire strainer or a smooth-wire puller/chain grab with a crimp sleeve or gripping style tensioner until the brace post begins to move away from the soil.

Close brace wire loops by wrapping additional brace wire around the loops, using a crimp sleeve, or another appropriate method. Consider installing the ratchet on the opposite side of the fence wire.

Alternatively, a single loop of class 3 galvanized cable ($5/32$ " diameter min.) may be wrapped around the brace and secured with a wire joiner/tensioner or gripping style tensioner. Tighten the cable until the brace post begins to move away from the soil.

Floating Diagonal Braces

In areas where soil depth restricts the required embedment depth, a floating diagonal brace may be used for corner and end assemblies for 48" and 60" fences.

Corner and end posts:

Material: Wood

Diameter: 4 in.

Length: 8 ft. for 48" fence; 9 ft. for 60" fence

Depth: 4 ft. below the ground line

Brace posts:

Material: Wood

Diameter: 4 in.

Length: 2 times the height of the end or corner posts (e.g. 8 ft. for a 48" fence)

Cut a ½-1" deep notch in the end post at $\frac{2}{3}$ the height of the end post to fit the end of the brace post. Cut the top end of the brace post and taper to fit in the notch. Secure the brace post to the end post using a $\frac{3}{8}$ " x 10" (min.) brace pin.

The bottom of the brace post shall be tapered or smoothed and set on a reinforced concrete block (3" x 8" x 12") or flat rock of equivalent size. The block shall be allowed to float.

Two barbed staples shall be driven into the bottom of the brace post, and 1 barbed staple shall be driven into the outside of the end post, approximately 3-4" above the soil line, to hold the brace wire.

Brace wire shall be wrapped around the brace assembly by running the wire through the staple on the end post and the staples on the brace post. Use at least 1 loop of 12.5 gauge high tensile steel, class 3 smooth wire or 2 loops of 9 gauge low tensile steel, class 3 smooth wire. The brace wire shall be tightened using a ratchet style in-line wire strainer until the end post begins to move away from the soil.

Fiberglass/PVC Braces with Anchor Systems

Fiberglass and PVC corner, end, and gate assemblies shall be installed according to the manufacturer's recommendations and will meet the following min. specifications:

- Assembly posts shall be 2 in. min. diameter
- Assemblies shall be 5 ft. high for a 48" fence and 6 ft high for a 60" fence
- Horizontal bracing is required on all assemblies
- Auger anchor shaft diameter shall be at least $\frac{3}{4}$ in.
- Five Foot Braces: Auger anchors shall have a min. diameter of 6 in. and length of 4 ft. for the corner posts and a min. diameter of 4 in. and length of 3 ft. for the diagonal posts.

- **Six Foot Braces:** Auger anchors shall have a min. diameter of 10 in. and length of 4 ft. for the corner posts and a min. diameter of 6 in. and length of 3 ft. for the diagonal posts.
- Use ¾ in anchor shaft extensions to meet minimum length criteria

Use 10 in. ground anchors for a;; corners and diagonals if assemblies are set in lighter, sandy soils or extremely wet soils. In situations where shallow soil depth to ledge or bedrock is encountered, a hole may be drilled in the rock (5 in. deep min.) and an auger anchor shaft or zinc-plated threaded rod (¾ in.) of appropriate length may be set in the hole with high strength epoxy.

7. Wire Spacing and Fastening.

The top wire shall be at least 2 inches below the top of wooden posts and 1 inch below the top of fiberglass or plastic posts.

The tension on the high tensile wire shall be enough to prevent the wire from sagging. Tension wire by hand using gripping-style joiners. In-line strainers and tension springs are can be used to tension wire, but they are not required.

Staples shall be driven diagonally to the wood's grain and at a slight downward angle, (upward if pull is up) to avoid splitting the post and loosening of the staple. Space should be left between the inside crown of the staple and the post to permit free movement of wire. Barbed staples shall be used for pressure treated posts.

High tensile aluminum wire shall be spliced using gripping-style splices or other methods recommended by the manufacturer. Do not use knots with aluminum wire.

8. Gates.

Install gates at locations suitable for providing controlled access. Select gates of appropriate size and materials for the specific fencing system. Install prefabricated gates according to the manufacturer's instructions.

Electrified gates maybe constructed of a single straight wire, galvanized cable, or poly-rope with a spring loaded insulated handle, or an expandable coiled high tensile 12.5 gauge 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 transmissions lines will be used to carry electricity past the gate to the remainder of the fence when the gate is open. Use a minimum of 10,000 V for underground transmission lines.

An electrified floodgate maybe used in lieu of a non-electrified gate, if desired. The electrified floodgate is constructed by stretching an electrified wire across the drainage above high water flow level. Attach droppers of 12.5 gauge high tensile fence wire, galvanized cable, or galvanized chains to electrified wire at a spacing of six inches above average normal water level. Connect gate to electric fence with double insulated cable through a cut-off switch and floodgate controller. If flooding is expected to last

some time, switch the floodgate off.

9. Energizers/Chargers

Electronic energizers/chargers or power fence controllers shall be installed according to the manufacturer's recommendations.

Warning signs shall be placed on the electric fence as required by local code and and/or recommended by the manufacturer.

10. Grounding

All electric fences must be properly grounded, with a min. of 3 ground rods (6-8 ft. long). Each ground rod shall be driven into the soil a min. of 6 ft. The energizer ground wire should be connected to a galvanized steel pipe or ½ inch diameter or larger rod. Do not use Rebar. One ground rod is needed for every 1 joule of energy output (*i.e.* if the energizer produces 3 joules, 3 ground rods are needed). One ground rod shall be located near the charger.

Ground rods shall be placed where soil remains moist for best results. Drive ground rods into the soil 10 feet apart to provide the required length of ground rod exposure to the soil. Connect a continuous ground wire from the energizer to each rod with a galvanized steel, stainless steel, or aluminum clamp. Do not use copper ground rods due to corrosion.

The ground wire(s) of the fence may be connected to the same ground as the energizer or separate ground with the same size and depth requirement.

If the voltage exceeds 400 volts, additional ground rods may be needed for the system to function properly. Follow the manufacturer's recommendations where they exceed the requirements of this standard.

Do not use the grounding system for other existing applications, such as power poles, breaker boxes, and milk barns. At least 40 feet shall separate the fence grounding system from any other electrical grounding system.

11. Lightning Protection

Lightning can cause damage to the energizer. Most energizers are poorly protected from lightning strikes. External lightning arrestors/diverters are required and shall be installed according to manufacturer's instructions.

12. Surge Protection

A surge protector shall be installed between the energizer and power supply.

13. Insulation and Insulated Cable

Insulators for positively charged wires shall be black or white, high grade, UV-resistant, high-density polyethylene/polypropylene. Insulators must be designed for high tensile fencing applications, be strong enough to support long spans of wire, and allow the wire to slide freely. Lightweight, yellow or red insulators designed for temporary electrified fencing or low tensile wire are not permitted.

All underground wire(s) installations must be double insulated; molded or high tensile strength 14 gauge or larger steel, aluminum, or copper wire. The insulation must be high density polyethylene with ultra-violet stabilizer or high density polypropylene with ultra-violet stabilizer.

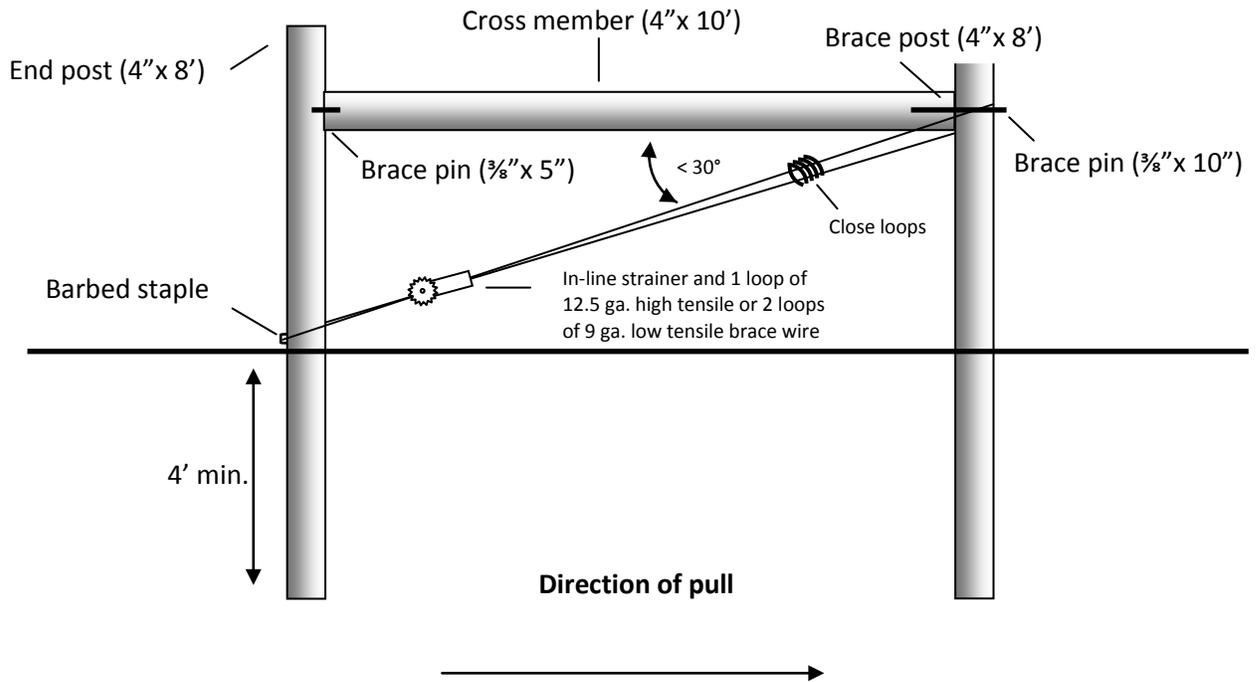
Insulators for end, corner, and angle braces shall be capable of withstanding at least 10,000 volts of current leakage and shall be made of high density polyethylene with ultra-violet stabilizer, high density polypropylene with ultra-violet stabilizer, or porcelain.

Use insulated galvanized steel, aluminum or copper wire to cross gates in areas where electrical shocks to humans and livestock should be prevented (e.g. working facilities). For underground burial, use wire designed for burial. Placing buried cable inside plastic pipe helps to decrease the incidence of short-circuiting. When overhead transmission is used, height should be sufficient so as not to impede the movement of livestock or equipment. Do not use insulated copper wire due to corrosion at the splice and lack of tensile strength.

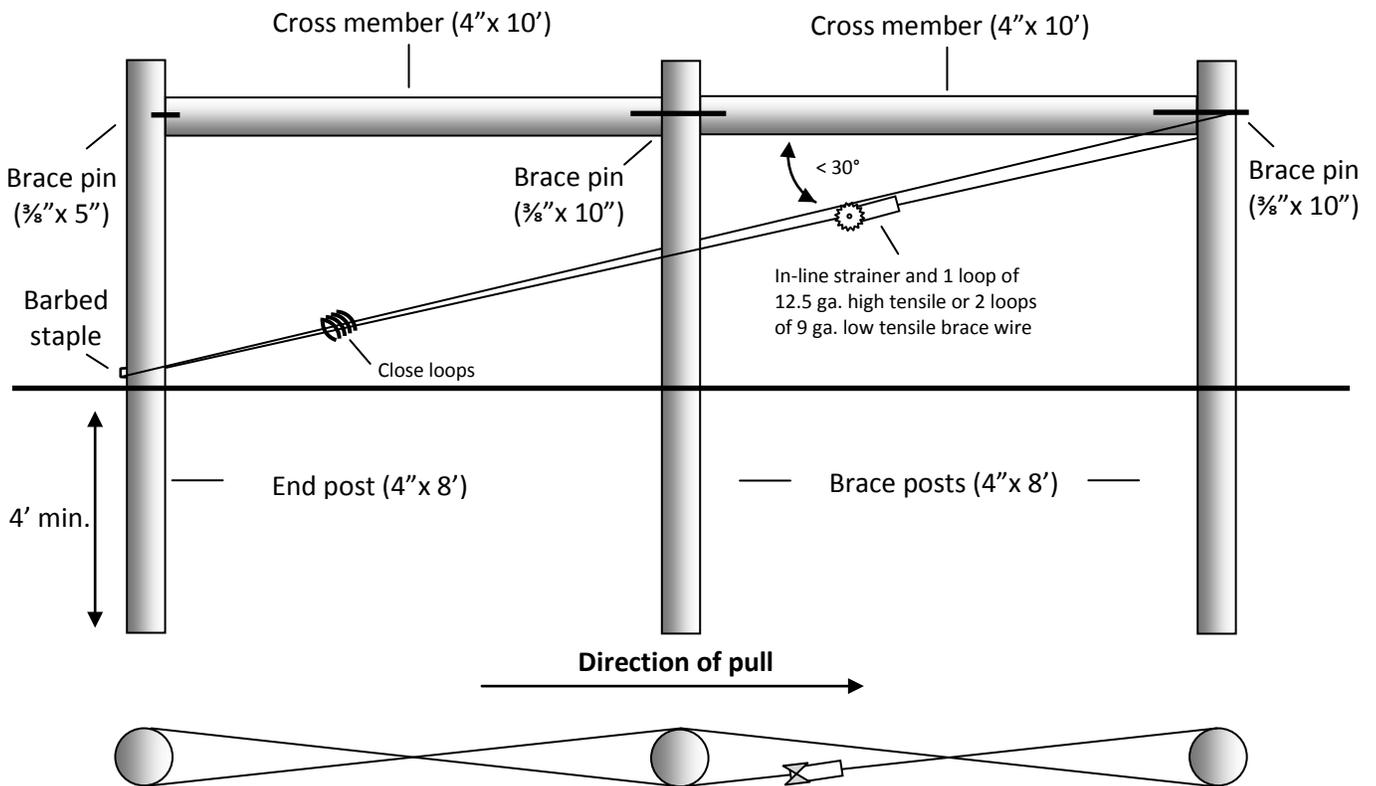
14. Modifications

The above criteria are provided for guidelines. Modifications to the above shall be based on manufacturer's recommendations and approved by the state agronomist. Manufacturer's recommendations shall be written (e.g. in a catalog or fact sheet).

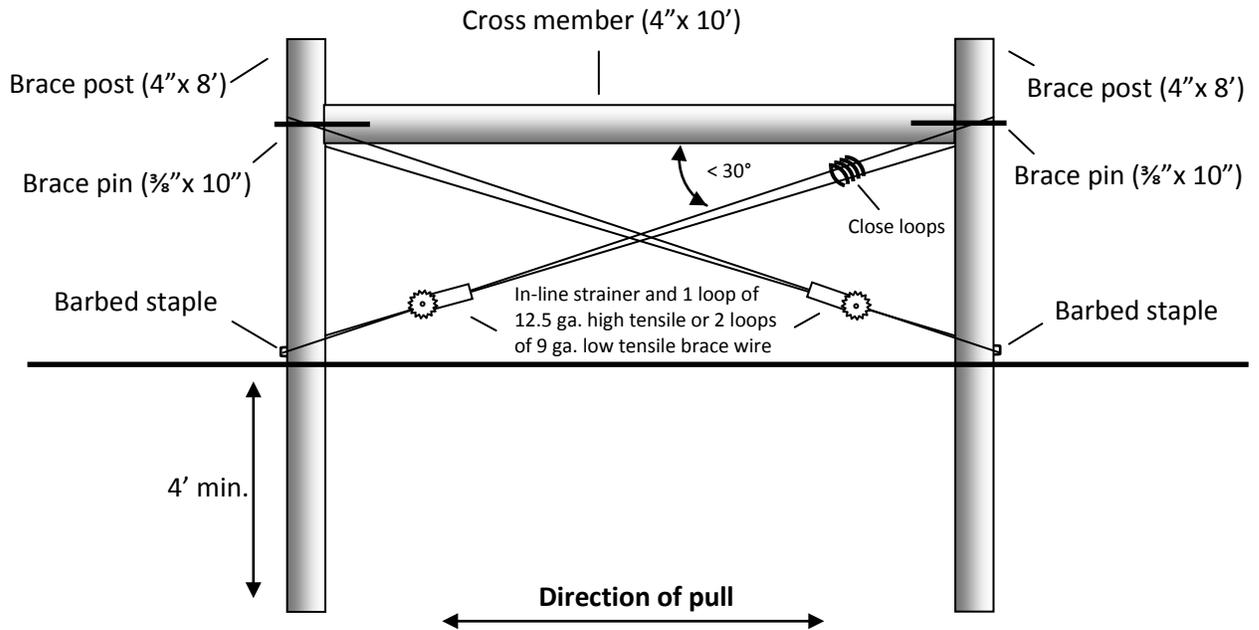
4' End Assembly: Single H-Brace



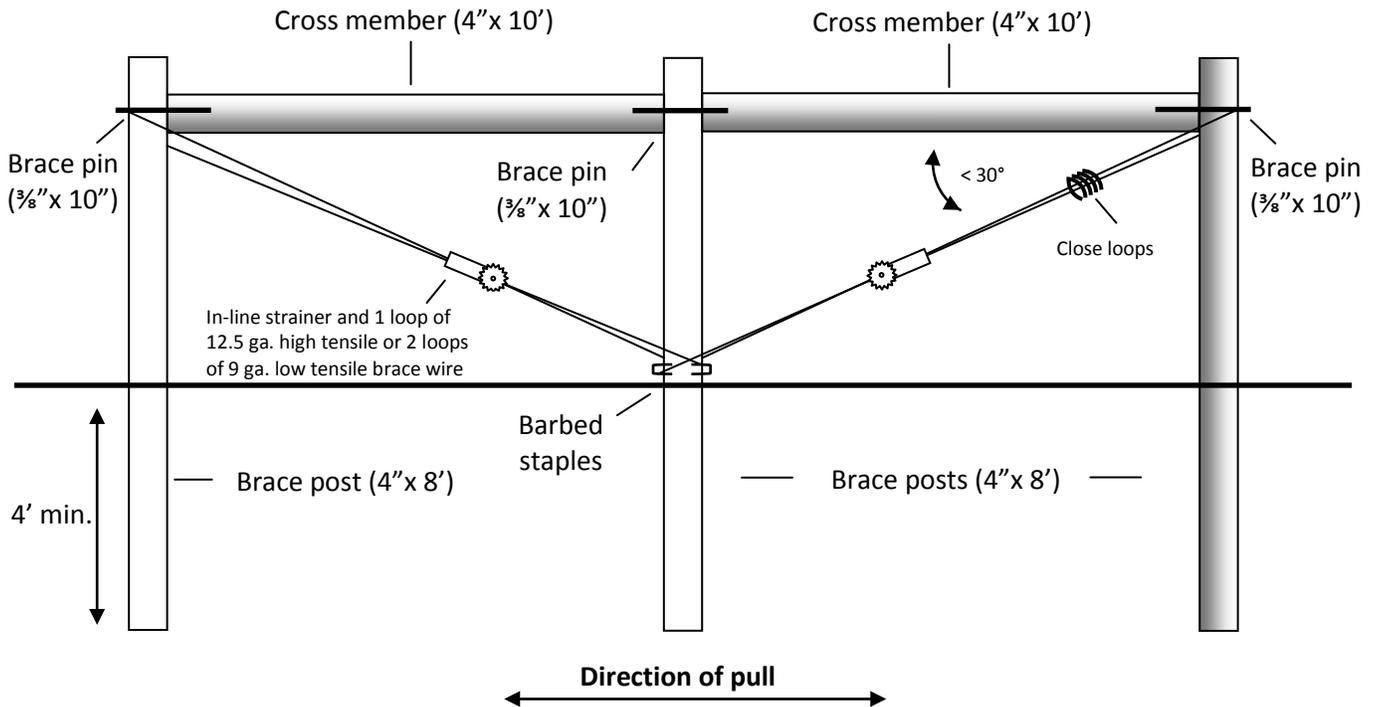
4' End Assembly: Double H-Brace



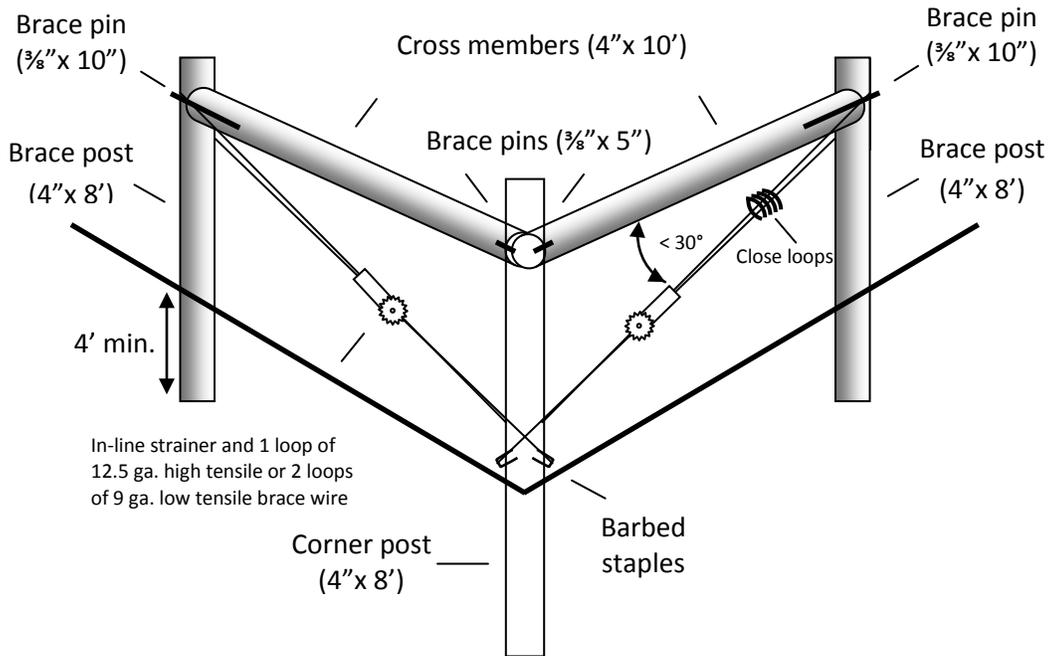
4' Pull and Gate Assembly: Single H-Brace



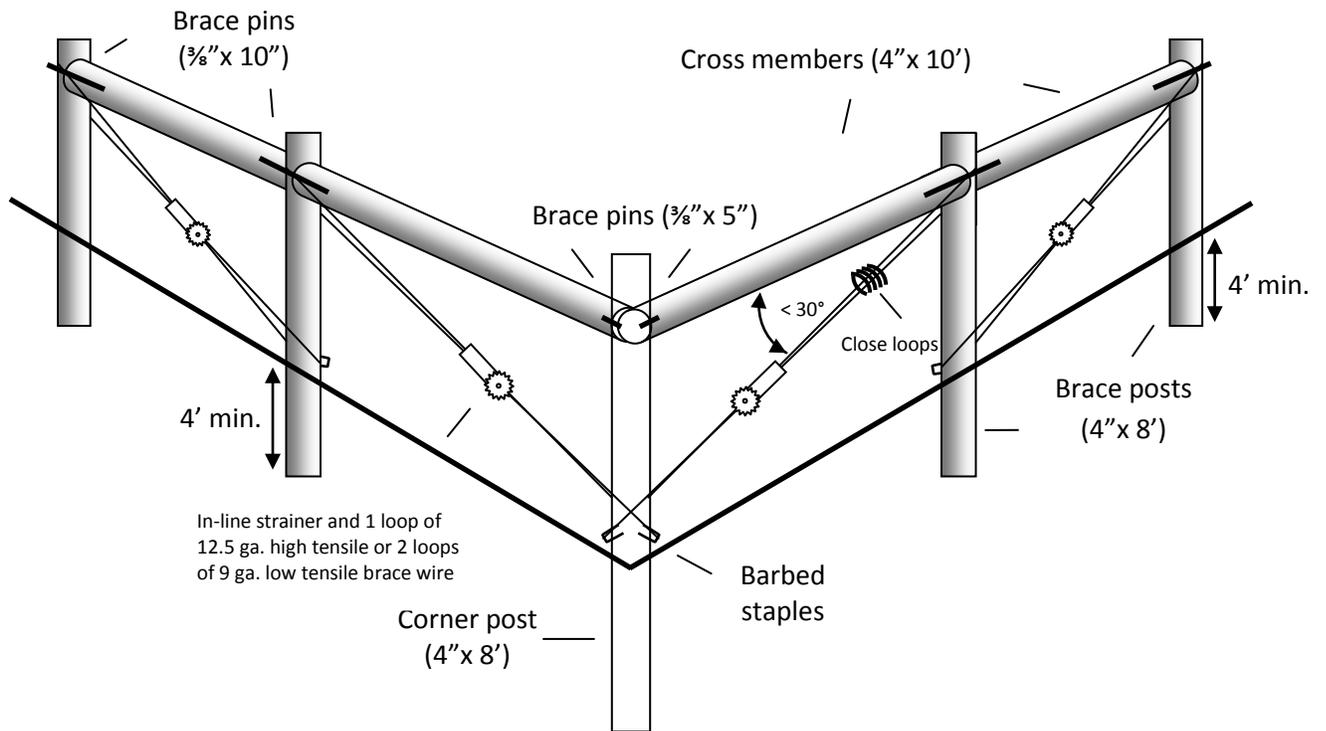
4' Pull and Gate Assembly: Double H-Brace



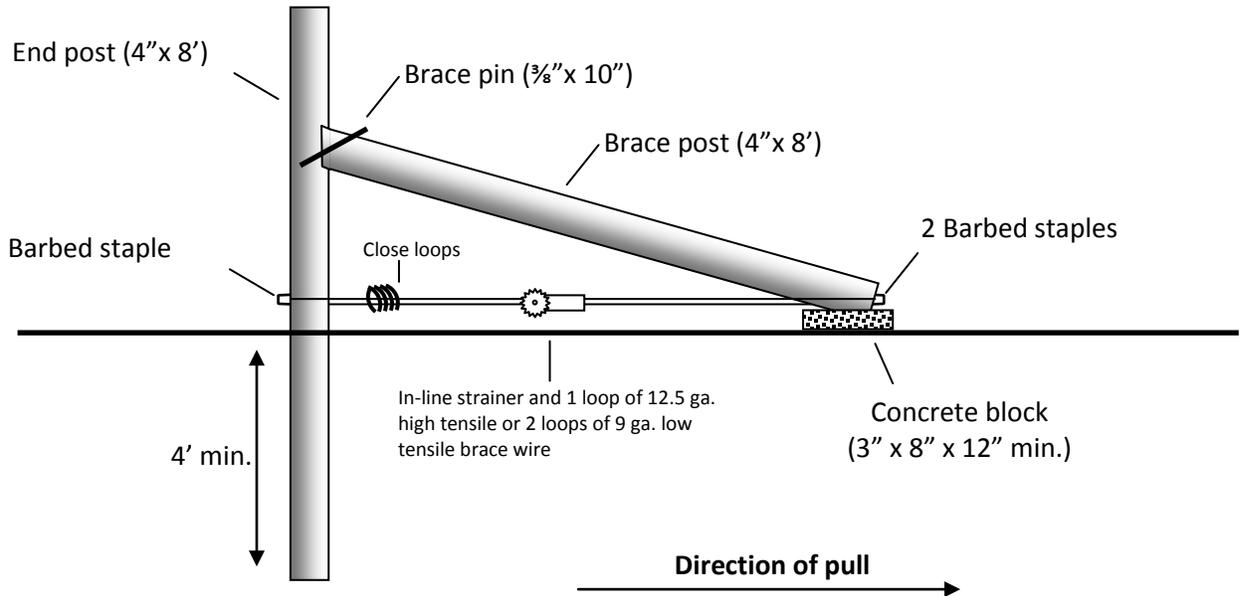
4' Corner Assembly: Single H-Brace



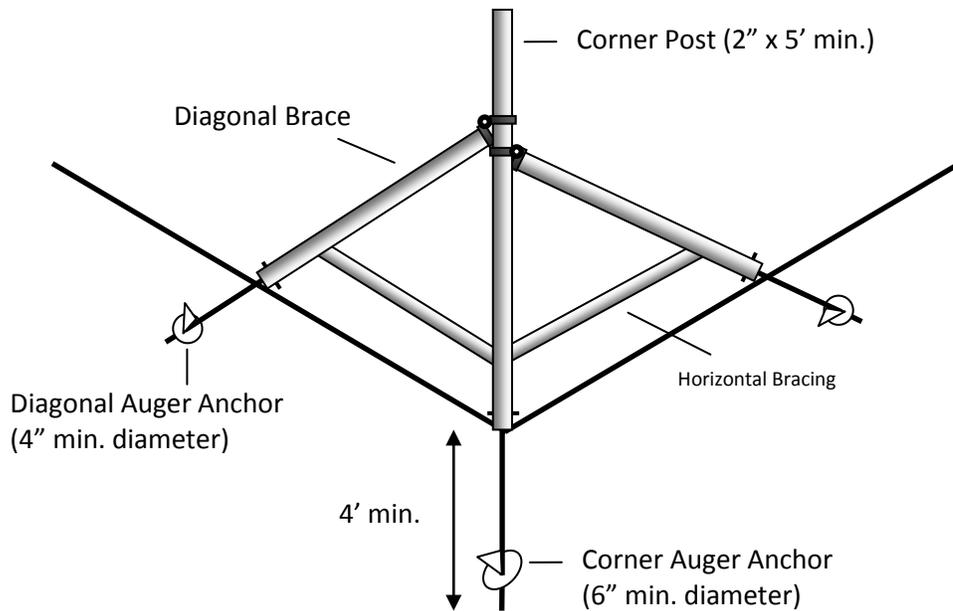
4' Corner Assembly: Double H-Brace



4' Floating Diagonal Brace



5' Fiberglass or PVC Corner Brace



6' Fiberglass or PVC Corner Brace

