Designation: F 1043 – 0~~0~~3

Standard Specification for Strength and Protective Coatings on ~~Metal~~ Steel Industrial Chain Link Fence Framework[1]

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 ~~metal~~ steel chain link fence framework. Maximum allowable heights of framework ~~up to 12 ft (3.66 m) maximum height with a~~ 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. (~~3~~For additional information, see CLFMI Guide WLG2445).

1.1.1 *Caution Regarding ~~Windscreens~~ Windload*—If ~~wind screens are~~ additives to ~~be installed at~~ the ~~time of fence erection~~ fence, such as windscreen, inserts or ~~at a later time,~~ signage, are required, it is advisable to use stronger framework and ~~parts and closer~~ fittings, to reduce the on-center spacing of posts or to add back bracing. Factors to consider when determining ~~up~~ 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 ~~outlined~~ requirements ~~within.~~ 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:*

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[1] This specification is under the jurisdiction of ASTM Committee F14 on Fences and is the direct responsibility of Subcommittee F14.40 on Chain Link Fence and Wire Accessories.

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A 90/A 90M Test Method for Weight [Mass] of Coating on Iron or Steel Articles with Zinc or Zinc Alloy Coatings[2]
A 123/A 123M Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron or Steel Products[2]
A 653/A 653M Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process[2]
A 875/A 875M Specification for Steel Sheet, Zinc-5 % Aluminum Alloy Metallic-Coated by the Hot-Dip Process[2]
A 1011 Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low Allow with Improved Formability[3]
B 6 Specification for Zinc (Slab Zinc)[4]
B 308/B 308M Specification for Aluminum Alloy 6061 T6 Standard Structural Steel[5]
B 429 Specification for Aluminum-Alloy Extruded Structural Pipe and Tube[4]
B 750 Specification for Zinc-5 % Aluminum-Mischmetal; Alloy in Ingot Form for Hot-Dip Coatings[6]
D 1499 Practice for Filtered Open-Flame Carbon-Arc Exposures of Plastics[7]
D 3359 Test Methods for Measuring Adhesion by Tape Tests[8]
E 8 Test Methods for Tension Testing of Metallic Materials[9]
E 376 Practice for Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Test Methods[10]
F 552 Terminology Relating to Chain Link Fencing[2]
F 934 Specification for Standard Colors for Polymer Coated Chain Link Fence[2]
F 1083 Specification for Pipe, Steel, Hot-Dipped Zinc Coated (Galvanized), Welded, for Fence Structures[2]
F 1553 Guide for Specifying Industrial and Commercial Chain Link Fence[2]
G 23 Practice for Operating Light-Exposure Apparatus (Carbon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials[11]
G 26 Practice for Operating Light-Exposure Apparatus (Xenon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials[12]

2.2 *CLFMI Guide:*
WLG2445 Guide for the Selection of Line Post Spacings[13]

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 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 ~~other~~ 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,

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[2] *Annual Book of ASTM Standards*, Vol 01.06.
[3] *Annual Book of ASTM Standards*, Vol 01.03.
[4] *Annual Book of ASTM Standards*, Vol 02.03.
[5] *Annual Book of ASTM Standards*, Vol 02.04.
[6] *Annual Book of ASTM Standards*, Vol ~~08.01.~~ 02.04.
[7] *Annual Book of ASTM Standards*, Vol 08.01.
[8] *Annual Book of ASTM Standards*, Vol 03.01.
[9] *Annual Book of ASTM Standards*, Vol 03.01.
[10] ~~Discontinued. See *1997 Annual*~~
[10] *Annual Book of ASTM Standards*, Vol ~~14.02. Replaced by Practices G 152 and G 153.~~ 03.03.
[11] Discontinued. See *1997 Annual Book of ASTM Standards* , Vol 14.02. Replaced by Practices G 152 and G 153.
[12] This specification is under the jurisdiction of ASTM Committee F14 on Fences and is the direct responsibility of Subcommittee F14.40 on Chain Link Fence and Wire Accessories.

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[13] Available from Chain Link Fence Manufacturers Institute, 10015 Old Columbia Road, Suite B-215, Columbia, MD 21046; or website http://www.chainlinkinfo.org/.

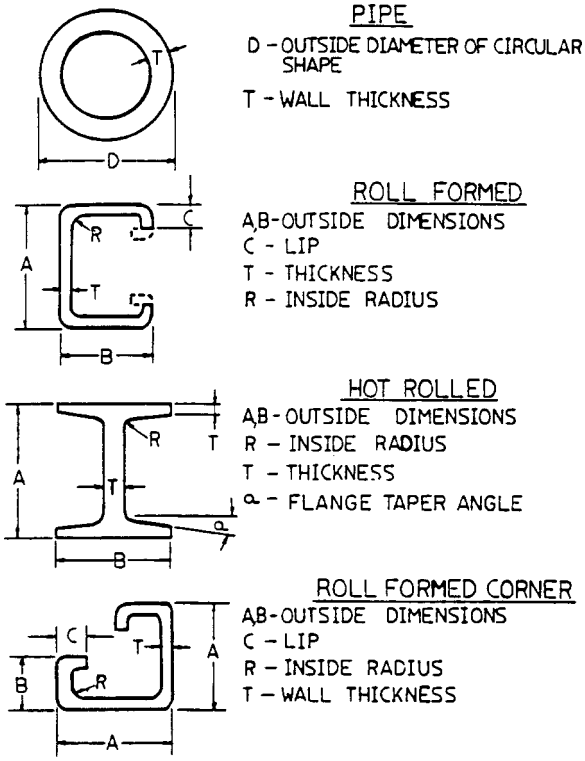

FIG. 1 Definitions of Dimensional Terms

TABLE 1 Size Terminology

Trade Size, in. ~~([mm])~~	Designator, NPS ~~([Metric])~~	Actual Outside Diameter	
		in.	mm
~~1⅜ (34.9)~~	~~1 (25)~~	~~1.315~~	~~33.4~~
1⅜ [34.9]	1 [25]	1.315	33.4
~~1⅝ (41.3)~~	~~1¼ (32)~~	~~1.660~~	~~42.2~~
1⅝ [41.3]	1¼ [32]	1.660	42.2
~~2 (50.8)~~	~~1½ (40)~~	~~1.900~~	~~48.3~~
2 [50.8]	1½ [40]	1.900	48.3
~~2½ (63.5)~~	~~2 (50)~~	~~2.375~~	~~60.3~~
2½ [63.5]	2 [50]	2.375	60.3
~~3 (76.2)~~	~~2½ (65)~~	~~2.875~~	~~73.0~~
3 [76.2]	2½ [65]	2.875	73.0
~~3½ (88.9)~~	~~3 (80)~~	~~3.500~~	~~88.9~~
3½ [88.9]	3 [80]	3.500	88.9
~~4 (101.6)~~	~~3½ (90)~~	~~4.000~~	~~101.6~~
4 [101.6]	3½ [90]	4.000	101.6

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 ~~(round, C, or H)~~ (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 ~~1~~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. ~~I~~ Heavy industrial fence represents the most rigid and 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 Fig. 2 and those of light industrial/commercial fence in Fig. 3.

5.2 *Historical Practice*—~~Considerable past experience~~—Experience has shown that galvanized steel ~~and 6063 T6 aluminum~~

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).
Group IB Aluminum Pipe	Aluminum pipe shall be produced of alloy Aluminum Pipe 6063 and shall conform to Specification B 429.
~~Group IC 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. The minimum weight shall be not less than 90 % of the nominal weight.~~
Group IC 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. The minimum weight shall be not less than 90 % of the nominal weight.
~~Group IIA Roll-Formed Steel Shapes (C-Sections)~~	~~Roll formed steel shapes shall be produced to commercial standards. Minimum yield strength shall be 45 000 psi (310 MPa). The minimum weight shall be not less than 90 % of the nominal weight. The formed lip shall be of the same thickness as the flat elements and shall project no less than ⅓ 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.~~
Group IIA Roll-Formed Steel Shapes (C-Sections)	Roll formed steel shapes shall be produced to commercial standards. Minimum yield strength shall be 45 000 psi [310 MPa]. The minimum weight shall be not less than 90 % of the nominal weight. The formed lip shall be of the same thickness as the flat elements and shall project no less than ⅓ 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.
Group IIB Aluminum Shapes	Aluminum shapes shall be produced of alloy 6061–T6 and shall conform to Specification B 308/B 308M.
~~Group III Hot-Rolled Shapes (H Beams)~~	~~Hot-rolled shapes shall meet the criteria and exhibit a minimum yield strength of 45 000 psi (310 MPa). The minimum weight shall be not less than 90 % of the nominal weight.~~
Group III Hot-Rolled Shapes (H Beams)	Hot-rolled shapes shall meet the criteria and exhibit a minimum yield strength of 45 000 psi [310 MPa]. The minimum weight shall be not less than 90 % of the nominal weight.
Group IV Alternate Design	Any suitable design can be delivered, provided it meets the strength and stiffness criteria of Fig. 2 (Industrial) or Fig. 3 (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.

~~alloy perform~~ performs satisfactorily as fence posts and rails if furnished to the standard weight (Schedule 40) and nominal sizes listed in ~~Specifications F 1083 and B 429 respectively.~~ Specification F 1083. Therefore, fence posts and rails consisting of standard weight (Schedule 40) galvanized steel ~~and 6063 T6 aluminum alloy pipe~~ in the nominal sizes and weight per foot listed in ~~Specifications F 1083 and B 429~~ Specification F 1083 shall be considered in compliance with this specification.

5.2.1 ~~Past e~~Experience has also shown that several additional products ~~also~~ performed satisfactorily provided certain additional requirements are met. The nominal dimensions, minimum yield strength (Y), and nominal weight/ft are also listed in Figs. 2 and 3. These satisfactory designs are classified ~~according to~~ 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

Description	Pipe			Roll-Formed				Hot-Formed				Performance Criteria for Future Products IV	
	IA	IB	IC	II				III					
Material	Steel	Aluminum	Steel	Steel				Steel					
Reference Specification	F 1083	B 429	A 653, A924, A 569	A 570 Grade 45, Others									
Minimum Yield Strenth psi (Mpa)	30,000 (205)	25,000 (170)	50,000 (344)	45,000 (310)				45,000 (310)					
	Structural			A	B	C	R	A	B	R	a	Bending Strength Z x Y	Stiffness E x I
Top Rail	D = 1.660 in. (42 mm)	D = 1.660 in. (42 mm)	D = 1.660 in. (42 mm)	1 1/4	1 5/8	3/8	3/16					7100 lbf-in	3 x 10^6 lbf-in.^{2}
	t = 0.140 in (3.6 mm)	t = 0.140 in (3.6 mm)	t = 0.111 in (2.8 mm)	t = 0.080 in (2.0 mm)								(802 N-m)	(8.6 kPa-m^4)
	2.27 lb/ft (3.38 kg/m)	0.786 lb/ft (1.17 kg/m)	1.82 lb/ft (2.71 kg/m)	1.35 lb/ft (2.01 kg/m)								t_{min} = 0.075in. (1.9 mm)	
Line post	D = 2.375in. (60 mm)	D = 2.375in. (60 mm)	D = 2.375in. (60 mm)	2 1/4	1 5/8	3/4	1/4	2 1/4	1 49/64	1/4	10	19600 lbf-in	16 x 10^6 lbf-in.^{2}
	t = 0.154 in (3.9 mm)	t = 0.154 in (3.9 mm)	t = 0.130 in (3.3 mm)	t = 0.121 in (3.1 mm)				t=0.125 in (3.2 mm)				(2200 N-m)	(46 kPa-m^4)
	3.65 lb/ft (5.43 kg/m)	1.264 lb/ft (1.88 kg/m)	3.12 lb/ft (4.64 kg/m)	2.78 lb/ft (4.13 kg/m)				3.26 lb/ft (4.85 kg/m)				t_{min} = 0.115in. (2.9 mm)	
End corner and pull post	D = 2.875 in. (73 mm)	D = 2.875 in. (73 mm)	D = 2.875 in. (73 mm)	3 1/2	1 1/2	1	3/16					37200 lbf-in	35 x 10^6 lbf-in.^{2}
	t = 0.203 in (5.2 mm)	t = 0.203 in (5.2 mm)	t = 0.160 in (4.1 mm)	t = 0.135 in (3.5 mm)								(4200 N-m)	(100 kPa-m^4)
	5.79 lb/ft (8.62 kg/m)	2.004 lb/ft (2.98 kg/m)	4.64 lb/ft (6.9 kg/m)	5.10 lb/ft (7.6 kg/m)								t_{min} = 0.125in. (3.2 mm)	

A = outside dimension
B = outside dimension
C = lip

D = outside diameter
R = radius at surface (max)
a = flange taper 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

NOTE—Engineering calculations should be used to determine post requirements for fences based on load and installation requirements.

FIG. 2 Summary of Requirements for Industrial Fence

Description	Pipe	Roll-Formed				Hot-Formed				Performance Criteria for Future Products IV	
	IC	II				III					
Material	Steel	Steel				Steel					
Reference Specification	A 653, A924, A 569	A 570 Grade 45, Others								Bending Strength	Stiffness
Minimum yield strength, psi (Mpa)	50,000 (344)	45,000 (310)				45,000 (310)					
		A	B	C	R	A	B	R	a	Z x Y	E x I
Top Rail	D = 1.660 in. (42 mm)	1 1/4	1 5/8	3/8	3/16					7100 lbf-in	3 x 10^6 lbf-in.^{2}
	t = 0.085 in (2.1 mm)	t = 0.080 in (2.0 mm)								(802 N-m)	(8.6 kPa-m^4)
	1.43 lb/ft (2.12 kg/m)	1.35 lb/ft (2.01 kg/m)								t_{min} = 0.075in. (1.9 mm)	
Line post	D = 2.375 in. (60 mm)	1 7/8	1 5/8	5/16	1/8	2 1/4	1 49/64	1/4	10	19600 lbf-in	16 x 10^6 lbf-in.^{2}
	t = 0.095 in (2.4 mm)	t = 0.121 in (3.1 mm)				t = 0.125 in (3.2 mm)				(2200 N-m)	(46 kPa-m^4)
	2.31 lb/ft (3.44 kg/m)	2.40 lb/ft (3.57 kg/m)				3.26 lb/ft (4.85 kg/m)				t_{min} = 0.115in. (2.9 mm)	
End corner and pull post:	D = 2.875 in. (73 mm)	3 1/2	1 1/2	1	3/16					37200 lbf-in	35 x 10^6 lbf-in.^{2}
	t = 0.110 in (2.8 mm)	t = 0.135 in (3.5 mm)								(4200 N-m)	(100 kPa-m^4)
	3.25 lb/ft (4.84 kg/m)	5.10 lb/ft (7.6 kg/m)								t_{min} = 0.125in. (3.2 mm)	

A = outside dimension
B = outside dimension
C = lip

D = outside diameter
R = radius at surface (max)
a = flange taper 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

NOTE—Engineering calculations should be used to determine post requirements for fences based on load and installation requirements.

FIG. 3 Summary of Requirements for Light Industrial/Commercial Fence

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 ⅕ 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 ⅓ 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 Fig. 2 or Fig. 3. 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 ~~2~~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 3)*:

7.1.1 *Type A*—Zinc, 1.8 oz/ft^2 ~~(~~ [550 g/m^2~~)~~] 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/ft^2 ~~(601~~[610 g/m^2~~)~~] minimum average zinc coating; or zinc coated in accordance with Specification A 653/A 653M for roll-formed shapes with a 4.0 oz/ft^2 ~~(~~[1220 g/m^2~~)~~ ~~zinc coated in accordance with Specification A 653/A 653M for roll-formed shapes.~~], total both sides.

7.1.2 *Type B*—Zinc with organic overcoat, 0.9 oz/ft^2 ~~(270~~[275 g/m^2~~)~~] 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/ft^2 ~~(~~[550 g/m^2~~)~~] total both sides, minimum coating in accordance with Specification A 875/A 875M.

7.2 *Internal Coatings (See Table 3)*:

7.2.1 *Type A*—Zinc, 1.8 oz/ft^2 ~~(~~ [550 g/m^2~~)~~] 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/ft^2 ~~(601~~[610 g/m^2~~)~~] minimum average zinc coating; or zinc coated in accordance with Specification A 653/A 653M for roll-formed shapes with a 4.0 oz/ft^2 ~~(~~[1220 g/m^2~~)~~ ~~zinc coated in accordance with Specification A 653/A 653M for roll-formed shapes.~~], total both sides.

7.2.2 *Type B*—Zinc-0.9 oz/ft^2 ~~(270~~ [275 g/m^2~~)~~] minimum.

7.2.3 *Type C*—Zinc-5 % aluminum-mischmetal alloy in accordance with Specification B 750, and a 1.8 oz/ft^2 ~~(~~[550 g/m^2~~)~~], 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*~~—Galvanized~~—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*:

TABLE 3 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
Type B	Type B	Group IC
Type B	Type D	Group IC
Type C	Type C	Group IC, II

[A] Any other combination of interior or exterior coatings is not available.
[B] Refer to Table 2 for material design definition.

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 ⅛-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 ~~vinyl~~ coating from the surface. The ~~PVC~~ 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~~s ([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)~~ [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 ~~IB~~ 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 ~~IC,~~ 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,

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 ~~e~~ insurance of conformity with this specification.

9.3.1 *Strength Tests*—The primary criteria~~a~~on, 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, or both 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—