



Designation: A910/A910M – 12

# Standard Specification for Uncoated, Weldless, 2-Wire and 3-Wire Steel Strand for Prestressed Concrete<sup>1</sup>

This standard is issued under the fixed designation A910/A910M; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope\*

1.1 This specification covers two types and two grades of 2-wire and 3-wire, uncoated steel strand for use in prestressed concrete construction. The two types of strand are low-relaxation and stress-relieved (normal-relaxation). Low-relaxation is to be regarded as the standard type. Stress-relieved (normal-relaxation) strand will not be furnished unless specifically ordered. The two grades are 250 [1725] and 270 [1860]. Grades 250 [1725] and 270 [1860] have minimum tensile strengths of 250 ksi [1725 MPa] and 270 ksi [1860 MPa] respectively, based on the nominal area of the strand.

1.2 This specification is applicable for orders in either inch-pound units (as Specification A910) or in SI units (as Specification A910M).

1.3 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 not 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.

## 2. Referenced Documents

2.1 *ASTM Standard*:<sup>2</sup>

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

2.2 *U.S. Military Standard*:<sup>3</sup>

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

2.3 *Federal Standard*:<sup>3</sup>

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

<sup>1</sup> 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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<sup>2</sup> 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.

<sup>3</sup> Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, http://www.access.gpo.gov.

## 3. Terminology

3.1 *Definition of Term Specific to This Specification:*

3.1.1 *strand, n*—Either two or three wires helically wound around each other with uniform pitch not less than 12 and not more than 16 times the nominal diameter of the strand.

3.1.1.1 *Discussion*—The direction of lay may be either right- or left-hand; however, strands of different lays should not be spliced together.

## 4. Ordering Information

4.1 It shall be the responsibility of the purchaser to specify all requirements that are necessary for material ordered to this specification. Such requirements shall include, but are not limited to, the following:

4.1.1 Quantity (feet [metres]),

4.1.2 Nominal diameter and description of strand (Table 1),

4.1.3 Number of wires (2 or 3),

4.1.4 Grade,

4.1.5 Type of strand (low-relaxation or stress-relieved (normal relaxation)),

4.1.6 Inspection (11.1),

4.1.7 Load-elongation curve (13.2),

4.1.8 Packaging (14.1), and

4.1.9 ASTM designation and year of issue.

## 5. Materials and Manufacture

5.1 *Base Metal*—The base metal shall be carbon steel of such quality that when drawn to wire, 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 dry-drawn finish.

NOTE 1—This product is a composite of two or three wires and is produced only to meet the prescribed mechanical properties, of which 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.

5.3 *Treatment*—After stranding, low-relaxation strand shall be subjected to a continuous thermo-mechanical treatment to

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

**TABLE 1 Breaking Strength Requirements**

Description and Nominal Diameter of Strand				Breaking Strength of Strand		Steel Area of Strand		Weight [Mass] of Strand	
in.		[mm]							
Description	Nominal Diameter	Description	Nominal Diameter	lbf	[kN]	in. <sup>2</sup>	[mm <sup>2</sup> ]	lbs/1000 ft	[kg/1000 m]
GRADE 250 [1725 MPa]									
2 × 0.114	0.228	[2 × 2.90]	[5.8]	5000	[22.2]	0.020	[13.2]	69.9	[104.0]
3 × 0.089	0.189	[3 × 2.25]	[4.8]	4750	[21.1]	0.019	[12.0]	63.3	[94.2]
3 × 0.095	0.205	[3 × 2.40]	[5.2]	5250	[23.4]	0.021	[13.6]	71.9	[107.0]
3 × 0.114	0.244	[3 × 2.90]	[6.2]	7750	[34.5]	0.031	[19.8]	104.0	[155.0]
3 × 0.118	0.256	[3 × 3.00]	[6.5]	8250	[36.7]	0.033	[21.3]	112.0	[167.0]
3 × 0.138	0.295	[3 × 3.50]	[7.5]	11 250	[50.0]	0.045	[29.0]	153.0	[228.0]
3 × 0.158	0.340	[3 × 4.00]	[8.6]	14 500	[64.5]	0.058	[37.4]	200.6	[298.4]
GRADE 270 [1860 MPa]									
2 × 0.114	0.228	[2 × 2.90]	[5.8]	5400	[24.0]	0.020	[13.2]	69.9	[104.0]
3 × 0.089	0.189	[3 × 2.25]	[4.8]	5130	[22.8]	0.019	[12.0]	63.3	[94.2]
3 × 0.095	0.205	[3 × 2.40]	[5.2]	5670	[25.2]	0.021	[13.6]	71.9	[107.0]
3 × 0.114	0.244	[3 × 2.90]	[6.2]	8370	[37.2]	0.031	[19.8]	104.0	[155.0]
3 × 0.118	0.256	[3 × 3.00]	[6.5]	8910	[39.6]	0.033	[21.3]	112.0	[167.0]
3 × 0.138	0.295	[3 × 3.50]	[7.5]	12 150	[54.0]	0.045	[29.0]	153.0	[228.0]
3 × 0.158	0.340	[3 × 4.00]	[8.6]	15 660	[69.7]	0.058	[37.4]	200.6	[298.4]

produce the prescribed mechanical properties. For stress-relieved (normal-relaxation) strand, only thermal treatment is necessary. Temper colors that result from the stress-relieving operation 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**. Low-relaxation strand shall also be tested as prescribed in Test Methods **A1061/A1061M**.

6.2 *Breaking Strength*—The breaking strength of the finished strand shall conform to the requirements prescribed in **Table 1**.

6.3 *Yield Strength*—Yield strength in lbs [kN] shall be measured at 1 % extension under load in accordance with the test procedure delineated in Test Methods **A1061/A1061M**, Section 9.1. 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 1**. Initial loads for the test and minimum yield strengths are listed in **Table 2**.

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 be determined in accordance with Test Methods **A1061/A1061M**, Section 9.2. 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 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 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

**TABLE 2 Yield Strength Requirements**

Description and Nominal Diameter of Strand				Minimum Load at 1 % Extension					
in.		[mm]		Initial Load		Stress-Relieved (Normal-Relaxation)		Low-Relaxation	
Description	Nominal Diameter	Description	Nominal Diameter	lbf	[kN]	lbf	[kN]	lbf	[kN]
GRADE 250 [1725 MPa]									
2 × 0.114	0.228	[2 × 2.90]	[5.8]	500	[2.2]	4250	[18.9]	4500	[20.0]
3 × 0.089	0.189	[3 × 2.25]	[4.8]	475	[2.1]	4038	[18.0]	4275	[19.0]
3 × 0.095	0.205	[3 × 2.40]	[5.2]	525	[2.3]	4463	[20.0]	4725	[21.0]
3 × 0.114	0.244	[3 × 2.90]	[6.2]	775	[3.5]	6588	[29.3]	6975	[31.0]
3 × 0.118	0.256	[3 × 3.00]	[6.5]	825	[3.7]	7013	[32.2]	7425	[33.0]
3 × 0.138	0.295	[3 × 3.50]	[7.5]	1250	[5.0]	9563	[42.5]	10 125	[45.0]
3 × 0.158	0.340	[3 × 4.00]	[8.5]	1450	[6.5]	12 325	[54.8]	13 050	[11.7]
GRADE 270 [1860 MPa]									
2 × 0.114	0.228	[2 × 2.90]	[5.8]	540	[2.4]	4590	[20.4]	4860	[21.6]
3 × 0.089	0.189	[3 × 2.25]	[4.8]	513	[2.3]	4360	[19.4]	4617	[20.5]
3 × 0.095	0.205	[3 × 2.40]	[5.2]	567	[2.5]	4820	[21.4]	5103	[22.7]
3 × 0.114	0.244	[3 × 2.90]	[6.2]	837	[3.7]	7115	[31.6]	7533	[33.5]
3 × 0.118	0.256	[3 × 3.00]	[6.5]	891	[4.0]	7574	[33.7]	8019	[36.0]
3 × 0.138	0.295	[3 × 3.50]	[7.5]	125	[5.4]	10 328	[45.9]	10 125	[45.0]
3 × 0.158	0.340	[3 × 4.00]	[8.6]	566	[7.0]	13 311	[59.2]	14 094	[62.7]