

700 MATERIAL DETAILS

Materials shall conform to the stated requirements and/or the requirements of the referenced specifications including modifications as noted.

Copies of all Supplemental Specifications referenced in this section are on file with the City of Columbus Transportation Division.

710 - FENCE AND GUARDRAIL

710.01 Barbed Wire. ASTM A 121, *Type Z*, Class 3 galvanizing or ASTM A 585, Type I, -, with the following *modifications*:

1. ***Modifications to ASTM A 121, Type Z, Class 3.***

7.1 Barbed wire strand wires shall be No. 12 1/2, 13 1/2, or 15 1/2 steel wire gage. Barbs shall be 4 point round steel wire spaced 5 inches (130 mm) center to center.

6.3.1 The weight of coating for various gages of wire composing the strands and barbs shall be not less than 0.80 ounces per square foot (244 g/m²) of surface.

9.1 One sample, as per Section 9.1, shall be selected from each 50 spools or fraction thereof.

9.2 Sufficient completed barbed wire shall be cut from the end of a spool to provide a sample length of 5 feet (1.5 m).

11 Inspection shall be done at the project site. Random samples shall be obtained from material delivered to the project site or at other locations designated by the Laboratory.

2. ***Modifications to ASTM A 585, Type I.***

12.3 Does not apply.

14 Inspection shall be done at the project site. Random samples shall be obtained from material delivered to the project site or at other locations designated by the Laboratory.

710.02 Woven Steel Wire Fence Type 47. ASTM A 116, *Type Z*, Class 3 galvanizing, with the following *modifications*:

7.1 The fence fabric shall be design number 1047-26.9.

11 Inspection shall be done at the project site. Random samples shall be obtained from material delivered to the project site or at other locations designated by the Laboratory.

Galvanizing. In addition, all hardware and attachments shall be galvanized in accordance with 711.02.

710.03 Chain-Link Fence. AASHTO M 181, with the following *modifications*:

3.1 Posts, gate frames, post branches and top rails shall be Type I or Type III material. Type I shall also conform to the requirements of Table 710.03-1. Type III shall also conform to the requirements of Table 710.03-2.

TABLE 710.03-1

STEEL POSTS, GATE FRAMES, POST BRACES, AND TOP RAILS

| Usage – nominal fence height 6 ft or less | Section Thickness | Outside Diameter or Dimensions (in) | Weight Nominal lb/ft | Tolerance (%) | Minimum Yield Strength (psi) |
|--|----------------------|--|----------------------------|------------------|---------------------------------------|
| Line posts | Grade 1 Pipe | 2.375 | 3.65 | -5 | 25,800 |
| | Grade 2 Pipe | 2.375 | 3.12 | -5 | 50,000 |
| | C-Section | 2.250 × 1.700 | 2.73 | -6 | 45,000 |
| | H-Section | 2.250 × 1.700 | 3.26 | -5 | 45,000 |
| End, corner pull posts | Grade 1 Pipe | 2.875 | 5.79 | -5 | 25,800 |
| | Grade 2 Pipe | 2.880 | 4.64 | -5 | 50,000 |
| | Square | 2.500 | 5.70 | -3 | 40,000 |
| | Roll-form | 3.500 × 3.500 | 5.14 | -6 | 35,000 |
| Gate Posts, for nominal width of gate (single or one leaf of Double): | | | | | |
| Up to 6 ft incl. | Grade 1 Pipe | 2.880 | 5.79 | -5 | 25,800 |
| | Grade 2 Pipe | 2.880 | 4.64 | -5 | 50,000 |
| | Square | 2.500 | 5.70 | -3 | 40,000 |
| | Roll-form | 3.500 × 3.500 | 5.14 | -6 | 35,000 |
| Over 6 to 13 ft incl. | Grade 1 Pipe | 4.000 | 9.11 | -5 | 25,800 |
| | Grade 2 Pipe | 4.000 | 6.56 | -5 | 50,000 |
| | Square | 3.000 | 9.35 | -3 | 40,000 |
| Over 13 to 18 feet incl. | Grade 1 Pipe | 6.630 | 18.97 | -5 | 25,800 |
| Over 18 feet | Round | 8.625 | 24.70 | -5 | 25,800 |
| Gate frames | Grade 1 Pipe | 1.900 | 2.72 | -5 | 25,800 |
| | Grade 2 Pipe | 1.900 | 2.28 | -5 | 50,000 |
| | Square | 2.000 | 2.66 | -3 | 40,000 |
| Top rails, ^[1] post braces | Grade 1 Pipe | 1.660 | 2.27 | -5 | 25,800 |
| | Grade 2 Pipe | 1.660 | 1.84 | -5 | 50,000 |
| | H-Section | 1.500 × 1.310 | 2.25 | -5 | 45,000 |
| | Roll-form | 1.6250 × 1.250 | 1.35 | -6 | 35,000 |
| | Round tubing | 1.660 | 1.38 | -5 | 50,000 |

[1] When tension wire is specified, it shall be of 0.177 in diameter.

TABLE 710.03-1M**STEEL POSTS, GATE FRAMES, POST BRACES, AND TOP RAILS**

| Usage – nominal fence height 1.8 m or less | Section Thickness | Outside Diameter or Dimensions (mm) | Weight Nominal (kg/m) | Minimum Tolerance (%) | Yield Strength (MPa) |
|---|-------------------|-------------------------------------|-----------------------|-----------------------|----------------------|
| Line posts | Grade 1 Pipe | 60 | 5.4 | -5 | 178 |
| | Grade 2 Pipe | 60 | 4.6 | -5 | 348 |
| | C-Section | 57 × 43 | 4.1 | -6 | 310 |
| | H-Section | 57 × 43 | 4.9 | -5 | 310 |
| End, corner pull posts | Grade 1 Pipe | 73 | 8.6 | -5 | 178 |
| | Grade 2 Pipe | 73.00 | 6.9 | -5 | 345 |
| | Square | 64.00 | 8.5 | -3 | 276 |
| | Roll-form | 89 × 89 | 7.6 | -6 | 241 |
| Gate Posts, for nominal width of gate (single or one leaf of Double): | | | | | |
| Up to 1.8 m incl | Grade 1 Pipe | 73.00 | 8.6 | -5 | 178 |
| | Grade 2 Pipe | 73.00 | 6.9 | -5 | 345 |
| | Square | 64.00 | 8.5 | -3 | 276 |
| | Roll-form | 89 × 89 | 7.6 | -6 | 241 |
| Over 1.8 to 4 m incl. | Grade 1 Pipe | 102.00 | 13.6 | -5 | 178 |
| | Grade 2 Pipe | 102.00 | 9.8 | -5 | 345 |
| | Square | 76.00 | 13.9 | -3 | 276 |
| Over 4 to 5.5 m incl. | Grade 1 Pipe | 168.00 | 28.2 | -5 | 178 |
| Over 5.5 m | Round | 219 | 36.8 | -5 | 178 |
| Gate frames | Grade 1 Pipe | 48 | 4.0 | -5 | 178 |
| | Grade 2 Pipe | 48 | 3.4 | -5 | 345 |
| | Square | 51 | 4.0 | -3 | 276 |
| Top rails, ^[1] post braces | Grade 1 Pipe | 42 | 3.4 | -5 | 175 |
| | Grade 2 Pipe | 42 | 2.7 | -5 | 345 |
| | H-Section | 38 × 33 | 3.3 | -5 | 310 |
| | Roll-form | 41 × 32 | 2.0 | -6 | 241 |
| | Round tubing | 42 | 2.1 | -5 | 345 |

[1] When tension wire is specified, it shall be of 4.5 mm diameter.

Top rails shall be furnished in lengths not less than 18 feet (5.5 m).

The fabric shall be fastened to the posts using either aluminum alloy or galvanized steel bands or wires. The wires shall be 0.148 inch (3.7 mm) minimum diameter and the zinc coating on steel fasteners shall not be less than 0.8 ounces per square foot (244 g/m²).

Stretcher bars shall have a 3/16 x 3/4 inch (5x19 mm) cross section or equivalent cross section with length equal to full height of fabric.

Truss rods shall be steel 3/8 inch (9.5 mm) diameter or equivalent cross section and shall have suitable adjustment.

Post tops shall be ornamental caps of steel, malleable iron or cast iron. They shall be provided with a hole suitable for through passage of the top rail. They shall fit snugly to the post, have a means of attaching securely to the post and exclude moisture from tubular posts.

Gates shall be swing type, complete with latches, stops, keepers, hinges, locks, and fabric. They shall be covered with fabric matching the fence. Hinges shall be of adequate strength to support the gate and shall not twist or turn under action of the gate. Latches shall be of the plunger bar type and shall be full gate height located in a manner that will engage the gate stop. Forked latches may be used for single gates less than 10 feet (3 m) wide. Latches shall provide for locking. Stops shall consist of a flush plate with anchor to be placed in concrete to engage the plunger bar of the latch. Other approved types of stops may be used for single gates less than 10 feet (3 m) wide. Keepers shall be substantial devices for securing and supporting the free end of the gate in open position.

Top rail couplings shall be outside sleeve type at least 6 inches (150 mm) long. A minimum of 20 percent of the coupling shall have an internal heavy spring to take up expansion and contraction.

Gate frames shall be assembled by welding using properly designed, formed sheet or sandcast fittings. Gates shall be covered with fabric matching the fence.

Hinges shall be the offset type. Latches, stops, and keepers shall be galvanized malleable iron except plunger bars which may be galvanized tubular or bar steel conforming to 6.2.

Top rails shall be furnished in lengths not less than 18 feet (5.5 m).

Stretcher bars shall be flat bars $\frac{3}{4}$ x $\frac{1}{4}$ inch (19 x 6 mm) section.

Rail couplings shall be self-centering of the outside type 6 inches (150 mm) long.

Tie wire shall be 0.148 inch (3.7 mm) minimum diameter and shall meet and aluminum alloy.

Turnbuckles shall be wrought or cast.

Truss and brace rods shall be $\frac{3}{8}$ inch (9.5 mm) outside diameter or equivalent cross section.

Brace bonds shall be beveled edge bars 1 x $\frac{1}{8}$ inch (25 x 3 mm) section.

Bolts shall have anodic coating at least 0.0002 inch (5 μ m) in thickness, chromate sealed.

11.1. The size of fabric shall conform to 0.148 inch (3.7 mm) nominal diameter of coated wire, 2 inch (50 mm) mesh.

14.1. Table 3. Type I Zinc-Coated Steel Chain Link Fabric shall have Class D weight of coating.

15.5. The vinyl covering shall be uniformly medium green color.

19.1. Inspection shall be done at the project site. Random samples shall be obtained from material delivered to the project site or at other locations designated by the Laboratory.

20.1. Certification. Three certified copies of the chemical and physical properties of each of the aluminum components shall be furnished to the Engineer.

32.2. Does not apply.

32.3.3.2. The minimum weight of interior coating shall be increased to an average of 0.9 ounces per square foot (275 g/m²) and not less than 0.8 ounces per square foot (244 g/m²) on an individual specimen.

**Table 710.03-2
Diameters Of Plain End,
Schedule 40 Aluminum Alloy Pipe**

The weights and dimensions shall be as specified in ANSI H 35.2.

| Material | Nominal Pipe Size in (mm) |
|--|--------------------------------------|
| Brace rails and top rails..... | 1 1/4 (32) |
| Gate frames and rail couplings..... | 1/2 (32) |
| Line posts | 2 (50) |
| End and corner posts | 2 1/2 (63.5) |
| Gate posts)single or one leaf of double: | |
| Gate opening - feet (meters) | |
| to 6 (1.8), incl..... | 2 1/2 (63.5) |
| Over 6 to 12 (1.8 to 3.6), incl..... | 3 1/2 (89) |
| Over 12 to 18 (3.6 to 5.5), incl | 6 (152) |
| Over 18 to 32 (5.5 to 9.75), incl..... | 8 (203) |

710.06 Deep Beam Rail. AASHTO M 180, Type II, Class A, with the following modifications:

5.1. Inspection shall be done at the project site. Random samples shall be obtained from material delivered to the project site or at other locations designated by the Laboratory.

5.2. Acceptance by sampling shall apply.

5.2.1

- (a) In lieu of samples, Certified Test Data covering the mechanical properties may be furnished with each identified heat of guardrail in conjunction with a field check of coating thickness indicating satisfactory coating weights. However, when a field check of coating thickness shows insufficient coating weight the guardrail shall be sampled and tested.
- (b) One piece of rail element, back up plate and end or buffer section may represent the entire lot.

9.1.2. The minimum check limits for both triple and single-spot tests apply.

710.09 Wire Rope Rail. AASHTO M 30, Class A, Type I Rope *with the following modifications:*

9. Inspection shall be done at the project site. Random samples shall be obtained from material delivered to the project site or at other locations designated by the Laboratory.

710.11 Fence Posts and Braces. Wood posts shall be round and conform to the requirements of 710.12 and 710.14. Dimension timber, posts and lumber for braces and stream crossings shall be sound, straight, free from knots, splits and shakes, and shall be treated in accordance with 712.06.

Steel line posts shall conform to ASTM A 702 with the following *modifications:*

5.6.2 Fasteners or clamps shall be 0.120 inch (3 mm) diameter and galvanized in accordance with ASTM A 116, Class 3.

5.6.1 Each post shall be supplied with a sufficient number of fasteners or clamps.

6.2 Post lengths shall be as designated.

7.1 Line posts and anchors shall be galvanized as per 711.02.

7.2 Delete.

9. Sampling shall be as per Section 700.

13. Certification and documentation shall be required.

710.12 Square Sawed, and Round Guardrail Posts. Pressure treated posts shall comply with 710.14 and 712.06. Posts shall be cut from growing timbers and shall be free from unsound or loose knots and rot and from injurious or excessive shake, and season checks that exceed 1/4 inch (6 mm) in width.

Round posts shall be 8 inches (200 mm) plus or minus 1 inch (25 mm) in diameter and have a uniform taper. The sweep shall not exceed 1 inch (25 mm) for the length of the post. Round posts shall be peeled their entire length, removing all outer and inner bark and leather fiber by shaving the surface. Knots shall be trimmed even with the post, and both ends of the post shall be sawed square.

Square sawed posts shall be free from injurious cross grain and sapwood. They may contain a limited number of sound knots that do not exceed two inches (50 mm) in diameter. They shall be free from wane above the ground line. Wane below the ground line shall be limited to two adjacent corners and shall not exceed 1 1/2 inches (38 mm) measured along the wane.

710.14 Pressure Treated Guardrail and Fence Posts, Braces and Blocks. Posts, braces and blocks shall conform to the requirements of AASHTO M 168 and 710.11, 710.12 and 712.06.

Acceptance. Use only structural timber, lumber and piling furnished under certification requirements of ODOT Supplement Specification 1072.

710.15 Steel Guardrail Posts. These posts shall be of the section and length as specified. They shall be of copper bearing steel when so specified. Steel shall conform to ASTM A 36/A 36M. Posts shall be galvanized in accordance with 711.02.

710.16 Guard Posts. *Provide pressure treated wood posts conforming to the requirements of 710.14. Provide posts that are either 5 ´ 6 inch (125 x150 mm) sawed square or 5 1/2 inch ± 1/2 inch (138 mm ± 12.5 mm) diameter round when measured 30 inches (0.75 m) from the top. Provide posts that are 5 feet, 3 inches (1.6 m) in length and are embedded such that 30 inches (0.75 m) remains exposed. Ensure that the center-to-center spacing is spaced at 6 feet (1.8 m) intervals, unless otherwise shown on the plans.*