

Section 907. FENCING MATERIALS

907.01 General Requirements. This specification covers materials for use in fencing property, right-of-way and other installations.

907.02 Testing. Material testing will be done according to applicable AASHTO, ASTM or Department methods as specified.

All designated weights include the weight of the required coating, unless otherwise specified.

Zinc coating at a rate of 1 ounce per square foot of surface area corresponds to a coating thickness of approximately 1.7 mils.

907.03 Woven Wire Fence.

- A. **Fabric.** The fence fabric shall be zinc coated or aluminum coated steel woven wire. Zinc coated steel woven wire shall meet ASTM A 116, Design No. 1047-6-11, Grade 60, Class 1 zinc coating. Aluminum coated steel woven wire shall meet ASTM A 584, Design No. 1047-6-11.
- B. **Barbed Wire.** The barbed wire shall be composed of two strands of wire with 4-point round barbs. Barbed wire shall meet ASTM A 121 for zinc coated steel barbed wire or ASTM A 585, Type I for aluminum coated steel barbed wire with aluminum coated barbs. The following additional requirements for ASTM A 121 barbed wire shall apply:

If the direction of the twisting of the strand wires alternates between left and right, there shall be no significant untwisting of the strand wires under a tensile force 950 pounds for 12½ gage wire, 850 pounds for 13½ gage wire, or 750 pounds for 15½ gage wire.

Barbed wire used with woven wire fence shall be standard grade and the class of coating required for the 3 sizes of zinc-coated steel wire is as follows:

Class 1 for 12½ gage, and Class 3 for 13½ and 15½ gage.

Barbed wire used with chain link fence shall be chain link fence grade.

- C. **Smooth Line Wire.** Line wire shall be No. 9 gage coated steel wire meeting Class 1 zinc-coated wire of ASTM A 116, Grade 60 or aluminum-coated wire meeting ASTM A 584.
- D. **Steel Posts.** All steel fence posts, braces, and fittings shall be galvanized according to ASTM A 123. The weight of the zinc coating, specified as a function of metal thickness in ASTM A 123, is modified as follows:

The weight of zinc coating per square foot of surface on posts and braces shall average not less than 2.00 ounces and no individual specimen shall show less than 1.80 ounces of zinc coating per square foot, regardless of metal thickness. The weights specified below for posts and braces shall include the zinc coating except that any weight of galvanizing over 4.00 ounces per square foot of surface will be deducted from the weight of the post.

An alternate zinc/clear coat system will be allowed for pipe sections only. This alternate coating system includes 0.90 ounces of zinc coating on both the interior and exterior surfaces of the pipe. The zinc coating shall be applied according to ASTM A 123. A clear acrylic coating having a minimum thickness of 0.30 mils shall be applied to the exterior surface after galvanizing.

1. **Line Posts.** The steel for line posts shall meet the physical requirements of ASTM A 702, Type A (hot wrought carbon steel, minimum 0.35 percent carbon) or Type B (hot wrought carbon or hot wrought rail steel). Line posts shall be 7 feet plus or minus 1 inch long and shall have a nominal weight of 1.33 pounds per foot with a minimum weight of 1.28 pounds per foot for any individual post, exclusive of anchor plate. The posts shall be notched, studded, or have other approved provisions for holding the fabric in place on the post and shall be provided with a suitable anchor plate. Each post shall be furnished with not less than seven 11-gage galvanized or aluminum coated wire clamps.
2. **End, Corner, Gate, Intersection, and Intermediate Braced Posts.** The end, corner, gate, intersection and intermediate braced posts and the braces shall be steel angle sections, steel pipe, or steel tubing. Their average weight shall be within 10 percent of the specified weight per foot. Angle sections for posts and braces shall meet the physical requirements of ASTM A 36 or ASTM A 702, Type A or B.

The posts shall be furnished complete with the necessary fittings and braces.

- a. **Posts.** Posts shall have a length of 8 feet plus or minus 1 inch. Angle sections shall be a nominal 2½ by 2½ by ½ inch. Pipe or tubing shall be a nominal 2-inch (2.375 inch O.D.) pipe weighing 3.65 pounds per foot.
- b. **Braces.** Angle section braces shall be nominal 1¾ by 1¾ by ¼ inch (2 by 2 by 3/16 inch O.D.) weighing 2.72 pounds per foot. Steel pipe braces shall be nominal 1½ inch (1.900 inch O.D.) weighing 2.72 pounds per foot. Steel tubing braces shall be nominal 1.750 inch O.D. weighing 3.13 pounds per foot.

The braces shall be of sufficient length to support the posts adequately. Each end or gate post shall be furnished with at least one brace. The corner and intermediate braced posts shall have at least two braces. Intersection posts shall have three braces.

- E. **Wood Posts.** Wood posts shall conform to the requirements for fence posts in subsection 912.08.
- F. **Gates.** Gates shall be of the width and height called for on the plans. The gates shall be furnished complete with approved hinges, latches and auxiliary braces to prevent sagging. All joints shall be welded or otherwise fitted to form a rigid and watertight frame. The fabric used to fill the gate frame shall be woven wire meeting the requirements in subsection 907.03.A.

907.04 Steel Chain Link Fence.

- A. **Fabric.** The fence fabric shall consist of either zinc coated steel fabric meeting ASTM A 392 (Class 2 coating), aluminum coated steel fabric meeting ASTM A 491, or polyvinyl chloride (PVC) coated steel fabric meeting ASTM F 668.

Zinc coated fabric shall be galvanized after weaving. Fabric height shall be as shown on the plans.

PVC coated steel chain link fence shall meet ASTM F 668, Class 2a, except that the steel core wire may be either hot-dipped zinc coated (galvanized) or aluminum coated (aluminized) prior to PVC coating. Both the metallic coating and the PVC coating shall be applied before weaving. The minimum weight of metallic coating shall be as specified by ASTM F 668 for zinc galvanized, or ASTM A 817 for aluminum. The fabric height and PVC color shall be as shown on the plans.

1. **Mesh Size.** The mesh size shall be 2.0 inches or as called for on the plans.
 2. **Wire Size.** Wire size shall be 9 gage zinc coated, 9 gage aluminum coated, or 10 gage aluminum coated.
 3. **Selvage.** Fabric for fences and bridge screening shall be furnished with top and bottom selvages knuckled.
- B. **Tension Wire.** The tension wire for chain link fence shall meet the requirements for steel wire in ASTM A 824, with a Type I aluminum coating (0.40 ounces per square foot of uncoated wire surface), a Type II, Class 3, zinc coating (2.00 ounces per square foot of uncoated wire surface), or shall be hot-dipped with either Type I aluminized, or a Type II, Class 1, galvanized coating followed by a PVC coating. The PVC coating shall meet the requirements for PVC coated steel chain link fence fabric. The color of the PVC coating shall match the color coating of the PVC coated steel chain link fence fabric.
- C. **Posts for Fence and Gates.** The fence posts (line posts and end, corner, angle, and intermediate braced posts) and gate posts shall be metallic coated steel and shall meet the requirements for the shape, size, and nominal weight specified in Tables 907-1 and 907-2, as applicable.

Table 907-1 Posts and Rail for Steel Chain Link Fence

Use	Fabric Height inches	Diameter (a) inches	Nominal Weight lb/ft.	ASTM Specification For Steel (b)
End, Corner, Angle, and Intermediate Braced Posts (c)	120 or Less	2-1/2 (2.875)	5.80	F 1083
		2-1/2 (2.875)	4.64	F 1043
		3-1/2 x 3-1/2 RF Corner (d)	5.10	F 1043
Line Posts	120 or Less	2 (2.375)	3.65	F 1083
		2 (2.375)	3.12	F 1043
		1-7/8 x 1-5/8 H-Section	2.72	F 1043
		2-1/4 x 1-45/64 H-Section	3.26	F 1043
		2-1/4 x 1-5/8 C-Section(c)	2.70	F 1043
	72 or Less	2 (2.375)	2.31	F 1043
		1-7/8 x 1-5/8 C-Section(c)	2.26	F 1043
	60 or Less	1-1/2 (1.900)	2.72	F 1083
Horizontal Rail	N/A	1-1/4 (1.660)	2.27	F 1083
		1-1/4 (1.660)	1.84	F1043

- a. Outside pipe diameter with nominal diameter given first; actual diameter in brackets.
- b. ASTM F 1083 references are for standard weight (Schedule 40) pipe.
- c. Posts for fencing on structures shall be 2½ inches (2.875) nominal outside pipe diameter and shall meet the requirements of either ASTM F 1083 (Schedule 40) or ASTM F 1043 (Group 1C) or as called for on the plans.
- d. RF - Roll-Formed Sections.

Table 907-2 Pipe for Gate Posts and Frames

Use	Gate Width feet	Diameter (a) inches	Nominal Weight lb/ft	ASTM Specification For Steel (b)
Gate Posts	6 or Less	2-1/2 (2.875)	5.80	F 1083
		2-1/2 (2.875)	4.64	F 1043
	7 to 13	3-1/2 (4.000)	9.11	F 1083
		3-1/2 (4.000)	7.65	F 1043
	14 to 18	6 (6.625)	18.97	F 1083
Gate Frames	6 or Less	1-1/4 (1.660)	2.27	F 1083
		1-1/4 (1.660)	1.40	F 1043
	7 to 18	1-1/2 (1.900)	2.72	F 1083
		1-1/2 (1.900)	2.28	F 1043

- a. Outside pipe diameter with nominal diameter given first; actual diameter in brackets.
- b. ASTM F 1083 references are for standard weight (Schedule 40) pipe.

The average weight per foot of post shall be within 10 percent of the specified weight per foot. All posts shall be at least 32 inches longer than the height of the fence fabric.

The steel posts shall be either zinc coated or aluminum coated inside and outside, or PVC coated according to one of the following methods:

1. **Zinc Coating.** Zinc coating shall be applied by the hot dipped process of ASTM A 123 or ASTM A 653. On pipe sections, the weight of zinc coating shall be a minimum average of 1.80 ounces per square foot of surface and a minimum of 1.60 ounces per square foot of surface on a single specimen. An alternate zinc/clear coat system will be allowed for pipe sections only. This alternate coating system shall comply with 907.03.D.

On posts other than pipe section, the weight of zinc coating shall be a minimum average of 2.00 ounces per square foot of surface and a minimum of 1.80 ounces per square foot of surface on a single specimen.

Testing shall be according to ASTM A 90.

2. **Aluminum Coating.** The weight of aluminum coating on posts shall be a minimum average of 0.75 ounces per square foot of surface, and a minimum of 0.70 ounces per square foot of surface on a single specimen, when tested according to ASTM A 428. The aluminum used for coating shall be (commercially pure) Type 2.
3. **Polyvinyl Chloride (PVC) Coating.** The thickness of PVC coating on posts shall be 10 - 14 mils. After metallic coating, exterior surfaces shall be PVC coated using a thermally fused and coated bonding process. The color of the PVC coating shall match the color coating of the PVC coated steel chain link fence fabric.

Fabrication requirements for PVC coated gates shall be as specified in subsection 907.04.D. After metallic coating, exterior surfaces (including hinges, latches, keepers, and stops) shall be PVC coated using a thermally fused and coated bonding process. The thickness of the PVC coating shall be 10 - 14 mils. The color of the PVC coating shall match the coating of the PVC coated steel chain link fence fabric.

The gate frame shall be filled with PVC coated fence fabric meeting the requirements of this specification.

- D. **Gates.** The gates shall be of the width and height called for on the plans. The gate frame shall be constructed of metallic-coated steel pipe meeting the requirements for size and weight specified in Table 907-2. The average weight per foot for the pipe for the gate frames shall be within 10 percent of the specified weight per foot; the specified weight includes the weight of the metallic coating. The type and weight of coating shall be the same as specified for posts.

All joints shall be welded or otherwise fastened to form a rigid and watertight frame. Welded joints shall be thoroughly cleaned by wire brushing and painted with two coats of an approved zinc-rich paint. The gates shall include intermediate braces and truss rods of

sufficient strength to prevent sagging. The gates shall be furnished complete with approved hinges, latches, keepers, and stops. The gate frames shall be filled with fabric meeting the same requirements as specified for the fence fabric.

- E. **Fence Fittings and Hardware.** All post caps, rail or brace ends, tie wires and clips (hog rings), tension and brace bands, tension bars, truss rods, barb arms, and similar hardware, as required, shall meet ASTM F 626 with the following exceptions and additions:

Hog rings for fastening fabric to the tension wire shall have the ends of the wire beveled to permit crimping.

All fittings used with fences and gates shall be malleable iron or pressed steel.

Wire ties and clips may be aluminum-coated, with a minimum coating weight of 0.30 ounces per square foot of surface.

Line post bands for fastening fabric to posts up to 2.375 inches O.D. may be 0.062 by 0.375 inches flat aluminum alloy bands with provision for self locking the ends.

Fabric fasteners for fencing on bridges shall be double-twisted, 9 gage, galvanized steel.

Polyvinyl chloride coated (PVC) fence fittings and hardware shall be as specified above. After metallic coating, exterior surfaces shall be PVC coated using a thermally fused and coated bonding process. The thickness of the PVC coating shall be 10-14 mils. The color of the PVC coating shall match the color of the PVC coated steel chain link fence fabric.

907.05 High-Tensile Wire Fence.

- A. **Wire.** Wire shall be 12½ gage, Grade 200, with Class 3 zinc coating according to ASTM A 854.
- B. **Wood Posts.** Wood posts shall conform to the requirements for fence posts in subsection 912.08, except all species including Northern White Cedar shall be pressure treated.
- C. **Hardware.** Hardware shall be galvanized according to ASTM A 153.

907.06 Protective Fencing. Fabric shall consist of orange-colored high density polyethylene mesh with a nominal 2 inch diamond design. Protective fencing shall be approximately 48 inches high and weigh a minimum of 0.102 pounds per square foot.