~~Designation:F 1043–06~~ Designation: F 1043 – 08

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

2.2 *Other Documents:*

[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.

Current edition approved ~~Oct.~~Aug. 1, ~~2006.~~2008. Published October ~~2006.~~2008. Originally approved in 1995. Last previous edition approved in ~~2004~~2006 as F 1043 - 0~~4~~6.

[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.

WLG2445 CLFMI Guide for the Selection of Line Post Spacings[3]

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 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 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.

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

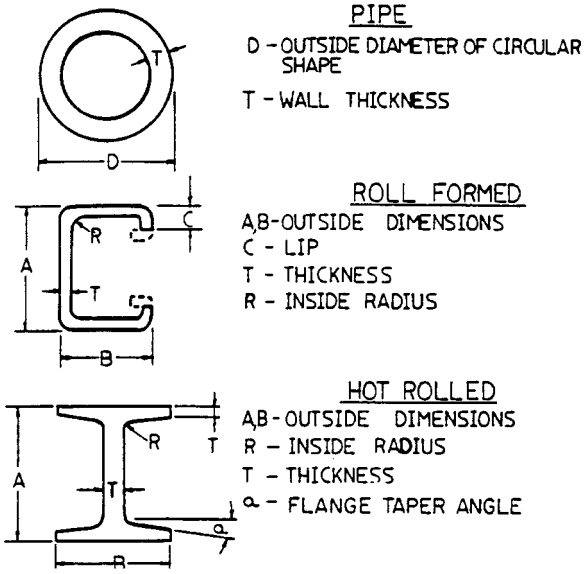

FIG. 1 Definitions of Dimensional Terms

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	33.40
~~1⅝ [41.3]~~	~~1¼ [32]~~	1.660	42.2
1⅝ [41.3]	~~1¼ [32]~~	1.660	42.16
~~2 [50.8]~~	1⅞ [40]	1.900	48.3
~~2 [50.8]~~	1⅞ [40]	1.900	48.26
~~2⅜ [63.5]~~	~~2 [50]~~	2.375	60.3
2⅜ [63.5]	~~2 [50]~~	2.375	60.33
~~3 [76.2]~~	2⅞ [65]	2.875	73.0
~~3 [76.2]~~	2⅞ [65]	2.875	73.03
~~3½ [88.9]~~	~~3 [80]~~	3.500	88.9
3½ [88.9]	~~3 [80]~~	3.500	88.90
~~4 [101.6]~~	~~34.000~~	~~101.60~~	
4 [101.60]	4.000	101.60	
~~4½ [90]~~	~~4.000~~	~~10~~	
4½ [90]	4.500	114.30	
~~1.00]~~	~~5.000~~	~~127~~	
5 [127.00]	5.000	127	
5⁹⁄₁₆ [141.30]	5.563	141.3	
6⅝ [168.28]	6.625	168.28	
8⅝ [219.08]	8.625	219.08	

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 F1083 shall be considered in compliance with this specification.~~ . 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.

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 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. The minimum weight shall be not less than 90 % o f the nominal weight.~~
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 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 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 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. 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]. The minimum weight shall be not less than 90 % o f the nominal weight.~~
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 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.~~
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.

TABLE 3 Summary of Requirements for Heavy Industrial Fence Framework

TABLE 3 *Continued*

Description	Pipe		Roll-Formed	Hot-Formed	Performance Criteria for Alternative Products
Material	IA Steel	IC Steel	II Steel	III 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
Material	IA Steel	IC Steel	II Steel	III 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	
Material	IC-L Steel	II-L Steel	III-L Steel	IV	
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]	