



Designation: **A886/A886M – 17** **A886/A886M – 24**

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

This standard is issued under the fixed designation A886/A886M; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope*

1.1 ~~This specification covers two types and two grades of indented seven-wire uncoated, low-relaxation, indented, Grade 270I [1860I] seven-wire steel strand for use in prestressed concrete construction. The two types of strand are low-relaxation and stress-relieved (normal-relaxation). Grade 250I [1725I] and Grade 270I [1860I] have minimum tensile strengths of 250 ksi [1725 MPa] and Grade 270I [1860I] has a minimum tensile strength of 270 ksi [1860 MPa], respectively, [MPa] based on the nominal area of the strand.~~

1.2 The text of this specification references notes and footnotes that provide explanatory material. These notes and footnotes (excluding those in tables) shall not be considered as requirements of the specification.

1.3 This specification is applicable for orders in either inch-pound units (as Specification A886) or in SI units (as Specification A886M).

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

1.5 *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 Standard:²

[A1061/A1061M Test Methods for Testing Multi-Wire Steel Prestressing Strand](#)

2.2 U.S. Military Standard:

[MIL-STD-129 Marking for Shipment and Storage](#)³

2.3 U.S. Federal Standard:

[Fed. Std. No. 123 Marking for Shipments \(Civil Agencies\)](#)³

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

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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 U.S. Government Printing Office, Superintendent of Documents, 732 N. Capitol St., NW, Washington, DC 20401-0001, <http://www.access.gpo.gov>.

*A Summary of Changes section appears at the end of this standard



3. Terminology

3.1 *Definition of Term/Terms Specific to this Specification:*

3.1.1 *lay length, n*—the axial distance required to make one complete revolution of any outer wire of a strand.

3.1.2 *strand, n*—a group of wires 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 wires.

3.1.2.1 *Discussion*—

The direction of lay is either right-handed or left-handed.

3.1.3 *strand splice, n*—a production connection between two separate lengths of strand never intended to carry prestressing loads.

3.1.4 *wire weld, n*—a resistance butt-weld joining two separate lengths of wire after wire drawing and before the wire is formed into strand.

4. Ordering Information

4.1 Orders for ~~indented~~ low-relaxation, indented, Grade 270 seven-wire steel strand under this specification shall contain the following information:

4.1.1 Quantity (feet [metres]),

4.1.2 Nominal diameter of strand (inches [millimetres]), and

~~4.1.3 Grade of strand;~~

~~4.1.4 Type of strand (low-relaxation or stress-relieved (normal-relaxation)), and~~

4.1.3 ASTM designation A886 [A886M] and year of issue.

4.2 The purchaser shall have the option to specify additional requirements, including but not limited to, the following:

4.2.1 Relaxation evidence from similarly dimensioned strand of the same grade (~~6.5.1~~),

4.2.2 Other types of indented wire (~~7.4.27.5.2~~),

~~4.2.3 If joints or~~ Whether strand splices are permitted (8.1.1),

4.2.4 Weldless, if desired ~~Weldless strand (8.1.48.2.2)~~,

4.2.5 Requirements for outside inspection (11.1),

4.2.6 Load-elongation curve, if desired ~~curve (13.2)~~,

4.2.7 Packaging and package marking (Section 14), and

4.2.8 Other special requirements, if any.

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 thermally treated, 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 be round and have a ~~common~~ dry-drawn finish.

5.2.1 *Traceability*—Traceability shall be based on pack number as reported by the manufacturer.



TABLE 1 Nominal Dimensions of Indentations

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

NOTE 1—This product is a composite of seven wires and is produced ~~only to only~~ meet the prescribed mechanical properties. The chemical composition 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 reelless pack. ~~Traceability is based on the identity of reels or reelless packs as maintained and reported by the manufacturer. pack.~~

5.3 *Indentations*—The outer wires shall have indentations that inhibit longitudinal movement of the strand relative to the concrete surrounding the strand in prestressed concrete construction. Indentations shall conform to the provisions in ~~Section 7.47.5~~. 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 2 ft [0.6 m] length of strand shall meet the pitch and shape requirements of **Table 1**. The center wire need not be indented.

5.4 *Treatment*—After stranding, ~~low-relaxation~~ strand shall be subjected to a continuous thermal-mechanical treatment to produce the prescribed mechanical properties. ~~For stress-relieved (normal-relaxation) strand, only thermal treatment is necessary.~~ Temper colors which result from the ~~stress-relieving operation~~ thermal-mechanical treatment are considered normal for the finished appearance of this strand.

6. Mechanical Property Requirements

6.1 Tests for mechanical properties shall be conducted in accordance with Test Methods **A1061/A1061M**.

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 ~~lb~~ pounds [kN] shall be measured at ~~±1.0 %~~ 1.0 % extension under load. The minimum yield strength shall be 90 % for ~~low-relaxation strand~~ and 85 % for ~~stress-relieved (normal-relaxation) strand~~ of the breaking strength listed in **Table 2**. Initial loads for the test and minimum yield strengths are listed 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 in./in. [0.0001 mm/mm] of gage length.

6.4 *Elongation*—The total elongation under load shall not be less than 3.5 % using a gage length of not less than 24 in. [600 mm]. It shall be permissible to determine the total elongation value by adding, to the ~~±1.0 % yield extension~~ 1.0 % 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.

6.5 *Relaxation Properties*—~~Low-relaxation strand~~ Strand shall have relaxation losses of not more than 2.5 % when initially loaded to 70 % of specified minimum breaking strength or not more than 3.5 % when loaded to 80 % of specified minimum breaking strength of the strand after 1000 ~~hours~~ h of testing.

6.5.1 If required, relaxation evidence shall be provided from the manufacturer's records of tests on similarly dimensioned ~~strand of the same grade.~~ strand.

7. Dimensions and Permissible Variations

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



TABLE 2 Breaking Strength Requirements

Nominal Diameter of Strand		Breaking Strength of Strand, lbf [kN]		Steel Area of Strand, in. ² [mm ²]	Mass [Weight] of Strand, lb/1000 ft [kg/1000 m]
in.	[mm]				
Grade 250I [1725I]					
0.250	[6.4]	9 000	[40.0]	0.036 [23.2]	122 [182]
0.313	[7.9]	14 500	[64.5]	0.058 [37.4]	197 [294]
0.375	[9.5]	20 000	[89.0]	0.080 [51.6]	272 [405]
0.438	[11.1]	27 000	[120.1]	0.108 [69.7]	367 [548]
0.500	[12.7]	36 000	[160.3]	0.144 [92.9]	490 [730]
0.600	[15.2]	54 000	[240.5]	0.216 [139.4]	737 [1094]
Grade 270I [1860I]					
0.313	[7.9]	16 500	[74.3]	0.061 [39.4]	210 [313]
0.313	[7.9]	16 500	[74.3]	0.061 [39.4]	210 [313]
0.375	[9.5]	23 000	[101.9]	0.085 [54.8]	290 [432]
0.438	[11.1]	31 000	[138.0]	0.115 [74.2]	390 [582]
0.500	[12.7]	41 300	[183.6]	0.153 [98.7]	520 [775]
0.600	[15.2]	58 600	[260.4]	0.217 [140.0]	740 [1102]

TABLE 3 Yield Strength Requirements^A

Nominal Diameter of Strand		Initial Load, lbf [kN]	Minimum Load at 1 % Extension, kN [lbf]	Low Relaxation ^B
in.	[mm]		Stress-Relieved (Normal Relaxation) ^C	
Grade 1725I [250I]				
0.250	[6.4]	900 [4.0]	7 650 [34.0]	8 100 [36.0]
0.313	[7.9]	1 450 [6.5]	12 300 [54.8]	13 050 [58.1]
0.375	[9.5]	2 000 [8.9]	17 000 [75.6]	18 000 [80.1]
0.438	[11.1]	2 700 [12.0]	23 000 [102.3]	24 300 [108.2]
0.500	[12.7]	3 600 [16.0]	30 600 [136.2]	32 400 [144.3]
0.600	[15.2]	5 400 [24.0]	45 900 [204.4]	48 600 [216.5]
Grade 1860I [270I]				
0.313	[7.9]	1 650 [7.3]	14 030 [63.2]	14 850 [66.9]
0.375	[9.5]	2 300 [10.2]	19 550 [86.6]	20 700 [91.7]
0.438	[11.1]	3 100 [13.8]	26 350 [117.3]	27 900 [124.2]
0.500	[12.7]	4 130 [18.4]	35 000 [156.1]	37 170 [165.2]
0.600	[15.2]	5 860 [26.1]	49 800 [221.3]	52 740 [234.4]

TABLE 3 Yield Strength Requirements^A

Nominal Diameter of Strand		Initial Load, lbf [kN]	Minimum Load at 1 % Extension, lbf [kN]
in.	[mm]		
Grade 270I [1860I]			
0.313	[7.9]	1 650 [7.3]	14 850 [66.9]
0.375	[9.5]	2 300 [10.2]	20 700 [91.7]
0.438	[11.1]	3 100 [13.8]	27 900 [124.2]
0.500	[12.7]	4 130 [18.4]	37 170 [165.2]
0.600	[15.2]	5 860 [26.1]	52 740 [234.4]

^A Minimum yield strength is 85 % of specified minimum breaking strength.
^A Minimum yield strength is 90 % of specified minimum breaking strength.

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

7.3 Lay length shall be between 12 and 16 times the nominal diameter of the strand.

7.4 Permissible Variations in Diameter:

7.3.1 All Grade 250I [1725I] strand shall conform to a size tolerance of ±0.016 in. [±0.40 mm] from the nominal diameter measured across the crowns of the wire.