

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 Fig. 2 and those of light industrial/commercial fence in Fig. 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) 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.

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 Figs. 2 and 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 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)<sup>1/2</sup>, and ratio of width to thickness for elements supported along one edge may not exceed 0.34 (E/Y)<sup>1/2</sup>.

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 1/3 the width of the flat element. For simple rectangular lips of the same thickness as the flat element, this requirement is satisfied when

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 Strength psi (Mpa)	30,000 (205)	25,000 (170)	50,000 (344)	45,000 (310)				45,000 (310)					
Structural												Bending Strength	Stiffness
				A	B	C	R	A	B	R	a	Z x Y	E x I
Top Rail	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 = 0.140 in. (3.6 mm) 0.786 lb/ft (1.17 kg/m)	D = 1.660 in. (42 mm) t = 0.111 in. (2.8 mm) 1.82 lb/ft (2.71 kg/m)	1 1/4	1 3/8	3/4	3/16	t = 0.080 in. (2.0 mm) 1.35 lb/ft (2.01 kg/m)				7100 lbf-in (802 N-m)	3 x 10 <sup>6</sup> lbf-in. <sup>2</sup> (8.6 kPa-m <sup>4</sup> )
Line 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 = 0.154 in. (3.9 mm) 1.264 lb/ft (1.88 kg/m)	D = 2.375 in. (60 mm) t = 0.130 in. (3.3 mm) 3.12 lb/ft (4.64 kg/m)	2 1/4	1 3/8	3/4	1/4	2 1/4	1 3/8	1 3/8	10	19600 lbf-in (2200 N-m)	16 x 10 <sup>6</sup> lbf-in. <sup>2</sup> (46 kPa-m <sup>4</sup> )
End corner and pull 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 = 0.203 in. (5.2 mm) 2.004 lb/ft (2.98 kg/m)	D = 2.875 in. (73 mm) t = 0.160 in. (4.1 mm) 4.64 lb/ft (6.9 kg/m)	3 1/2	1 1/2	1	3/16	t = 0.135 in. (3.5 mm) 5.10 lb/ft (7.6 kg/m)				37200 lbf-in (4200 N-m)	35 x 10 <sup>6</sup> lbf-in. <sup>2</sup> (100 kPa-m <sup>4</sup> )

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