



Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework¹

This standard is issued under the fixed designation F 1043; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers the strength and protective coating requirements for industrial steel chain link fence framework. Maximum allowable heights of framework and post spacing are to be based on chain link fence fabric mesh size and gages, and specified wind loads. Post spacings are not to exceed 10 ft. (For additional information, see CLFMI Guide **WLG2445**.)

1.1.1 *Caution Regarding Windload*—If additives to the fence, such as windscreen, inserts, or signage are required, it is advisable to use stronger framework and fittings, to reduce the on-center spacing of posts, or to add back bracing. Factors to consider when determining windload include the type of screening material to be used, area of fence to be covered and local wind conditions.

1.2 Posts and rails may have any cross-sectional shape meeting the requirements herein. The shapes may be formed and welded, cold formed, hot rolled, or extruded.

1.3 The values in inch-pound units are to be regarded as the standard. The values stated in SI units are for information purposes only.

NOTE 1—For aluminum-alloy extruded structural pipe and tube please refer to Specification B 429.

2. Referenced Documents

2.1 ASTM Standards:²

A 90/A 90M Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings

A 123/A 123M Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A 653/A 653M Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

A 875/A 875M Specification for Steel Sheet, Zinc-5 %

Aluminum Alloy-Coated by the Hot-Dip Process

A 1011/A 1011M Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

B 6 Specification for Zinc

B 429/B 429M Specification for Aluminum-Alloy Extruded Structural Pipe and Tube

B 750 Specification for GALFAN (Zinc-5 % Aluminum-Mischmetal) Alloy in Ingot Form for Hot-Dip Coatings

D 1499 Practice for Filtered Open-Flame Carbon-Arc Exposures of Plastics

D 3359 Test Methods for Measuring Adhesion by Tape Test

E 8 Test Methods for Tension Testing of Metallic Materials

E 376 Practice for Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Examination Methods

F 552 Terminology Relating to Chain Link Fencing

F 934 Specification for Colors for Polymer-Coated Chain Link Fence Materials

F 1083 Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures

F 1553 Guide for Specifying Chain Link Fence

G 23 Practice for Operating Light-Exposure Apparatus (Carbon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials (Discontinued 2001)³

G 26 Practice for Operating Light-Exposure Apparatus (Xenon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials (Discontinued 2001)³

2.2 Other Documents:

WLG2445 CLFMI Guide for the Selection of Line Post Spacings⁴

3. Terminology

3.1 Definitions:

3.1.1 *posts*—vertical members of the fence.

3.1.1.1 *Discussion*—End, corner, and pull posts are posts at which chain link fabric terminates. Gateposts are posts to which gates are either attached or latched. Line posts are posts

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Withdrawn.

⁴ Available from Chain Link Fence Manufacturers Institute, 10015 Old Columbia Road, Suite B-215, Columbia, MD 21046, <http://www.chainlinkinfo.org>.

that occur in a line of fence in which the chain link fabric passes and to which it is tied.

- 3.1.2 rails—horizontal members of the fence.
- 3.1.2.1 Discussion—May be top, bottom, intermediate or brace rails.
- 3.1.3 The dimensional terminology is shown in Fig. 1.
- 3.1.4 The relationship of measured dimension (used throughout) to trade and industry usage is shown in Table 1.
- 3.1.5 open sections—non-tubular framework sections (such as H-posts, C-posts, roll-formed top rail, and terminal posts).
- 3.1.6 polymer coatings—examples of some polymer coatings are acrylic urethane, polyurethane, polyvinyl chloride (PVC), polyester, and polyolefin elastomer.
- 3.1.7 See Terminology F 552 for definitions of other terms.

4. Ordering Information

- 4.1 Orders for steel fence framework purchased to this specification shall include the following information:
 - 4.1.1 Number of posts and rails by size and length,
 - 4.1.2 Type of outside and inside coating (Section 7) and class of material,
 - 4.1.3 Color, if applicable, in accordance with Specification F 934,
 - 4.1.4 Material group (IA, IC, IC-L, II, II-L, III, III-L) (Table 2),
 - 4.1.5 Certification, if required, and
 - 4.1.6 Exception(s) to this specification, or special requirements, if any.

NOTE 2—These details may be covered in whole or in any part by accompanying the orders with design drawings and notations thereon.

5. Strength Requirements

5.1 It is the intent of this specification to permit the continuance of historically proved practice in the installation of chain link fence systems, and to provide strength requirements for alternative shapes and materials. Two categories are described. Heavy industrial fence represents the most rigid and

TABLE 1 Pipe Diameter Terminology

Trade Size, in. [mm]	Actual Outside Diameter	
	in.	mm
1½ [33.40]	1.315	33.40
1½ [42.16]	1.660	42.16
1¾ [48.26]	1.900	48.26
2 [60.33]	2.375	60.33
2½ [73.03]	2.875	73.03
3 [88.90]	3.500	88.90
4 [101.60]	4.000	101.60
4½ [114.30]	4.500	114.30
5 [127.00]	5.000	127
5½ [141.30]	5.563	141.3
6 [168.28]	6.625	168.28
8 [219.08]	8.625	219.08

TABLE 2 Definitions of Fence Framework Materials Design

Material	Description of Material
Group IA Round Steel Pipe	Steel pipe shall be produced to conform to Specification F 1083, standard weight (Schedule 40). Weight shall not vary more than 10 % ± from that prescribed.
Group IC/IC-L Round Steel Pipe (Electric Resistance Welded Pipe)	Steel pipe shall be produced in accordance with commercial standards. Minimum yield strength shall be 50 000 psi [344 MPa]. Such products shall include, without seeking to limit to, cold-formed and welded pipe. Weight shall not vary more than 10 % ± from that prescribed.
Group II/II-L Roll-Formed Steel Shapes (C-Sections)	Roll formed steel shapes shall be produced to commercial standards. Minimum yield strength shall be 50 000 psi [344 MPa], and 60 000 psi [413 MPa] for the 3.25 in. × 2.50 in. line post sections. The formed lip shall be of the same thickness as the flat elements and shall project no less than ½ the width of the flat element being stiffened. Group II products shall be designated such that the strong axis is perpendicular to the line of fence. Weight shall not vary more than 10 % ± from that prescribed.
Group III/III-L Hot-Rolled Shapes (H Beams)	Hot-rolled shapes shall meet the specified criteria and exhibit a minimum yield strength of 50 000 psi [344 MPa]. Weight shall not vary more than 10 % ± from that prescribed.
Group IV/IV-L Alternate Design	Any suitable design can be delivered, provided it meets the strength and stiffness criteria of Table 3 (Heavy Industrial) or Table 4 (Light Industrial/Commercial) and the producer has supplied, in a form acceptable to the purchaser, data that demonstrates conformance with the specification. At the producer's option the methods in either Section 6 or 6.4 may be used.

mechanically durable of the commonly installed framework. Light industrial/commercial fence, as provided herein, exhibits approximately 80 % of the load bearing capability of heavy industrial fence. The summary requirements and options for heavy industrial fence are given in Table 3 and those of light industrial/commercial fence in Table 4.

5.2 Historical Practice—Experience has shown that galvanized steel performs satisfactorily as fence posts and rails if furnished to the standard weight (Schedule 40) and nominal sizes listed in Specification F 1083. Therefore, fence posts and rails consisting of standard weight (Schedule 40) galvanized steel in the nominal sizes and weight per foot listed in Specification F 1083 shall be considered in compliance with this specification.

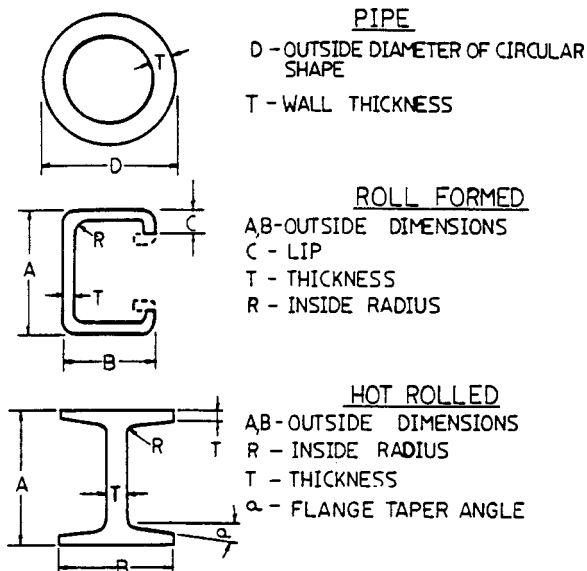


FIG. 1 Definitions of Dimensional Terms

TABLE 3 Summary of Requirements for Heavy Industrial Fence Framework

Description	Pipe		Roll-Formed	Hot-Formed	Performance Criteria for Alternative Products
	IA	IC	II	III	
Material	Steel	Steel	Steel	Steel	IV
Reference Specification	F 1083 Regular Grade 30 000 psi Intermediate Strength Grade 50 000 psi Available in 5.563 in. O.D. and larger High Strength Grade 83 000 psi	A 653/A 653M, A 924/A 924M, A 1011/A 1011M	A 1011/A 1011M Grade 50, Others		The performance criterion for Alternative Products is as stated in: F 1043 Table 2, Group IV/IV-L Alternative Design, 5. Strength Requirements, 6. Strength Calculations, and if requested it is the producers responsibility to provide information for which Group of material this is an Alternative Product. The Alternative Product shall meet or exceed the strength requirements of the referenced Group material.
Minimum Yield Strength, psi [MPa]	30 000 [205] 50 000 [344] For Sizes 5.563 in. O.D. and Larger and 83 000 [572]	50 000 [344] 60 000 [414]	50 000 [344]	50 000 [344]	
Framework	See Fig. 1 for Definitions of Dimensional Terms				
Rail or Braces	D = 1.660 in. [42 mm] T = 0.140 in. [3.6 mm] 2.27 lb/ft [3.38 kg/m]	D = 1.660 in. [42 mm] T = 0.111 in. [2.8 mm] 1.84 lb/ft [2.74 kg/m]	A = 1.625 in. [41.2 mm] B = 1.25 in. [31.7 mm] C = 0.375 in. [9.5 mm] R = 0.1875 in. [4.76 mm] T = 0.80 in. [2.0 mm] 1.35 lb/ft [2.01 kg/m]		
Line Post	D = 1.900 in. [48 mm] T = 0.145 in. [3.7 mm] 2.72 lb/ft [4.05 kg/m]	D = 1.900 in. [48 mm] T = 0.120 in. [3.0 mm] 2.28 lb/ft [3.39 kg/m]	A = 1.875 in. [47.6 mm] B = 1.625 in. [41.2 mm] C = 0.5625 in. [14.3 mm] R = 0.25 in. [6.4 mm] T = 0.121 in. [3.1 mm] 2.40 lb/ft [3.39 kg/m]		
Line or Terminal Post	D = 2.375 in. [60 mm] T = 0.154 in. [3.9 mm] 3.65 lb/ft [5.43 kg/m]	D = 2.375 in. [60 mm] T = 0.130 in. [3.3 mm] 3.12 lb/ft [4.64 kg/m]	A = 2.25 in. [57.2 mm] B = 1.70 in. [43.2 mm] C = 0.75 in. [19.1 mm] R = 0.25 in. [6.4 mm] T = 0.121 in. [3.1 mm] 2.78 lb/ft [4.13 kg/m] (Line Post Only)	A = 2.25 in. [57.2 mm] B = 1.70 in. [43.2 mm] R = 0.25 in. [6.4 mm] a = 10 T = 0.125 in. [3.2 mm] 3.26 lb/ft [4.85 kg/m] (Line Posts Only)	
Line or Terminal Post	D = 2.875 in. [73 mm] T = 0.203 in. [5.2 mm] 5.79 lb/ft [8.62 kg/m]	D = 2.875 in. [73 mm] T = 0.160 in. [4 mm] 4.64 lb/ft [6.90 kg/m]	A = 3.25 in. [82.6 mm] B = 2.50 in. [64.0 mm] C = 1.00 in. [25.4 mm] R = 0.25 in. [6.4 mm] T = 0.130 in. [3.30 mm] 4.50 lb/ft [6.70 kg/m] (60 000 min yield) (Line Post Only)		
Line or Terminal Post	D = 3.5 in. [89.9 mm] T = 0.216 in. [5.49 mm] 7.58 lb/ft [11.3 kg/m]	D = 3.5 in. [89.9 mm] T = 0.160 in. [4.06 mm] 5.71 lb/ft [8.50 kg/m]			
Line or Terminal Post	D = 4.000 in. [102 mm] T = 0.226 in. [5.7 mm] 9.11 lb/ft [13.56 kg/m]	D = 4.000 in. [102 mm] T = 0.160 in. [4.1 mm] 6.56 lb/ft [9.76 kg/m]			

TABLE 3 *Continued*

Description	Pipe		Roll-Formed	Hot-Formed	Performance Criteria for Alternative Products
	IA	IC	II	III	
Material	Steel	Steel	Steel	Steel	IV
Line or Terminal Post	D = 4.50 in. [114.3 mm] T = 0.237 in. [6.02 mm] 10.80 lb/ft [16.1 kg/m]	D = 4.50 in. [114.3 mm] T = 0.220 in. [5.59 mm] 10.07 lb/ft [14.98 kg/m] 60 000 [414]			
Line or Terminal Post		D = 5.0 in. [127.0 mm] T = 0.180 in. [4.57 mm] 9.27 lb/ft [4.20 kg/m] 60 000 [414]			
Line or Terminal Post	D = 5.563 in. [141.3 mm] T = 0.258 in. [6.55 mm] 14.63 lb/ft [21.77 kg/m]				
Line or Terminal Post	D = 6.625 in. [168 mm] T = 0.280 in. [7.11 mm] 18.97 lb/ft [28.3 kg/m]				
Terminal Post	D = 8.625 in. [219.10 mm] T = 0.322 in. [8.18 mm] 28.58 lb/ft [42.50 kg/m]				

A = outside dimension
B = outside dimension
C = lip

D = outside diameter
R = radius at surface (max)
a = flange taper (degree of angle)
T = thickness (wall)

See Fig. 1 for drawings of shapes.

TABLE 4 Summary of Requirements for Light Industrial/Commercial Fence Framework

Description	Pipe	Roll-Formed	Hot-Formed	Performance Criteria for Alternative Products	
	IC-L	II-L	III-L	IV	
Material	Steel	Steel	Steel		
Reference Specification	A 653/A 653M, A 924/A 924M, A 1011/A 1011M	A 1011/A 1011M Grade 50, Others			
Minimum Yield Strength, psi [MPa]	50 000 [344]	50 000 [344]	50 000 [344]		
Framework	See Fig. 1 for Definitions of Dimensional Terms	See Fig. 1 for Definitions of Dimensional Terms	See Fig. 1 for Definitions of Dimensional Terms	Bending Strength Z × Y	Stiffness E × I
Rail or Braces	D = 1.660 in. [42 mm] T = 0.085 in. [2.16 mm] 1.43 lb/ft [2.12 kg/m]	A = 1.625 in. [41.2 mm] B = 1.25 in. [31.7 mm] C = 0.375 in. [9.5 mm] R = 0.1875 in. [4.76 mm] T = 0.080 in. [2.0 mm] 1.35 lb/ft [2.01 kg/m]		7000 lbf-in. [795 N-m]	3 × 10 ⁶ lbf-in. ² [8.6 kPa-m ⁴]
				T _{min} = 0.075 in. [1.9 mm]	

TABLE 4 *Continued*

Description	Pipe	Roll-Formed	Hot-Formed	Performance Criteria for Alternative Products	
Material	IC-L	II-L	III-L	IV	
	Steel	Steel	Steel		
Line Post	D = 1.900 in. [48 mm] T = 0.090 in. [2.3 mm] 1.74 lb/ft [2.59 kg/m]	A = 1.875 in. [47.6 mm] B = 1.625 in. [41.2 mm] C = 0.5625 in. [14.3 mm] R = 0.25 in. [6.4 mm] T = 0.105 in. [2.67 mm] 1.85 lb/ft [2.75 kg/m]		9800 lbf-in. [1106 N-m]	6×10^6 lbf-in. ² [20 kPa-m ⁴]
				$T_{min} = 0.085$ in. [2.15 mm]	
Line or Terminal Post	D = 2.375 in. [60 mm] T = 0.095 in. [2.4 mm] 2.31 lb/ft [3.44 kg/m]	A = 1.875 in. [47.6 mm] B = 1.625 in. [41.2 mm] C = 0.5625 in. [14.3 mm] R = 0.25 in. [6.4 mm] T = 0.121 in. [3.1 mm] 2.40 lb/ft [3.57 kg/m] (Line Post Only)		16 800 lbf-in. [1900 N-m]	10×10^6 lbf-in. ² [46 kPa-m ⁴]
				$T_{min} = 0.090$ in. [2.28 mm]	
Line or Terminal Post	D = 2.875 in. [73 mm] T = 0.110 in. [2.8 mm] 3.25 lb/ft [4.84 kg/m]		A = 2.25 in. [57.2 mm] B = 1.70 in. [43.2 mm] R = 0.25 in. [6.4 mm] a = 10 T = 0.125 in. [3.2 mm] 3.26 lb/ft [4.85 kg/m] (Line Post Only)	31 900 lbf-in. [3606 N-m]	21×10^6 lbf-in. ² [100 kPa-m ⁴]
				$T_{min} = 0.105$ in. [2.66 mm]	
Terminal Post Only	D = 4.000 in. [102 mm] T = 0.160 in. [4.1 mm] 6.56 lb/ft [9.76 kg/m]			71 800 lbf-in. [8114 N-m]	100×10^6 lbf-in. ² [288 kPa-m ⁴]
				$T_{min} = 0.145$ in. [3.7 mm]	
A = outside dimension B = outside dimension C = lip	D = outside diameter R = radius at surface (max) a = flange taper (degree of angle) T = thickness (wall)		See Fig. 1 for drawings of shapes.	Y = yield strength, min Z = section modulus I = moment of inertia E = modulus of elasticity	

5.2.1 Experience has also shown that several additional products performed satisfactorily provided certain additional requirements are met. The nominal dimensions, minimum yield strength (Y), and nominal weight/ft are also listed in **Tables 3 and 4**. These satisfactory designs are classified in accordance with products and special requirements as described in **Table 2**.

6. Strength Calculations

6.1 The strength of a structural member can generally be predicted from established engineering principles. The intent of this section is to provide criteria by which alternate designs can be judged to provide adequate strength without premature failure by local buckling. Accordingly, the criteria of **6.2 and 6.3** shall be satisfied even though, in general, only one will govern a particular design.

6.2 The elastic bending strength equals the yield strength times the section modulus of the entire cross section.

6.2.1 The yield strength may be considered to be either: (1) the minimum specified yield strength for material used to form a part, or (2) the value determined from tension tests performed in accordance with Test Method E 8. The specimen may be cut either from material before forming or from the part after fabrication.

6.3 Accepted engineering practice indicates that the full bending strength of a structure can be realized if the additional dimensional restrictions shown below are satisfied.

6.3.1 For circular shapes the ratio of the diameter to the thickness may not exceed $0.1 E/Y$.

6.3.2 For cross-sectional shapes composed of flat elements, the ratio of width to thickness for elements supported along two parallel edges may not exceed $1.2 (E/Y)^{1/2}$, and ratio of width to thickness for elements supported along one edge may not exceed $0.34 (E/Y)^{1/2}$.

6.3.3 In these formulas, Y is the yield strength of the material and E is the modulus of elasticity of the material. A formed lip shall be considered to provide support only if the radius of gyration of the lip about the mid-thickness of the flat element from which it projects is not less than $1/5$ the width of the flat element. For simple rectangular lips of the same thickness as the flat element, this requirement is satisfied when the projecting distance of the lip is not less than $1/3$ the width of the flat element being stiffened.

6.4 Strength Tests:

6.4.1 At the producer's option, the producer may provide data from appropriate bending tests, to demonstrate compliance with **Table 3** or **Table 4**. The producer shall provide test

data from cantilever tests that have a 6-ft [1.83-m] span from the fixed end to the application of load.

6.4.2 Having once provided evidence of the validity of the designs, the producer’s responsibility shall thereafter be limited to the quality control provisions of Section 9.

7. Coating Requirements

NOTE 3—The order of designation of these coating types is not to be construed as a measure of their effectiveness.

7.1 *External Coatings (See Table 5):*

7.1.1 *Type A*—Zinc, 1.8 oz/ft²[550 g/m²] minimum average in accordance with Specification F 1083 for pipe; roll-formed shapes shall be coated in accordance with Specification A 123/A 123M except with a 2.0 oz/ft²[610 g/m²] minimum average zinc coating; or zinc coated in accordance with Specification A 653/A 653M for roll-formed shapes, including longitudinal (vertical) edges with a 4.0 oz/ft²[1220 g/m²], total both sides.

7.1.2 *Type B*—Zinc with organic overcoat, 0.9 oz/ft² [275 g/m²] minimum zinc coating with a verifiable polymer film.

7.1.3 *Type C*—Zinc-5 % aluminum-mischmetal alloy in accordance with Specification B 750 and a 1.8 oz/ft²[550 g/m²], total both sides, minimum coating in accordance with Specification A 875/A 875M.

7.2 *Internal Coatings (See Table 5):*

7.2.1 *Type A*—Zinc, 1.8 oz/ft²[550 g/m²] minimum average in accordance with Specification F 1083 for pipe; roll-formed shapes shall be coated in accordance with Specification A 123/A 123M except with a 2.0 oz/ft²[610 g/m²] minimum average zinc coating; or zinc coated in accordance with Specification A 653/A 653M for roll-formed shapes, including longitudinal (vertical) edges with a 4.0 oz/ft²[1220 g/m²], total both sides.

7.2.2 *Type B*—Zinc-0.9 oz/ft²[275 g/m²] minimum.

7.2.3 *Type C*—Zinc-5 % aluminum-mischmetal alloy in accordance with Specification B 750, and a 1.8 oz/ft² [550 g/m²], total both sides, minimum coating in accordance with Specification A 875/A 875M.

7.2.4 *Type D*—81 % nominal zinc pigmented coating, 0.3-mils [0.0076-mm] minimum thickness.

7.3 *Optional Supplemental Color Coating*—Polymer coating, PVC or polyolefin elastomer 10-mils [0.254-mm] minimum or polyester 3-mils [0.0076-mm] minimum coating can be specified in conjunction with all metallic coatings and is applied to the exterior surface of tubular shapes, and to the exterior and interior surfaces of roll-formed open-sided shapes. Unless otherwise specified, color of the coating shall be in accordance with Specification F 934.

7.4 *Welded Section*—Zinc-coated framework produced from precoated steel sheet meeting Specification A 653/A 653M shall have exterior weld surface recoated with the same type of material and thickness as the basic coating.

8. Additional Coating Requirements

8.1 *Coating Materials:*

8.1.1 Zinc used for coating shall be any grade of zinc conforming to the requirements of Specification B 6 and shall be applied by the hot-dip method.

8.1.2 Zinc-5 % aluminum-mischmetal alloy coating shall meet the requirements of Specification B 750 and shall be applied by the hot-dip method.

8.1.3 PVC, polyester polymer, or polyolefin elastomer coating shall be of a color conforming to Specification F 934. The PVC, polyester, or polyolefin elastomer coating shall not fade, crack, blister, or split under normal use. It shall have demonstrated the ability to withstand exposure in a weatherometer apparatus for 1000 h without failure when tested with Practice D 1499.

8.1.4 Adhesion shall be tested as follows:

8.1.4.1 *PVC or Polyolefin Elastomer* —At three separate locations, using a sharp blade, cut two parallel lines 1/8-in. [3.2-mm] apart and 1-in. [25.4-mm] long through the coating. At one end of the parallel cut, attempt to pull away the coating from the surface. The coating should break and not peel back in two of the three tests.

8.1.4.2 *Polyester*—Use cross hatch test in accordance with Test Methods D 3359, Method B.

8.1.4.3 One hundred percent adhesion is generally not possible due to variations of the undercoating.

8.1.5 Zinc-pigmented coating shall yield a dry film with a 0.3-mil [0.0076-mm] minimum total thickness.

8.1.6 *Clear Polymeric*—Clear polymeric coatings shall be a clear film applied in a manner assuring good adhesion. The existence of a clear film coating shall be verified by a 15-second contact with a copper sulfate solution (specific gravity 1.186) at three separate locations on a specimen. Copper sulfate will react with zinc to form a black deposit of copper anywhere the zinc is not protected by the clear polymeric coating. The clear exterior coating shall have a demonstrated ability to withstand exposure for 500 h without failure at a black panel temperature of 145°F [63°C] when tested in accordance with Practice D 1499. (See Practice G 26, xenon Type BH apparatus; or Practice G 23, carbon-arc Type HH apparatus).

9. Quality Control Provisions

9.1 *Group IA, IC, and IC-L*—When requested, producers shall furnish, at the time of delivery, the following information for each size ordered:

- 9.1.1 Statement of conformance,
- 9.1.2 Nominal diameter,
- 9.1.3 Minimum weight per foot, and
- 9.1.4 Coating requirements.

9.2 *Group II, II-L, III, and III-L*—When requested, producers shall furnish, at the time of delivery, the following information for each size ordered:

- 9.2.1 Statement of conformance,

TABLE 5 Cross Reference of Industrial Fence Products with Commercially Available Coatings^A

Outside Surface Coatings from 7.1	Inside Surface Coatings from 7.2	Material Description ^B
Type A	Type A	Group IA, II, III, II-L, III-L
Type B	Type B	Group IC, IC-L
Type B	Type D	Group IC, IC-L
Type C	Type C	Group IC, II, IC-L, II-L

^A Any other combination of interior or exterior coatings is not available.

^B Refer to Table 2 for material design definition.

- 9.2.2 Minimum yield strength,
- 9.2.3 Representative yield strength,
- 9.2.4 Minimum weight per foot,
- 9.2.5 Nominal cross-sectional dimensions, and
- 9.2.6 Coating requirements.

9.3 *Group IV (Alternate Designs)*—The producers may elect either of the methods of 9.3.1 or 9.3.2 to provide assurance of conformity with this specification.

9.3.1 *Strength Tests*—The primary criterion, minimum elastic bending strength is measurable in a number of standard tests.

9.3.1.1 Required documents are as follows:

- (1) Statement of conformance,
- (2) Required minimum elastic bending strength,
- (3) Required maximum total deflection,
- (4) Actual elastic bending strength, and
- (5) Actual total deflection.

9.3.2 *Strength Calculation*—Conformance may be demonstrated by calculation.

9.3.2.1 The elastic bending strength is the yield strength (Y) times the section modulus (Z).

9.3.2.2 The buckling criterion of 6.4 shall be satisfied.

9.3.2.3 *Required Documents*—Producers electing to use this section shall provide, at the time of delivery:

- (1) A statement of conformance,
- (2) Minimum yield strength,
- (3) Yield strength,
- (4) Minimum cross section to meet all requirements,
- (5) Actual cross section,
- (6) Corresponding minimum weight per foot, and
- (7) Conformance to coating requirements of Section 7.

9.4 *Inspection*:

9.4.1 *Sampling*—The purchaser may select one sample from each lot. A lot shall consist of the smaller of 500 pieces or all pieces delivered at the same time. This sample will then be tested for any or all attributes specified in this specification.

9.5 *Retest*—In case of failure of the initial test, two additional samples shall be taken and tested, each of which shall conform to the requirements specified. In the event of failure of either test, the entire lot may be rejected.

9.6 The method of determining weight or thickness of coating shall be as follows:

9.6.1 For zinc coated or zinc-5 % aluminum-mischmetal alloy coated, the weight of the coating shall be determined in accordance with Test Method A 90/A 90M.

9.6.2 Specified organic coating thickness, exclusive of the metallic coating, shall be determined in accordance with Practice E 376.

10. Workmanship, Finish and Appearance

10.1 *Posts and Rails*—Finished posts and rails shall show good workmanship and be reasonably free of defects. Coatings shall be uniform and free of voids or excessive roughness.

11. Certification and Reports

11.1 *Posts and Rails*—When specified by the purchaser in the contract or order, a manufacturer's certification that the material was manufactured, sampled, tested, and inspected in accordance with this specification and/or an independent test lab certification that the material has been found to meet the requirements of this specification shall be furnished. When specified in the contract or purchase order, a report of the test results shall be furnished.

12. Keywords

12.1 coatings, protective; fence, chain link; framework, fence; posts, fence; rails, fence; strength, fence posts; strength, fence rails

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