



Designation: A 886/A 886M – 99

Standard Specification for Steel Strand, Indented, Seven-Wire Stress-Relieved for Prestressed Concrete¹

This standard is issued under the fixed designation A 886/A 886M; 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 seven-wire uncoated, indented, stress-relieved steel strand for use in pretensioned prestressed concrete construction. Grade 250I and Grade 270I have minimum ultimate strengths of 250 ksi [1725 MPa] and 270 ksi [1860 MPa], respectively, based on the nominal area of the strand.

1.2 Supplement I describes low-relaxation strand and relaxation testing for that product. Low-relaxation strand shall be furnished when specifically ordered and furnished in place of stress-relieved strand if mutually agreed to by the purchaser and supplier.

1.3 This specification is applicable for orders in either inch-pound units (as Specification A 886) or in SI units (as Specification A 886M).

1.4 The values stated in either inch-pound units or SI units are to be regarded separately as standards. Within the text, the inch-pound units are shown in parentheses. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other. Combining values from the two systems may result in nonconformance with the specification.

2. Referenced Documents

2.1 ASTM Standards:

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products²

E 328 Methods for Stress Relaxation Tests for Materials and Structures³

2.2 U.S. Military Standards:

MIL-STD-129 Marking for Shipment and Storage⁴

MIL-STD-163 Steel Mill Products Preparation for Shipment and Storage⁴

¹ This specification is under the jurisdiction of ASTM Committee A-1 on Steel, Stainless Steel, and Related Alloys and is the direct responsibility of Subcommittee A01.05 on Steel Reinforcement.

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² Annual Book of ASTM Standards, Vol 01.03.

³ Annual Book of ASTM Standards, Vol 03.01.

⁴ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

2.3 U.S. Federal Standards:

Fed. Std. No. 123 Marking for Shipments (Civil Agencies)⁴

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *strand, n*—all strand shall be of the seven-wire type having a center wire enclosed tightly by six helically placed outer wires with uniform pitch of not less than 12 and not more than 16 times the nominal diameter of the strand.

4. Ordering Information

4.1 Orders for seven-wire stress-relieved strand under this specification should include the following information:

4.1.1 Quantity (meters [feet]),

4.1.2 Diameter of strand (millimeters [inches]),

4.1.3 Grade of strand,

4.1.4 Packaging,

4.1.5 ASTM designation and year of issue, and

4.1.6 Special requirements, if any.

NOTE 1—A typical ordering description is as follows: 25 600 m (84 000 ft) 12.70-mm (0.5-in.), Grade 1860I (2701) strand, in 3658-m (12 000-ft) spoolless packs to ASTM A 886/A 886M—_____.

5. Materials and Manufacture

5.1 *Base Metal*—The base metal shall be carbon steel of such quality that when it is drawn to wire, subjected to the indentation process, fabricated into strand, and then stress-relieved, it shall have the properties and characteristics prescribed in this specification.

5.2 *Wire*—The wire from which the strand is to be fabricated shall have a common dry-drawn finish.

NOTE 2—This product is a composite of seven wires and is produced to mechanical properties only, the chemistry of all wires or any individual wire is not pertinent to this application, and heat identity is not necessarily maintained. It is possible that wire from more than one heat may be used in the manufacture of a reel or pack. Traceability is based on pack identity as maintained and reported by the manufacturer.

5.3 *Indentations*—The outer wires shall have indentations designed to reduce longitudinal movement of the strand within the concrete, and conform to the provisions in Section 7. The

surface of the outer wires shall be suitably deformed mechanically by rolling to produce a series of indentations. Indentations shall be in two or more lines spaced uniformly around the wire. Indentations in adjacent lines shall be staggered throughout the length of the wire. At least 90 % of the indentations in any 0.6 m (2 ft) length of strand shall meet the pitch and shape requirements of Table 1. The center wire need not be indented.

5.4 *Stress-Relieving*—After stranding, all strand shall be subjected to a stress-relieving continuous heat treatment to produce the prescribed mechanical properties. Temper colors which result from the stress-relieving operation are considered normal for the finished appearance of this strand.

6. Mechanical Property Requirements

6.1 Methods of testing for mechanical properties are described in Supplement VII of Methods and Definitions A 370.

6.2 *Breaking Strength*—The breaking strength of the finished strand shall conform to the requirements prescribed in Table 2.

6.3 *Yield Strength*—Yield strength in kN (lb) is measured 1 % extension under load. The load at this extension shall be recorded as yield strength and shall meet the requirements prescribed in Table 3.

6.3.1 The extension under load shall be measured by an extensometer calibrated with the smallest division not larger than 0.0001 mm/mm (0.001 in./in.) of gage length.

6.4 *Elongation*—The total elongation under load shall be not less than 3.5 % and shall be measured in a gage length of not less than 600 mm (24 in.). In practice the total elongation value may be determined by adding to the 1 % yield extension the percent extension or movement between the jaws gripping the strand after yield determination. The percent is calculated on the new base length of jaw-to-jaw distance.

7. Dimensions and Permissible Variations

7.1 The size of the finished strand shall be expressed as the diameter of the strand in decimals of an inch [millimetre]. All nominal dimensional requirements for wires and strands shall refer to the wire and strand before indenting.

7.2 The diameter of the center wire of any strand must be larger than the diameter of any outer wire in accordance with Table 4.

7.3 Permissible Variations in Diameter:

7.3.1 All Grade 250I strand shall conform to a size tolerance of ±0.40 mm (±0.016 in.) from the nominal diameter measured across the crowns of the wire.

7.3.2 All Grade 270I strand shall conform to a size tolerance of +0.65 mm, -0.15 mm (+0.026 in., -0.006 in.) from the nominal diameter measured across the crowns of the wire.

TABLE 2 Breaking Strength Requirements

Diameter of Strand		Breaking Strength of Strand, kN (lbf)		Steel Area of Strand, mm ² (in. ²)	Mass [Weight] of Strand, kg/1000 m (lb/1000 ft)
mm	in.				
Grade 1725I [250I]					
6.4	(0.250)	40.0	(9 000)	23.2 (0.036)	182 (122)
7.9	(0.313)	64.5	(14 500)	37.4 (0.058)	294 (197)
9.5	(0.375)	89.0	(20 000)	51.6 (0.080)	405 (272)
11.1	(0.438)	120.1	(27 000)	69.7 (0.108)	548 (367)
12.7	(0.500)	160.1	(36 000)	92.9 (0.144)	730 (490)
15.2	(0.600)	240.2	(54 000)	139.4 (0.216)	1094 (737)
Grade 1860I (270I)					
7.9	(0.313)	74.3	(16 500)	39.4 (0.061)	313 (210)
9.5	(0.375)	102.3	(23 000)	54.8 (0.085)	432 (290)
11.1	(0.438)	137.9	(31 000)	74.2 (0.115)	582 (390)
12.7	(0.500)	183.7	(41 300)	98.7 (0.153)	775 (520)
15.2	(0.600)	266.7	(58 600)	140.0 (0.217)	1102 (740)

TABLE 3 Yield Strength Requirements^A

Diameter of Strand		Initial Load, kN (lbf)	Minimum Load at 1 % Extension, kN (lbf)
mm	(in.)		
Grade 1725I(250I)			
6.4	(0.250)	4.0 (900)	34.0 (7 650)
7.9	(0.313)	6.5 (1 450)	54.7 (12 300)
9.5	(0.375)	8.9 (2 000)	75.6 (17 000)
11.1	(0.438)	12.0 (2 700)	102.3 (23 000)
12.7	(0.500)	16.0 (3 600)	136.2 (30 600)
15.2	(0.600)	24.0 (5 400)	204.2 (45 900)
Grade 1860I(270I)			
7.9	(0.313)	7.3 (1 650)	62.4 (14 030)
9.5	(0.375)	10.2 (2 300)	87.0 (19 550)
11.1	(0.438)	13.8 (3 100)	117.2 (26 350)
12.7	(0.500)	18.4 (4 130)	156.1 (35 000)
15.2	(0.600)	26.1 (5 860)	221.5 (49 800)

^AYield strength minimum is 85 % of specified minimum breaking strength.

7.3.3 Variation in cross-sectional area and in stress resulting therefrom shall not be cause for rejection provided the diameter differences of the individual wires and the diameters of the strand are within the tolerances specified.

7.4 Indentations:

7.4.1 Two acceptable types of indented wire are shown in Fig. 1 (a) and (b) with dimensions given in Table 1.

7.4.2 Other types of indented wire are permitted, by agreement between the purchaser and supplier.

8. Workmanship, Finish, and Appearance

8.1 Joints:

8.1.1 There shall be no strand joints or strand splices in any length of the completed strand unless specifically permitted by the purchaser.

TABLE 1 Nominal Dimensions of Indentations

Fig.	Wire Diameter, <i>d</i>		Strand Diameter		Depth, <i>a</i>		Length, <i>L</i>		Pitch, <i>P</i>	
	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.
1 (a)	2.6 and below	(0.104 and below)	7.9	(0.312)	0.05 to 0.10	(0.002 to 0.004)	2.0	(0.079)	5.6	(0.220)
1 (a)	over 3.2	(over 0.125)	9.5	(0.375)	0.05 to 0.13	(0.002 to 0.005)	2.7	(0.108)	5.6	(0.220)
			11.1	(0.438)						
			12.7	(0.500)						
1 (b)	3.2 and below	(0.125 and below)	9.5	(0.375)	0.05 to 0.15	(0.002 to 0.006)	2.9	(0.115)	5.6	(0.220)