Designation: F1043 – 17a

Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework[1]

This standard is issued under the fixed designation F1043; 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 fence framework. The intended use is for all types of fence, including but not limited to, chain link, expanded metal, wire mesh both welded and woven, PVC and wood. Consult fencing product manufacturer for post spacing requirements. Post spacings for chain link fence 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 stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A90/A90M Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
B6 Specification for Zinc
D1499 Practice for Filtered Open-Flame Carbon-Arc Exposures of Plastics
D3359 Test Methods for Rating Adhesion by Tape Test
E8 Test Methods for Tension Testing of Metallic Materials
E376 Practice for Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Testing Methods
F552 Terminology Relating to Chain Link Fencing
F934 Specification for Colors for Polymer-Coated Chain Link Fence Materials
F1083 Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures
G155 Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

2.2 *Other Documents:*
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 fencing material 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 fencing material passes and to which it is secured.

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 C-posts, and roll-formed top rail).

[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.

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

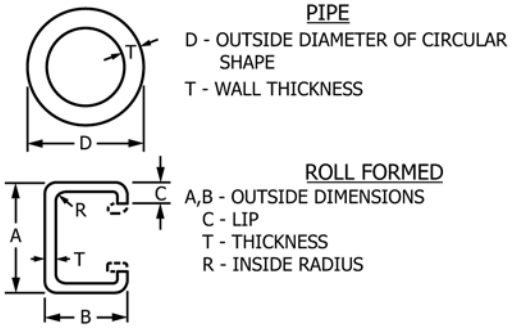

FIG. 1 Definitions of Dimensional Terms

TABLE 1 Pipe Diameter Terminology

Trade Size, in. (mm)	Actual Outside Diameter	
	in.	mm
1⅜ (33.40)	1.315	33.40
1⅝ (42.16)	1.660	42.16
1⅞ (48.26)	1.900	48.26
2⅜ (60.33)	2.375	60.33
2⅞ (73.03)	2.875	73.03
3½ (88.90)	3.500	88.90
4 (101.60)	4.000	101.60
4½ (114.30)	4.500	114.30
5⁹⁄₁₆ (141.30)	5.563	141.3
6⅝ (168.28)	6.625	168.28
8⅝ (219.08)	8.625	219.08

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 F552 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 F934,

4.1.4 Material group (IA, IC, II, II-L, IV, IV-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—These details may be covered in whole or in any part by accompanying the orders with design drawings and notations thereon.

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 F1083, standard weight (Schedule 40). Weight shall not vary more than 10 % ± from that prescribed.
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. 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 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 IV/IV-L Alternate Design	Any suitable design can be delivered, provided it meets the strength and stiffness criteria of (Heavy Industrial) or (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 proven practice in the installation of 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 80 % of the load bearing capability of heavy industrial fence. The summary requirements and options for Heavy Industrial fence and those of Light Industrial/Commercial Fence are given in Table 3.

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, Regular Grade, 30,000 psi) and nominal sizes listed in Specification F1083. Therefore, the minimum performance criteria is based on the historical strength of Specification F1083 Schedule 40, Regular Grade, 30,000 psi minimum yield.

TABLE 3 Summary of Requirements for Heavy Industrial and Light Industrial/Commercial Fence Framework

TABLE 3 Group IA—Summary of Requirements for Hot Dipped, Welded Schedule 40 Regular Grade and High Strength Grade Heavy Industrial Steel Pipe—Hot Dipped

Reference Specifications	Steel F1083			Regular Grade	High Strength Grade
Framework Size O.D.	Uses	Wall Thickness	Weight	Minimum Yield	Minimum Yield
1.660 in. (42 mm)	Rail and Braces	0.140 in. (3.6 mm)	2.27 lb/ft (3.4 kg/m)	30000 psi (205 Mpa)	50000 psi (344 Mpa)
1.900 in. (48 mm)	Line Post	0.145 in. (3.7 mm)	2.72 lb/ft (4 kg/m)	30000 psi (205 Mpa)	50000 psi (344 Mpa)
2.375 in. (60 mm)	Line Post and Terminal	0.154 in. (3.9 mm)	3.65 lb/ft (5.4kg/m)	30000 psi (205 Mpa)	50000 psi (344 Mpa)
2.875 in. (73 mm)	Line Post and Terminal	0.203 in. (5.2 mm)	5.80 lb/ft (8.6 kg/m)	30000 psi (205 Mpa)	50000 psi (344 Mpa)
3.500 in. (89.9 mm)	Line Post and Terminal	0.216 in. (5.49 mm)	7.58 lb/ft (11.3 kg/m)	30000 psi (205 Mpa)	50000 psi (344 Mpa)
4.000 in. (102 mm)	Line Post and Terminal	0.226 in. (5.7 mm)	9.12 lb/ft (13.6 kg/m)	30000 psi (205 Mpa)	Not Available
4.500 in. (114.3 mm)	Line Post and Terminal	0.237 in. (6.02 mm)	10.8 lb/ft (16.1 kg/m)	30000 psi (205 Mpa)	50000 psi (344 Mpa)
5.563 in. (141.3 mm)	Line Post and Terminal	0.258 in. (6.55 mm)	14.63 lb/ft (21.77 kg/m)	30000 psi (205 Mpa)	50000 psi (344 Mpa)
6.625 in. (168 mm)	Line Post and Terminal	0.280 in. (7.11 mm)	18.99 lb/ft (28.3 kg/m)	30000 psi (205 Mpa)	50000 psi (344 Mpa)
8.625 in. (219.10 mm)	Terminal	0.322 in. (8.18 mm)	28.58 lb/ft (42.5 kg/m)	30000 psi (205 Mpa)	50000 psi (344 Mpa)

Note: Group IA material is available in two yield strengths:
IA-1. Regular Grade—Minimum yield strength shall be 30 000 psi (205 Mpa)
IA-2. High Strength Grade—Minimum yield strength shall be 50 000 psi (344 MPa).

Group IA Hot-Dipped Protective Zinc Coating:

1.1 Zinc for coating shall be Special High Grade per ASTM B6.
1.2 O.D. 1.8 oz/ft^2 (550 g/m^2) minimum average in accordance with Specifications F1083.
1.3 I.D. 1.8 oz/ft^2 (550 g/m^2) minimum average in accordance with Specifications F1083.
1.4 If so specified O.D. 2.0 oz/ft^2 610 g/m^2) minimum average.
1.5 If so specified I.D. 2.0 oz/ft^2 610 g/m^2) minimum average.

TABLE 3 Group IC Summary of Requirements Galvanized High Strength Material Heavy Industrial Steel Pipe—Galvanized

Reference Specifications	Steel--Galvnized Before Forming A653/A653M and A924/924M Steel--Galvanized After Forming A1011/1011M			
Framework Size O.D.	Uses	Wall Thickness	Weight	Minimum Yield (psi)
1.660 in. (42 mm)	Rail and Braces	0.111 in. (2.8 mm)	1.84 lb/ft (2.74 kg/m)	50 000 psi (344 MPa)
1.900 in. (48 mm)	Line Post	0.120 in. (3 mm)	2.28 lb/ft 3.39 kg/m)	50 000 psi (344 MPa)
2.375 in. (60 mm)	Line Post and Terminal	0.130 in. (3.3 mm)	3.12 lb/ft (4.64 kg/m)	50000 psi (344 MPa)
2.875 in. (73 mm)	Line Post and Terminal	0.160 in. (4 mm)	4.64 lb/ft (6.90 kg/m)	50 000 psi (344 MPa)
3.500 in. (89.9 mm)	Line Post and Terminal	0.160 in. (4.06 mm)	5.71 lb/ft (8.50 kg/m)	50 000 psi (344 MPa)
4.000 in. (102 mm)	Line Post and Terminal	0.160 in. (4.1 mm)	6.56 lb/ft (9.76 kg/m)	50 000 psi (344 MPa)

Group IC products are available in two types of coatings.

1. Group IC Galvanized Before Forming

1.1 Zinc for exterior coating shall be Special High Grade per ASTM B6.
1.2 O.D. zinc weight to be a minimum of 0.9 oz/ft^2 (275 g/m^2) with a verifiable verifiable polymer overcoat.
1.3 I.D. zinc weight to be a minimum of 0.9 oz/ft^2 (275 g/m^2).
1.4 Framework produced from galvanized steel sheet meeting Specification A653/A653M shall have exterior welded surface recoated with the same type of material and thickness of base coating.

2. Group IC Galvanized After Forming

3.1 Zinc for exterior coating shall be Special High Grade per ASTM B6.
3.2 O.D. zinc weight to be a minimum of .9 oz/ft^2 (275 g/m^2) with a verifiable polymer overcoat.
3.3 I.D. coating to be 81 % nominal zinc pigmented coating, 0.3 mils (0.0076 mm) minimum coverage.

TABLE 3 Group II Summary of Requirements for Hot Dipped Roll-Formed Material Heavy Industrial Roll-Formed, Galvanized

Reference Specifications	Steel—A1011/A1011M Grade 50 Others			
Framework Dimensions	Uses	T	Weight	Minimum Yield (psi)
A=1.625 in. (41.2 mm) B=1.25 in. (31.7 mm) C=0.375 in. (9.5 mm) R=.01875 in. (4.76 mm)	Rail and Braces	0.080 in. (2.0 mm)	1.35 lb/ft (2.01 kg/m)	50 000 psi (344 MPa)
A=1.875 in. (47.6 mm) B=1.625 in. (41.2 mm) C=0.5625 in. (14.3 mm) R=.25 in. (6.4 mm)	Line Post	0.121 in. (3 mm)	2.40 lb/ft (3.39 kg/m)	50 000 psi (344 MPa)
A=2.25 in. (57.2 mm) B=1.70 in. (43.2 mm) C=0.75 in. (19.1 mm) R=.25 in. (6.4 mm)	Line Post	0.121 in. (3 mm)	2.78 lb/ft (4.13 kg/m)	50 000 psi (344 MPa)
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)	Line Post	0.130 in. (3.3 mm)	4.50 lb/ft (6.70 kg/m)	60 000 psi (413 MPa)
See Figure 1. for Definition of Dimensional Terms: A, B, C, R, T				

TABLE 3 Group II-L Summary of Requirements for Hot Dipped Roll-Formed Material Light Industrial

Reference Specifications		Steel—A1011/A1011M Grade 50 Others		
Framework Dimensions	Uses	T	Weight	Minimum Yield (psi)
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)	Rails and Braces	0.80 in. (2.0 mm)	1.35 lb/ft (2.01 kg/m)	50 000 psi (344 MPa)
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)	Line Post	0.105 in. (2.67 mm)	1.85 lb/ft (2.75 kg/m)	50 000 psi (344 MPa)
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)	Line Post	0.121 in. (3.1 mm)	2.40 lb/ft (3.57 kg/m)	50 000 psi (344 MPa)
See Figure 1. for Definition of Dimensional Terms: A, B, C, R, T				

1. Group II and II-L Roll-Formed Protective Zinc Coating

A

1.1 II and II-L Coating Zinc 2.00 oz/ft^2 (610 g/m^2) minimum average coating in accordance with Specification A123/A123M; or zinc coated in accordance with Specification A653/A653M for roll-formed shapes, including longitudinal (vertical) edges with a 4.0 oz/ft^2 (1220 g/m^2), total both sides.

Description

The performance criterion for Alternative Products is stated in: F1043, Table 2 Group IV/IV_L Alternative Design.

Performance Criteria for Alternative Products

5. Strength Requirements
6. Strength calculations

If requested it is the producers responsibility to provide information for which Group of material this is an alternative product. The alternative product shall me et or exceed the s trength and coating requirements of the referenced Group material.

TABLE 3A Guidelines for Selection of Line Post Size and Spacing for Heavy Industrial Fence

NOTE 1—Advancements have been made to more accurately calculate and define wind load on fences. The American Society of Civil Engineers ASCE/SEI 7-10 Minimum Design Loads for Buildings and Structures is the foundation of The Chain Link Fence Institute's document Chain Link Fence Wind Load Guide for the Selection of Line Post Spacing, WLG 2445, if needed consult guide to calculate post size. More fences are being designed to withstand higher wind load forces. ASCE/SEI 7-10 states that all of the U.S. inland areas can be subjected to 105 MPH wind gusts and many coastal areas up to 170 MPH. The minimum line post size required to achieve setting at 10 ft. 0 in. on center in this table is based on a fence having 2-in. mesh, 9 gauge fabric, 105 MPH wind gust, Category B, no icing. Fences subjected to higher wind gusts, fences over 16 ft. 0 in. and for fences designed with smaller steel mesh configurations having a greater percentage of closure, and for solid fences containing wind screens or privacy inserts consult the Chain Link Fence Manufacturers Institute Guide for the Selection of Line Post and Line Post Spacing WLG2445. The maximum standard post spacing, 10 ft, 0 in. on-center, can be reduced to comply with the structural design.

Fence Fabric Height	Group IA[A] ASTM F 1083 Sch. 40 Pipe	Group IC Elec. Resistance Welded Pipe	Group II Rolled Formed C-Section
	Min	Min	Min
up to 6 ft, 0 in.	1.900 in.	1.900 in.	1.875 by 1.625 in.
over 6 ft, 0 in., up to 8 ft, 0 in.	2.375 in.	2.375 in.	1.875 by 1.625 in.
over 8 ft, 0 in., up to 10 ft, 0 in.	2.875 in.	2.875 in.	2.250 by 1.700 in.
over 10 ft, 0 in., up to 12 ft, 0 in.	3.500 in.	2.875 in.	3.250 by 2.500 in.
over 12 ft, 0 in., up to 14 ft, 0 in.	3.500 in.	3.500 in.	N/A[B]
over 14 ft, 0 in., up to 16 ft, 0 in.[C]	4.000 in.	4.000 in.	N/A

[A] Regular grade, 30,000 psi steel yield pipe. F1083 High Strength Grade 50 000 psi steel yield pipe, not listed.
[B] N/A = Larger post not available than maximum size previously listed.
[C] For heights over 20 ft, contact licensed professional engineer.

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 Table 3. 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 E8. 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 Table 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

7.1 Coating requirements are listed in the material description of Group in Table 3.

8. Additional Coating Requirements

8.1 *Coating Materials:* Zinc used for coating shall be Special High Grade conforming to the requirements of Specification B6 and shall be applied by the hot-dip method.

8.1.1 PVC, polyester polymer, or polyolefin elastomer coating shall be of a color conforming to Specification F934. 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 D1499.

8.1.2 Adhesion shall be tested as follows:

8.1.2.1 *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, with a knife peal back a section of the coating between ⅛ in. (3.2 mm) and ¼ in. (6.4 mm) to form a tab. Using the tab attempt to pull away the coating from the surface. The coating should break and not peal back in two of the three tests. If unable to cut a tab due to the adhesion the product is considered to have passed the adhesion test.

8.1.2.2 *Polyester*—Use cross hatch test in accordance with Test Methods D3359, Method B, 95 % minimum coating adhesion.

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

8.1.3 Zinc-pigmented coating shall yield a dry film with a 0.3-mil (0.0076-mm) minimum total thickness.

8.1.4 *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 D1499. (See Practice G155).

8.2 *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 F934.

9. Quality Control Provisions

9.1 *Group IA, IC, IV, and IV-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 Outside diameter,

9.1.3 Minimum weight per foot,

9.1.4 Coating requirements,

9.1.5 Minimum yield strength,

9.1.6 Bending moment, and

9.1.7 Section modulus.

9.2 *Group II, II-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 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, the weight of the coating shall be determined in accordance with Test Method A90/A90M.

9.6.2 Specified organic coating thickness, exclusive of the metallic coating, shall be determined in accordance with Practice E376.

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