Designation: F 1043 – 04

Standard Specification for Strength and Protective Coatings on 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 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 for the Selection of Line Post Spacings (WLG2445) . Website address: www.chainlinkinfo.org)

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 or Steel Articles with Zinc or Zinc Alloy Coatings

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

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

A 875/A 875M Specification for Steel Sheet, Zinc-5 % Aluminum Alloy Metallic-Coated by the Hot-Dip Process

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

B 6 Specification for Zinc (Slab Zinc)

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

B 750 Specification for 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 Tests

E 8 Test Methods for Tension Testing of Metallic Materials

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

F 552 Terminology Relating to Chain Link Fencing

F 934 Specification for Standard Colors for Polymer Coated Chain Link Fence

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

F 1553 Guide for Specifying Industrial and Commercial Chain Link Fence

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

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

2.2 *Other Documents:*

WLG2445 CLFMI Guide for the Selection of Line Post Spacings

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

[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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[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.

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.

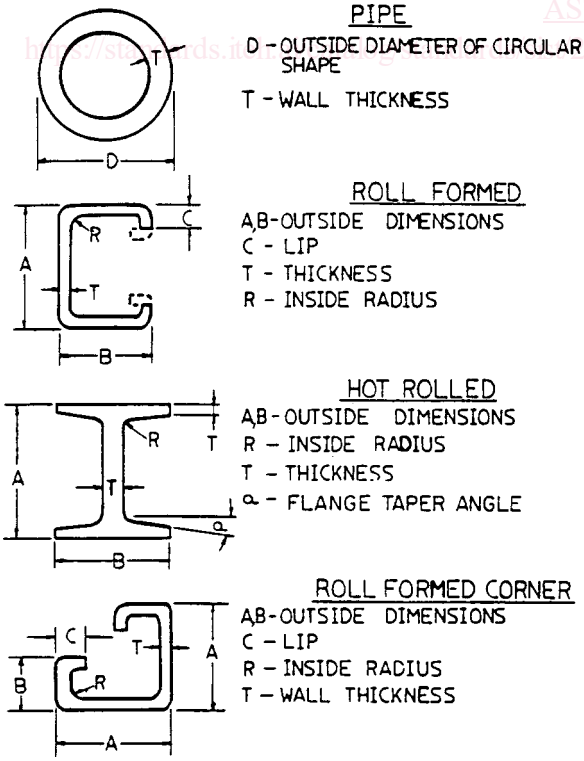

FIG. 1 Definitions of Dimensional Terms

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
1⅝ [41.3]	1¼ [32]	1.660	42.2
2 [50.8]	1½ [40]	1.900	48.3
2½ [63.5]	2 [50]	2.375	60.3
3 [76.2]	2½ [65]	2.875	73.0
3½ [88.9]	3 [80]	3.500	88.9
4 [101.6]	3½ [90]	4.000	101.6

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 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. The minimum weight shall be not less than 90 % of the nominal weight.
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 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 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]. 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 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.

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 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

TABLE 3 Summary of Requirements for Heavy Industrial Fence Framework

Description	Pipe		Roll-Formed	Hot-Formed	Performance Criteria for Future Products	
Material	IA	IC	II	III	IV	
	Steel	Steel	Steel	Steel		
Reference Specification	F 1083	A 653/A 653M, A 924/A 924M, A 1011/A 1011M	A 1011/A 1011M Grade 50, Others			
Minimum Yield Strength, psi [MPa]	30 000 [205]	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 = 0.140 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]		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]	
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]		T_{min} = 0.105 in. [2.65 mm]	
					9800 lbf-in. [1106 N-m]	7×10^6 lbf-in.^{2} [20 kPa-m^4]
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)	16 800 lbf-in. [1900 N-m]	16×10^6 lbf-in.^{2} [46 kPa-m^4]
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)		T_{min} = 0.125 in. [3.2 mm]	
					31 900 lbf-in. [3606 N-m]	35×10^6 lbf-in.^{2} [100 kPa-m^4]
Terminal Post			A = 3.50 in. [88.9 mm] B = 1.50 in. [38.1 mm] C = 1.00 in. [25.4 mm] R = 0.1875 in. [4.76 mm] T = 0.135 in. [3.5 mm] 5.10 lb/ft [7.6 kg/m] (Terminal Post Only)		T_{min} = 0.125 in. [3.2 mm]	
					31 900 lbf-in. [3606 N-m]	35×10^6 lbf-in^2 [100 kPa-m^4]
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 = 4.00 in. [102 mm] T = 0.160 in. [4.1 mm] 6.56 lb/ft [9.76 kg.m]			T_{min} = 0.145 in. [3.7 mm]	
					71 800 lbf-in. [8114 N-m]	100×10^6 lbf-in.^{2} [288 kPa-m^4]
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]				T_{min} = 0.270 in. [6.9 mm]	
					255 000 lbf-in. [28 811 N-m]	800×10^6 lbf-in.^{2} [2300 kPa-m^4]

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

steel in the nominal sizes and weight per foot listed in Specification F 1083 shall be considered in compliance with this specification.

5.2.1 Experience has also shown that several additional products performed satisfactorily provided certain additional requirements are met. The nominal dimensions, minimum