



Designation: A 910/A 910M – 99

Standard Specification for Uncoated, Weldless, 2- and 3-Wire Steel Strand for Prestressed Concrete¹

This standard is issued under the fixed designation A 910/A 910M; 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 two types and two grades of 2- and 3-wire, uncoated steel strand for use in pretensioned and posttensioned prestressed concrete construction. The two types of strand are low-relaxation and stress-relieved (normal-relaxation). Low-relaxation shall be regarded as the standard type. Stress-relieved (normal-relaxation) strand will not be furnished unless specifically ordered, or by arrangement between purchaser and supplier. The two grades are 1725 (250) and 1860 (270). Grades 250 and 270 have minimum tensile strengths of 1725 MPa (250 ksi) and 1860 MPa (270 ksi) respectively, based on the nominal area of the strand.

1.2 The values stated in either inch-pound units or SI units are to be regarded as the standard. 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

2.3 Federal Standard:

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 strands shall be comprised of either two wires or three wires helically wound around each other; they shall have a uniform pitch of not less than 12 nor more than 16 times the nominal diameter of the strand.

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

4. Ordering Information

4.1 Orders for 2- or 3-wire low-relaxation or stress-relieved (normal-relaxation) strand under this specification should include the following information:

4.1.1 Quantity (meters [feet]),

4.1.2 Diameter of strand (Section 7),

4.1.3 Number of wires (2 or 3),

4.1.4 Grade of strand (see 1.1 and Table 1 and Table 2),

4.1.5 Type of strand (see 1.1 and Table 2),

4.1.6 Packaging (Section 14),

4.1.7 ASTM designation and year of issue, and

4.1.8 Special requirements, if any.

NOTE 1—A typical ordering description is as follows: 100 000 m (325 000 ft) of 6.2 mm (0.244 in.) diameter, three wire, Grade 1860 MPa (270 ksi), low-relaxation strand in 10 000 m (32 500 ft) reelless packs conforming to ASTM A 910/A 910M-XX.

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 2—This product is a composite of two or three wires and is produced to mechanical properties only, of which 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

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² *Annual Book of ASTM Standards*, Vol 01.04.

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.

TABLE 1 Breaking Strength Requirements

Description and Diameter of Strand				Breaking Strength of Strand		Steel Area of Strand		Weight of Strand	
in.		mm							
Description	Nominal Diameter	Description	Nominal Diameter	lbf	kN	in. ²	mm ²	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

TABLE 2 Yield Strength Requirements

Description and Diameter of Strand				Initial Load		Minimum Load at 1 % Extension			
in.		mm				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

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 *Thermal 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 that result from the stress-relieving operation are considered normal for the finished appearance of this strand.

6. Mechanical Properties

6.1 Methods of testing for mechanical properties are in Annex A7 of Test Methods and Definitions A 370. Low-relaxation strand shall also be tested as prescribed in Methods E 328.

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 kN (lbs) is measured at 1 % 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 1. Initial loads for the test and minimum yield strengths are listed in Table 2.

6.4 *Elongation*—The total elongation under load shall not be less than 3.5 %. In practice the total elongation value may be determined 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.