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# 12 Right-of-Way Fencing

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## Types

### Farm Field Type Fence

*Posts*

*Diagonal Braces*

*Line Posts*

*Woven Wire Fabric*

*Barbed Wire*

### Chain Link Type Fence

## Gates

## Measurements

## Material Acceptance

# CHAPTER TWELVE:

## ***RIGHT-OF-WAY FENCING***

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Under certain conditions, right-of-way fence is specified on contracts at various locations. For example, right-of-way fences are placed along limited controlled access highways for the purpose of denying access to the highway except at designated locations. The types of fencing, materials, placement procedures, and basis of payment are discussed in this chapter.

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### TYPES

Right-of-way fencing normally consists of six types:

- 1) Farm Field Type Fence (F.F.T.F.)
- 2) Chain Link Type Fence (C.L.T.F.)
- 3) Barbed Wire Type Fence
- 4) Temporary Fence
- 5) Reset Fence
- 6) Gates

F.F.T.F. is the most commonly used and consists of a woven wire fabric. Often known as Farm Fence, F.F.T.F. is used in agricultural or non-residential areas.

C.L.T.F. is used in residential, industrial and commercial areas, or areas with a high concentration of people. For example; C.L.T.F. is used in rest areas around sewage treatment plants and between the rest area and the roadway. C.L.T.F. consists of a woven wire fabric sometimes known as industrial fence.

Barbed wire type fence is not commonly used. This fence consists of two strands of barbed wire on "T" posts. Barbed wire fence is detailed on Standard Sheet **603-FFTF-03**. The posts are placed similar to F.F.T.F. except for post spacing.

Temporary fence is used only on a temporary basis. On portions of a contract where fence is required on the right-of-way, the required permanent fence is erected and maintained at locations where the property owner desires to use the adjacent area for pasture for livestock. If the permanent fence has not been erected by the time the adjacent property owner uses the pasture, a temporary fence is erected and maintained. The temporary fence is required to be sufficient to prevent the livestock from entering the right-of-way. Temporary fence is not paid for unless there is a bid item in the contract. If the temporary fence is a pay item, the fence is measured and paid for by the linear foot.

Resetting fence consists of the removal of an existing fence within the limits of a new improvement, storing the fence, and resetting the fence when and where indicated on the plans. Resetting fence is completed as if the fence were new fence. If the fence is F.F.T.F. then the fence is required to be placed in the same manner as new F.F.T.F. The replacement of damaged or missing parts, including posts, is included in resetting. Reset fence is paid for at the contract unit price per linear foot.

Gates are infrequently used in INDOT work. A right-of-way fence that represents a property line does not often have a gate. Gates are used in internal fences located within the right-of-way. For example, a C.L.T.F. around a rest area sewage treatment plant is an internal fence. Gates are used to give access to such an area so that maintenance activities may be done. Gates of this nature are of the same woven fabric as the fencing that is interrupted.

## **FARM FIELD TYPE FENCE**

There are basically seven individual parts to F.F.T.F. Standard Sheet **603-FFTF-01** details the parts. They are:

- 1) End, Corner, or Pull Posts
- 2) Diagonal Braces
- 3) Line Posts
- 4) Woven Wire Fabric
- 5) Barbed Wire
- 6) Concrete
- 7) Fasteners

## *POSTS*

End, corner, or pull posts are made of galvanized or aluminum coated tubular steel. These tubular steel posts have a diameter of 2 in., a weight of 3.65 lb/ft, and a length of 7 ft. The posts act as an anchoring device for the fence fabric and barbed wire. An end post is the post at the beginning or end of a run of fence. A corner post is a post that is placed at locations in which there is a horizontal change in the property line (R/W). A change of direction with an angle of 10° or more requires a corner post. A pull post is an intermediate post in between an end post and a corner post. Pull posts are required to be placed no farther than 500 ft intervals in straight runs and at each vertical angle point of 10° or more.

Because end, corner, and pull posts are anchoring devices, they are placed in concrete. The concrete may be either Class A or B. The concrete and post are placed in a drilled hole with a diameter of 1 ft and a depth of 36 in. The post is required to extend into the concrete 2 ft 6 in. and be at the required grade and alignment.

All end, corner, and pull posts are fitted with caps to protect the post against moisture.

## *DIAGONAL BRACES*

Diagonal braces are placed at all end, corner, and pull posts. The purpose of the diagonal brace is to keep the posts in alignment. Diagonal braces are made of galvanized tubular steel with a diameter of 1 1/4 in., a weight of 2.27 lb/ft., and a length of 7 ft.

The diagonal brace is fastened to the end, corner, or pull post by the methods detailed on Standard Sheet **603-FFTF-01**. The opposite end is placed in a Class A or Class B concrete anchor. This anchor is approximately 2 ft in length and 1 ft in diameter, and is also detailed on Standard Sheet **603-FFTF-01**.

Care is taken during placement of the concrete anchors for end, corner, pull posts and the diagonal braces. If the concrete is allowed to take a "mushroom" shape, future damage may occur. A mushroom anchor allows the freezing and thawing action of the surrounding soil to lift the post or diagonal brace. Therefore, the upper limits of the concrete are required to not exceed the circumference of the drilled hole. No tension or strain is placed on posts or braces until the concrete has cured 4 days.

## *LINE POSTS*

Line posts in F.F.T.F. are the intermediate posts between end, corner, or pull posts. Their function is to give the fence fabric and barbed wires support and correct the alignment. Line posts may be studded T or U posts.

Line posts are required to be:

- 1) Galvanized
- 2) Have an anchor plate
- 3) Spaced uniform as practicable
- 4) Driven to the required grade and alignment
- 5) Placed at each abrupt change in grade
- 6) Set on 16 ft centers
- 7) Set with a 2 ft spacing tolerance at special locations

Occasionally, special cases arise and the PE/PS may direct other placements. For example, if a tree is located on the right-of-way and is to remain in place, the fence may be set off line enough to miss the tree. Such a case requires a gradual offset for at least three posts in each direction to eliminate sharp bends.

## *WOVEN WIRE FABRIC*

Forty seven inch woven fence fabric for F.F.T.F. is a series of 10 horizontal line wires kept in alignment by vertical stays. Both the line wires and vertical stays are galvanized or aluminum coated No. 9 gauge wire. Two methods of securing the vertical stays are detailed on Standard Sheet **603-FFTF-01**. The methods are "wrapped" and "welded". The wrapped type is the most commonly used.

Placement of the fence fabric has several general factors to consider during the inspection procedure:

- 1) The tension required to stretch the fabric is applied by mechanical fence stretchers.
- 2) All slack is removed before making permanent attachments elsewhere.

- 3) Line wires are fastened to end, corner, or pull posts by wrapping the wires around the post and tying the wire back on the wire with no less than 1 1/2 tightly wrapped twists.
- 4) All splices in the fabric are securely made with the best practice and the recommendations of the manufacturer.
- 5) The fabric is placed on the side of the post facing the pavement.
- 6) The fabric is fastened to intermediate or line posts with at least five wire ties.

### ***BARBED WIRE***

Two strands of barbed wire are used with F.F.T.F. One is placed below the fence fabric and the other is placed above the fence fabric.

Barbed wire is composed of a No. 12 1/2 gauge galvanized or aluminum coated steel wire. The barbs are spaced at approximately 5 in. and are 4 round, 14 gauge barbs. Barbed wire No. 15 1/2 gauge, high tensile strength line wires with No. 16 1/2 gauge barbs may be substituted. The barb points and spacing are the same as No. 12 1/2 barbed wire.

Placement of the barbed wire has several general factors to consider during the inspection procedure as follows:

- 1) The tension required to stretch the wire is applied with single wire stretchers.
- 2) All slack is removed before making permanent attachments elsewhere.
- 3) Line wires are fastened to end, corner, or pull posts by wrapping the wire back on itself with no less than 1 1/2 tightly wrapped twists.
- 4) All splices in the wire are securely made with the best practice and the recommendations of the manufacturer.
- 5) The barbed wire is placed on the side of the post facing the pavement.

- 6) The top barbed wire is placed 2 in. above the fence fabric. The lower barbed wire is placed 1 1/2 in. to 2 in. below the fence fabric or 1 to 1 1/2 in. above the ground line.
- 7) The barbed wires are attached to each line post.

Additional barbed wire may be required at small stream crossings and ground depressions. The space below the fence fabric is required to have barbed wire as shown on Standard Sheet **603-FFTF-03**. If the installation causes collecting drifts in the channel, the barbed wire is not placed. The wires are stretched taut between posts and fastened to the posts such that vertical movement is prevented.

### **CHAIN LINK TYPE FENCE**

There are basically nine individual parts to C.L.T.F. Standard Sheet **603-CLTF-01** details the parts. They are:

- 1) End, corner, and pull posts
- 2) Nominal braces
- 3) Line posts
- 4) Truss rod
- 5) Woven wire fabric
- 6) Stretcher bar
- 7) Tension Wire
- 8) Concrete
- 9) Fasteners

End, corner, and pull posts are the same material as used for F.F.T.F. and are also placed the same as F.F.T.F. Line posts in C.L.T.F. are placed in concrete anchors in the same manner as end, corner, and pull posts. Therefore, they are usually placed at the same time as these posts. The line post is required to be 1 1/4 in. tubular.

Line posts in C.L.T.F. are required to be:

- 1) Galvanized
- 2) Set on 10 ft maximum centers
- 3) Spaced as uniform as practicable
- 4) Placed in concrete class A or B
- 5) Placed at the required grade and alignment
- 6) Placed at each abrupt change in grade
- 7) Fitted with a cap to exclude moisture

The bracing for C.L.T.F. at end, corner, or pull post is different than for F.F.T.F. Bracing includes:

- 1) The first line post
- 2) A 1 1/4 in. nominal brace
- 3) A truss rod
- 4) A turnbuckle with 4 in. of take up
- 5) Necessary fittings

The assembly of C.L.T.F. bracing is detailed on Standard Sheet **603-CLTF-01**. The Technician is required to inspect the bracing to verify correct assembly.

The truss rods, turnbuckles, and fittings are required to be commercial quality steel, malleable iron, or wrought iron that is galvanized.

Tension wire is used at the top and bottom of chain link fence. These wires are required to be No. 7 gage spring coil or crimped steel, zinc or aluminum coated, and have a minimum breaking load of 1950 lb.

The placement procedures for the tension wires include the following requirements:

- 1) Be placed prior to fence fabric
- 2) Be stretched taut by single wire stretchers

- 3) Be secured at the ends in a satisfactory manner
- 4) Be secured to all posts
- 5) Not be placed until the concrete anchors have cured 4 days

The fence fabric used for C.L.T.F. is a series of bent wires woven together. This weaving creates a 2 in. mesh pattern. After the wires are weaved, they are twisted together at the top and bottom. The twisting creates a barbed finish that is called "selvage".

The chain link fence fabric is required to have the following qualities:

- 1) A height of 48 in. (unless otherwise specified)
- 2) Be made of No. 9 gage wire
- 3) Have a woven mesh of 2 in.
- 4) Be galvanized or aluminum coated (coated after weaving) or be aluminum fabric

Placement of the fence fabric has several general factors to consider during the inspection procedure:

- 1) The fabric is attached to the terminal ends with a stretcher bar. This bar is flat and measures 3/16 in. x 3/4 in.. The stretcher bar is threaded through the loops of the fabric and is secured to the posts by means of clamps with bolts and nuts. The number of clamps is indicated on Standard Sheet **603-CLFT-01**.
- 2) The fabric is stretched using mechanical fence stretchers.
- 3) All slack is removed before making permanent attachments elsewhere.
- 4) The fabric is fastened to the line posts with ties or clips. The ties are spaced 12 in. center to center. Therefore, 5 ties are required on 48 in. fabric.
- 5) The fabric is fastened to the tension wires with ties. These ties are made of aluminum wire. Galvanized steel wire ties may be used and are required to be no smaller than No. 12 gage. All ties are spaced 24 in. center to center along the tension wires.

- 6) Fence fabric is placed 3 in. above the ground level and 3 in. below the top of the posts.

## **GATES**

Gates used in fence are detailed on Standard Sheet **603-CLFT-03**. Gates may be single or double swing. Single gates may be as wide as 32 ft and double swing gates may be as wide as 64 ft. The width of the gate opening determines the diameter size of the gate post. Gate post sizes are indicated on a table in Section **910.18(d)**.

The materials required for a gate are as follows:

- 1) Galvanized gate post
- 2) Galvanized 1 1/2 in. nominal gate frame with weld joint, riveted construction, or malleable fittings
- 3) 3/8 in. round truss rod
- 4) Stretcher bar with fittings
- 5) Galvanized standard hinge
- 6) Galvanized standard lock
- 7) Fence fabric

## **MEASUREMENTS**

Fence and resetting fence is measured by the linear foot. Measurement is made along the top of the fence. Measurements begin from the outside of an end post, continue to the outside of another end post, and are made to the nearest 0.5 ft. Measurements are recorded in a systematic method and retained for the final record. The Technician consults with the PE/PS concerning a preferred systematic method.

Gates are paid for as each as set out in the itemized proposal.

## **MATERIAL ACCEPTANCE**

Fencing materials are inspected by INDOT Testing. Once inspections are complete, tags with "seal" numbers are attached to the materials. Rolls of fence fabric, barbed wire, and tension wire are required to have tags on each roll. Groups of individual items may have only one seal number. For example, a bundle of 100 "T" posts has one number. Miscellaneous materials and gates are visually accepted.

The seal numbers indicate that the materials have been tested and are acceptable for use. Damaged material from shipment or placement may not be used or corrected before used. Seal numbers are required to be recorded and given to the PE/PS.