Greenville Utilities Commission

Greenville, North Carolina

Substation Fence Specification

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1.0 Substation Fence Specification

1.1 General

This specification covers the requirements for material and erection of security fencing for substation. The fence shall be installed after site grading is complete and prior to the beginning of foundation or grounding system excavations.

The substation fence shall consist of woven steel fabric on steel posts. It shall be a minimum of 8 ft. (total height fabric with barbed wire) high with line posts no more than 10 ft. apart. More specific requirements are further described under the material (1.2) and Erection (1.3) sections.

The primary components of the fence are:

- a. Fabric
- b. Line Posts
- c. End & Corner Posts
- d. Gate Posts
- e. Top Rail
- f. Barbed Wired
- g. Extension Arms
- h. Stretcher Bars
- i. Post Braces
- j. Tension Wire
- k. Gate Frames
- I. Hardware (Hinges, Latches, Stops, keepers, Ties, Clips, Bands)

1.2 Material

1.2.1 Fabric

The fence fabric shall be a minimum of 7 ft. high. It shall consist of a minimum No. 9 USCG steel wire, woven into a 2 in. square mesh. The minimum breaking strength of wire shall be 1200 lbs. The sides of the mesh pattern shall be approximately 45° to a vertical line. Top and bottom of fabric shall have twisted and barbed finish.

The fabric shall be galvanized in accordance with ASTM A392, Class II.

1.2.2 Line, End, Corner, Pull and Gate Posts

All posts shall be steel and conform to the sizes as listed in the Table for the specific type of application. All posts shall be of continuous length without welds or splices.

Tubular material shall conform to ASTM A53 Grade B.

Line posts and gateposts shall be of sufficient height to; (a) accommodate a 7 ft. fabric; (b) accommodate extension arms, and (c) be embedded 3 ft. (min.) into the concrete footing.

All tubular posts shall be galvanized in accordance with ASTM A120.

Fence Posts For 8ft. Fence

Use	Туре	Minimum Size
Line Posts	Round	OD =2.375"
		T=0.154"
End, Corner, Pull Posts	Round	OD = 2.875"
		T=0.0203"
Gate Posts	Round	OD = 4.0"
		T= 0.226"

1.2.3. Top Rail

Top rails shall be round steel pipe or tubing. The minimum size shall not be less than 1-5/8 in. OD nor have a minimum wall thickness less than .138 in. Lengths should be a minimum of 16 ft. Provisions for adequately joining lengths together and securing to end or corner posts shall be compatible for the physical size of the top rail.

Top rails shall be galvanized in accordance with ASTM A120.

1.2.4 Barbed Wire

Barbed wire shall consist of two strands of 12-1/2 USCG steel wire with 4-point barbs at a maximum spacing of 5 in. apart. The wire shall be

galvanized after weaving in accordance with ASTM A121, Class 3. Barbed wire installation shall include roller type device to maintain tension.

1.2.5 Extension Arms

The extension arms shall extend upward and outward from the fence at an angle of 45 degrees. There shall be provisions for three equally spaced lines of barbed wire on the extended arms. The uppermost wire shall be approximately 1 ft. above the fabric.

The extension arm shall be made of pressed steel or malleable iron and should be capable of supporting a downward force of 300 lbs.

The extension arm shall be galvanized in accordance with ASTM A153, Class B1.

1.2.6 Stretcher Bar

Stretcher bars shall be galvanized steel bars not less than $\frac{1}{4}$ in x $\frac{3}{4}$ in. Bar lengths shall be approximately 1 in. less than the fabric height.

The stretcher bar shall be used for securing the fabric to all terminal posts. One bar is required for each gate and end posts and two required for each corner and pull post.

1.2.7 Post Braces

Post braces are required at each gate, corner, pull and end post. It shall consist of a strut, which shall not be less in size than the top rail, and a tension rod with turnbuckle. The rod shall be steel and have a minimum diameter of 3/8 in.

The strut shall be secured to the adjacent line post at approximately midheight of the fabric. The tension rod is also secured near this area on the line pole and is anchored near the base of the corner post (or gate, pull or end post).

Bracing members shall all be hot-dip galvanized per ASTM 153.

1.2.8 Tension Wire

Tension wire shall not be less than No. 7 USCG galvanized steel wire.

1.2.9 Gate Frames

Gate frames shall be constructed of tubular steel members which shall be welded at the joints. Additional horizontal and vertical struts may be required to provide for a rigid gate panel allowing for no visible sag or twist. Gate frames shall be made to have approximately 3 in. clearance above the final grade.

Fabric for the gate panels shall be the same as the fence.

Gate frame and bracing members shall not be less than the structural equivalent of 1.9 in. OD standard pipe. Steel tension rods and turnbuckles may be utilized. Gate frame shall have provisions for three lines of barbed wire above fabric.

1.2.10 Hardware

Hinges shall be heavy duty and allow 180 degree swing of all gate leaves. The hinges shall not twist or turn under the action of the gate and shall provide ease of operation.

Latches, Stops and Keepers shall all be heavy duty construction of galvanized steel or malleable iron. Latches shall have a heavy duty drop bar. The center stop shall be made to be cast in concrete and engage the drop bar. A keeper shall be provided which will secure the free end of the gate in the open position.

Hardware shall allow for gate operation from either side with provisions for securing with padlock.

Bands, Wire Ties and Clips for securing fabric to top rails, line posts, terminal posts and tension wires shall be galvanized steel and of adequate strength for the purpose intended. Aluminum wire ties of adequate strength are acceptable for this work also.

1.3 Fence Erection

1.3.1 The fabric shall be placed on the outside of the posts, stretched taut and secured to the posts, top rail and tension wire. The fabric shall be secured to the line posts with wire ties or metal bands at maximum intervals of 14 in. The top and bottom edges shall be secured, respectively, to the top rail and tension wire with tie wires not exceeding intervals of 24 in. The fabric shall be secured to terminal posts by means of the stretcher bar which is passed through the end loops of the fabric

and is secured to the terminal posts by metal bands spaced at a maximum interval of 14 in.

- 1.3.2 All fabric for fencing shall either be a left-hand or right-hand weave. Rolls of fabric shall be joined together by weaving a single strand into the end of the roll to form a continuous piece.
- 1.3.3 The spacing of line posts 10 ft. (max.) shall in general be measured parallel to the ground. All posts shall be placed in a vertical position except as may be specifically designated otherwise.
- 1.3.4 The fence Contractor shall coordinate closely with the grading Contractor so that the fence should follow the grade of the site as to leave negligible space between the bottom of the fence and the ground to limit unauthorized entry.
- 1.3.5 All posts shall be set in holes and backfilled with concrete. Concrete shall have a minimum compressive strength of 2500 psi at 28 days with a maximum size of aggregate of 1 in. The concrete shall be well worked (rodded or vibrated) in the hole.
- 1.3.6 The minimum diameter of holes shall be 12 in. for line posts shall be 12 in. for line posts shall be 12 in and 18 in. for terminal posts. The minimum depth of the footing holes shall be 36" inches below the finished surface.
- 1.3.7 All posts shall be coated with epoxy paint equivalent to Bitumastic 300M Coal Tar epoxy at 16 mils or Devchem 253 @ 15 mils. Thickness. The paint shall be applied to all posts from the base to 12" above final grade At approximately 4 feet. The paint can be applied with spray gun, rollers or dipped.