Section 4154. Fence Materials

4154.01 DESCRIPTION.

A. Materials covered by this section include woven wire farm field fabric, chain link fabric, barbed wire, steel fence posts, wood fence posts, tie and brace wire, gates, and special fittings.

B. Use material of the size and type designated in the contract documents. Use new material meeting the requirements of the following provisions.

4154.02 FIELD FENCE AND DEER FENCE.

A. Field Fence.

1. Use fabric meeting the requirements of ASTM A 116, Class 3 coating.
- For Type 47 fence, the fabric design is ASTM Design Number 1047-6-11 grade 60 wire or 1047-6-12 1/2 grade 125 wire.
- For Type 39 fence, the fabric design is ASTM Design Number 939-6-11 grade 60 wire or 939-6-12 1/2 grade 125 wire.

2. When the type is not designated, furnish one of the above 1047 fabrics.

3. Fabric may be furnished in lengths greater than 20 rods (100 m).

4. Use galvanized (as determined by visual inspection) steel rod for splicing fence material.

B. Deer Fence

Use woven wire fence fabric that:
- meets the requirements (excluding wire spacing and fence height) for 12.5 gage wire according to ASTM A 116, and
- has wires spaced horizontally and vertically as shown in the contract documents or closer.

4154.03 CHAIN LINK FABRIC.

A. When chain link fence is specified in the contract documents, use either:
- Zinc coated fabric meeting the requirements of ASTM A 392, Class 2 coating, or
- Aluminum coated fabric meeting the requirements of ASTM A 491.

B. Knuckle the salvage top and bottom, except as indicated. Use material 72 inches (1.8 m) high (unless specified otherwise) and fabricated from No. 9 (3.76 mm diameter) wires.

4154.04 BARBED WIRE.

Use barbed wire meeting the requirements of ASTM A 121 for 950 pounds (4.23 kN) force minimum strand breaking strength and 4 barbs at nominal 5 inch (125 mm) centers. Ensure the zinc coating is at least 0.80 ounce per square foot (244 g/m^2).

4154.05 BRACE WIRE, TENSION WIRE, AND TIE WIRE.

A. Use galvanized wire meeting requirements of ASTM A 116, Class 3 coating, or an aluminum coated steel wire with a coating of not less than 0.25 ounce per square foot (76 g/m^2). Use tension wire at the bottom of chain link fence that meets the requirements of ASTM A 641/641 M, hard grade, with a Class 3 zinc coating or an aluminum coating of no less than 0.25 ounce per square foot (76 g/m^2).

B. Unless designated otherwise, use wire sizes no smaller than the following diameters:

Table 4154.05-1: Wire Sizes

Use	Wire Size
Tension wire	No. 7 (4.49 mm)
Brace wire	No. 9 (3.76 mm)
Tie wires or clips for fastening field fence to steel posts	No. 12 (2.68 mm)

Use tie wires for chain link fence that are the size and type the manufacturer recommends, but no smaller than No. 9 (3.76 mm) diameter for post ties or No. 12 (2.68 mm) diameter for rail and brace ties. Equivalent steel clips or aluminum wires or clips may be used if the Engineer approves.

4154.06 STAPLES.

Use plain, class 3 zinc coated, No. 9 (3.76 mm), 1 3/4 inch (45 mm) long wire staples, unless specified otherwise in the contract documents. Obtain Engineer's approval for the staples to be used.

4154.07 WOOD POSTS.

A. Use pine posts that:
- Meet the requirements of Section 4164 with pressure preservative treatment meeting the requirements of Section 4161.
- Are of the size and length designated in the contract documents.

B. Unless specified otherwise, use round stock posts of the following sizes and lengths:

Table 4154.07-1: Post Sizes and Lengths

Use	Length, feet (meters)
Line posts, 4 inch (100 mm) top	7 (2.1 m)
End, corner, gate, pull, angle, and brace posts, 6 inch (150 mm) top	8 (2.4 m)

C. If contemplating driving the line posts, the tip of the post may have a blunt point made before treatment and located near the center line of the post.

4154.08 BRACES FOR FIELD FENCE.

A. Use steel angle (or other approved bracing systems) weighing (with a mass of) no less than 1.94 pounds per foot (2.9 kg/m).

B. Use angles no less than 2 inches by 1 1/2 inches by 3/16 inches (50 mm by 40 mm by 5 mm). Use braces shown in the contract documents.

C. Ensure ends are flattened to fit squarely against the posts with brace approximately horizontal.

D. For steel line posts, use coated braces as required.

4154.09 STEEL LINE POSTS FOR FIELD FENCE.

A. Use T-section (or other approved sections) steel posts as line posts with wood posts, as shown in the contract documents. Do not use them for corner, brace, pull, end, or gate posts.

B. Only one type of steel post may be used in any installation 1,000 feet (300 m) or less in length.

C. Equip posts with lugs or other approved means to prevent the fence fabric from moving vertically.

D. Use posts that weigh (have a mass of) no less than 1.3 pounds per foot (1.9 kg/m), exclusive of anchor plate.

E. Provide each post with a steel anchor plate of adequate size, firmly attached. After the anchor plate is attached, completely paint the finished post with a prime coat and an enamel finish coat, with no limitation on color or tip identification except as provided for 1,000 foot (300 m) installations. Ensure the paint is thoroughly dry before posts are bundled for shipment. Unless specified otherwise, use steel line posts that are 7 feet (2.1 m) in length.

4154.10 STEEL POSTS, BRACES, AND RAILS FOR CHAIN LINK FENCE.

A. Use galvanized standard weight (schedule 40) pipe meeting the requirements of ASTM F 1083 of the lengths designated in the contract documents. Posts, braces, and rails of alternate cross sectional shape, material, or protective coating may be used if approved according to Materials I.M.

454.10. Ensure similar parts with different shapes or protective coatings are not intermingled within the project limits.

B. Ensure protective coatings for steel posts, braces, and rails of alternate shapes or alloys comply with one of the following methods. Other protective coatings, including polymeric, metallic, or combinations of the two, that provide protection equivalent to a zinc coating meeting ASTM A 123, may be approved.

1. Zinc coatings meeting the requirements of ASTM A 123.

2. Hot dipped pure aluminum coating with a minimum coating of 0.75 ounce per square foot (228 g/m^2) of surface, triple spot test, 0.70 ounce per square foot (213 g/m^2) of surface, single spot test, as measured according to ASTM A 428. Both outer and inner surfaces of pipe or tubing coated with a chromate chemical treatment and a thin resin film for protection during storage or handling.

C. With the posts, provide approved caps that, for 3 inch and 4 inch (75 mm and 100 mm) posts, either:

- Make a driving fit over the upper 1/2 inch (13 mm) of the post, or
- Have other approved means for holding the cap securely in place.

4154.11 SPECIAL FITTINGS FOR CHAIN LINK FENCE.

A. Comply with the following:

1. Attach braces to posts using fittings which will hold both the post and brace rigidly.

2. Use diagonal tension rods of 3/8 inch (9.5 mm) diameter, round steel rods with an appropriate commercial means for tightening.

3. Furnish a locknut or other device to hold the tightening device in place.

4. Use wire ties meeting requirements of Article 4154.05.

5. Furnish a suitable sleeve or coupling device, recommended by the manufacturer, to connect sections of top rail and to provide for expansion and contraction.

6. Use stretcher bars no less than 3/8 inch (9.5 mm) diameter, or equivalent cross section area, with suitable clamps for attaching fabric to corner, end, or gate posts.

B. Ensure all special fittings, except aluminum fittings, have a galvanized coating of no less than 0.8 ounce per square foot (244 g/m^2) applied by the hot dip process.

4154.12 GATES.

A. Field Fence and Chain Link Fence.

1. Ensure gates provide the width of opening shown in the contract documents. Install a vertical stay in gates more than 6 feet (1.8 m) wide. Where the width of opening specified is:

- 16 feet (5 m) or less, provide a single gate frame.
- More than 16 feet (5 m), provide two gate frames using a drop bar locking device allowing operation as a double gate.

2. Ensure each gate is furnished complete with necessary hinges, latch, and other special fittings recommended for the type of gate and gate post being installed.

3. For chain link fence gates, use the pipe size shown in the contract documents or approved by the Engineer. When size is not shown in the contract documents, use:

- 1 1/2 inch (40 mm) nominal diameter pipe for gates 6 feet (1.8 m) wide or more, and
- 1 1/4 inch (30 mm) nominal diameter pipe for gates less than 6 feet (1.8 m) wide.

4. Use gate fabric similar to that used for the fence. Attach using stretcher bars.

5. Use adjustable rods to cross truss gates 6 feet (1.8 m) wide or more.

6. Ensure materials are galvanized with no less than 0.8 ounce per square foot (244 g/m^2) of surface. Gates for field fence may be painted with a prime coat and an enamel finish coat.

B. Deer Fence.
Furnish the following, galvanized according to Article 4154.10:

1. Tines molded in one piece of steel with no welds.

2. Structural steel tubes with wall thickness of 0.1875 inches (4.75 mm) and unit weight of 4.32 pounds per foot (6.43 kg/m).

3. Support plates, hinges, and top braces.