Designation: A 779/A 779M – 05

Standard Specification for Steel Strand, Seven-Wire, Uncoated, Compacted, Stress-Relieved for Prestressed Concrete[1]

This standard is issued under the fixed designation A 779/A 779M; 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 describes three grades of compacted, seven-wire, uncoated, stress-relieved strand for use in pretensioned and post-tensioned prestressed concrete construction.

1.2 Supplement I describes low-relaxation strand and low-relaxation testing.

1.3 The values stated in either inch-pound or SI units are to be regarded as 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 shall be used independently of the other, without combining values in any way.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

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

A 751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products

E 328 Methods for Stress Relaxation Tests for Materials and Structures

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *compacted strand*—strand that has been compacted by drawing through a die or a similar compacting process and subsequently stress-relieved prior to winding into coils or reelless packs.

3.1.2 *lot*—all of the compacted strand of the same grade and package size produced on the same production equipment and submitted for inspection at the same time.

3.1.3 *strand*—a group of wires having a center wire enclosed tightly by six helically placed outer wires with a uniform pitch of not less than 14 and not more than 18 times the nominal diameter of the strand.

4. Classification

4.1 *Grade 1700 (245)*—Nominal diameter of 18.0 mm (0.7 in.) with tensile failure stress of 1705 MPa (247 ksi) based on nominal area of the strand.

4.2 *Grade 1800 (260)*—Nominal diameter of 15.2 mm (0.6 in.) with tensile failure stress of 1815 MPa (263 ksi) based on nominal area of the strand.

4.3 *Grade 1860 (270)*—Nominal diameter of 12.7 mm (0.5 in.) with tensile failure stress of 1860 MPa (270 ksi) based on nominal area of the strand.

5. Ordering Information

5.1 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:

5.1.1 Quantity (meters (feet)),

5.1.2 Grade of strand (Section 4),

5.1.3 Special inspection requirements, if desired (see Section 13),

5.1.4 Packaging,

5.1.5 ASTM designation and date of issue, and

5.1.6 Special requirements, if any.

NOTE 1—A typical ordering description is as follows: 100 000 m Grade 260 compacted low-relaxation strand in approximately 3700 m reelless packs to ASTM A 779/A 779M (328 000 ft Grade 1800 compacted low-relaxation strand in approximately 12 000 ft-reelless packs to ASTM A 779/A 779M.)

6. Materials and Manufacture

6.1 The steel shall be of such quality that, when processed, the finished wire shall be free of detrimental flaws and undue segregation.

6.2 Wire from which the strand is to be fabricated shall be in the cold-drawn condition and have a common dry-drawn finish.

[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.

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

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TABLE 1 Breaking Strength Requirements

Nominal Diameter of Strand		Specified Minimum Breaking Strength of Strand, kN (lbf)	Nominal Steel Area of Strand		Nominal Mass (Weight) of Strands kg/1000 m (lb/1000 ft)
mm	(in.)		mm^2	$(in.)^2$	
		Grade 1860 (270)			
12.7	(0.5)	209 (47 000)	112	(0.174)	890 (600)
		Grade 1800 (260)			
15.2	(0.6)	300 (67 440)	165	(0.256)	1295 (873)
		Grade 1700 (245)			
18.0	(0.7)	380 (85 430)	223	(0.346)	1750 (1176)

6.3 After stranding and compacting, all strand shall be subjected to a stress-relieving continuous thermal treatment to produce the desired mechanical properties. Temper colors which result from the stress-relieving operation are considered normal for the finished appearance of this strand.

7. *Chemical Requirements* Chemical Requirements

7.1 The chemical analysis of each heat shall be determined in accordance with Test Methods, Practices, and Definitions A 751.

7.2 Variations in production processes and equipment necessitates the individual selection of an appropriate chemical composition at the discretion of the producer.

7.3 Phosphorus and sulfur values shall not exceed the following:

Phosphorus 0.040 % max

Sulfur 0.050 % max

8. Mechanical Requirements

8.1 *Breaking Strength*—The breaking strength of the finished strand shall conform to the values specified in Table 1 and shall be determined using methods and procedures described in Annex A 7 of Test Methods and Definitions A 370.

8.2 *Load at 1 % Extension*—The minimum load at 1 % extension shall conform to the specified values shown in Table 2 when tested using methods and procedures described in Annex A 7 of Test Methods and Definitions A 370.

8.3 *Elongation*—The total elongation of the strand under maximum load shall not be less than 3.5 % measured in a gage length of not less than 600 mm (24 in.) when tested using methods and procedures described in Annex A 7 of Test Methods and Definitions A 370.

8.3.1 Strand specimens that break outside of the extensometer or in the testing machine grips and meet the minimum specified value, shall be considered as meeting the elongation requirements of this specification.

8.4 If any strand specimen breaking within the grips of the testing machine results in test values below those specified, those results shall be considered invalid and retesting shall be required.

9. Dimensions and Permissible Variations

9.1 The size of the finished strand shall be expressed as the nominal diameter of the strand in fractions or decimal fractions of an inch.

9.2 Prior to compacting, the diameter of the center wire of any strand shall be larger than the diameter of any outer wire by a minimum of 2 %.

TABLE 2 Yield Strength Requirements

Nominal Strand Diameter		Initial Load, kN (lbf)	Specified Minimum Load at 1 % Extension, kN (lbf)
mm	(in.)		
		Grade 1860 (270)	
12.7	(0.5)	20.9 (4700)	182 (40 900)
		Grade 1800 (260)	
15.2	(0.6)	30.0 (6740)	261 (58 700)
		Grade 1700 (245)	
18.0	(0.7)	38.0 (8540)	330 (74 300)

9.3 After compacting, the strand shall conform to a size tolerance of plus 0.4 mm (0.016 in.) or minus 0.2 mm (0.008 in.) from the nominal diameter when measured across the crowns of the wire.

10. Workmanship

10.1 *Joints*:

10.1.1 There shall be no strand joints or strand splices in any length of the completed strand.

10.1.2 During the process of manufacture of individual wires for stranding, welding shall be permitted only prior to the start of wire drawing.

10.2 The finished compacted strand shall be uniform in diameter and shall be free of imperfections not consistent with good commercial drawing and stranding practice.

10.3 When the strand is cut without seizings, the wires shall not fly out of position. If a wire or wires flies out of position and can be replaced by hand, the strand will be considered satisfactory.

10.4 The strand shall not be oiled or greased. Slight rusting, provided it is not sufficient to cause pits visible to the unaided eye, shall not be cause for rejection.

10.5 Curvature of the finished compact strand shall be not more than 75 mm (3 in.) in a length of 1 m (3 ft) when lying on a flat surface.

11. Sampling

11.1 One specimen for test shall be taken from each 18 Mg (20 ton) or fraction thereof from the lot of compacted strand. The test specimen shall be cut from the outside ends of reels or either end of coils or reelless packs.

12. Test Methods

12.1 Test specimens obtained in 11.1 shall be tested for dimensions (Section 9), breaking strength (8.1), load at 1 % extension (8.2), elongation (8.3), and workmanship (Section 10).

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12.2 Typical load-elongation curves, based on accumulated data, shall be delivered to the purchaser on each lot shipped.

12.2.1 When specified in the purchase order or contract, a load-elongation curve shall be made from one test specimen representing the lot.

13. Inspection

13.1 Inspection of the material shall be agreed upon by the purchaser and the supplier as part of the purchase contract.

13.2 If purchaser inspection is required, the supplier shall afford the inspector representing the purchaser all reasonable facilities so that the inspector is satisfied that the material being furnished is in accordance with this specification. All tests and inspections shall be made at the place of manufacture prior to shipment and shall be conducted as not to interfere unnecessarily with the operation of the works.

14. Rejection and Rehearing

14.1 Material that fails to conform to the requirements of this specification shall be subject to rejection. Rejection shall be reported to the producer or supplier promptly and in writing. In case of dissatisfaction with the test results, the producer or supplier shall have the right to make claim for a rehearing.

15. Certification

15.1 If inspection by the purchaser is waived, a manufacturer's certification that the material has been tested in accordance with, and meets the requirements of this specification, shall be the basis of acceptance of the material. The certification shall include the specification number, year-date of issue, and revision letter, if any.

15.2 A material test report, certificate of inspection, or similar document printed from or used in electronic form from an electronic data interchange (EDI) transmission shall be regarded as having the same validity as a counterpart printed in the certifier's facility. The content of the EDI transmitted document must meet the requirements of the invoked ASTM standard(s) and conform to any existing EDI agreement between the purchaser and the supplier. Notwithstanding the absence of a signature, the organization submitting the EDI transmission is responsible for the content of the report.

NOTE 2—The industry definition as invoked here is: EDI is the computer-to-computer exchange of business information in a standard format such as ANSI ASC X12.

16. Packaging and Marking

16.1 The strand shall be furnished on reels, reelless packs, or in coils having a minimum inside diameter of 910 mm (36 in.). Each package shall be protected from mechanical damage during shipment. A strong tag securely attached to each package shall show the grade, length, reel or lot number, ASTM A 779/A 779M, special requirements, if any, and name or mark of the manufacturer. Special packaging, protection, or tagging shall be agreed upon between the purchaser and supplier at the time of purchase.

16.2 Low-relaxation compacted strand meeting the requirement of Supplement I shall be specifically identified.

17. Keywords

17.1 compacted strand (tendon); prestressed concrete

SUPPLEMENTARY REQUIREMENTS

I. LOW-RELAXATION COMPACTED STRAND

S1. Scope

S1.1 This supplement details those special properties that are applicable to low-relaxation compacted strand which are in addition to the properties prescribed in this specification.

S1.2 Relaxation testing methods as applicable to compacted strand are also prescribed.

S2.Applicable Documents

S2.1 *ASTM Standards:*

E 328 Methods for Stress Relaxation Tests for Materials and Structures

S3. Sampling

S3.1 Test specimens shall be selected from those obtained in Section 11, representative of the process. The number of samples to be tested shall be agreed upon between the purchaser and producer.

S4. Test Methods

S4.1 Compacted strand shall be tested for relaxation properties in accordance with Methods E 328.

S5. Load at 1 % Extension

S5.1 The load at 1 % extension of compacted strand with low relaxation properties shall be not less than 90 % of the specified minimum breaking strength as described in 8.1.

S6. Conditions of Relaxation Test

S6.1 The temperature of the test specimen and testing equipment shall be maintained at 20 ± 2°C (68 ± 3.5°F).

S6.2 The test specimen shall not be subjected to loading prior to the relaxation test.

S6.3 The initial load shall be applied uniformly over a period of not less than 3 min and not more than 5 min, and the gage length shall be maintained constant; load relaxation readings shall begin 1 min after application of total load.

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S6.3.1 The initial load shall be 70 % of the actual breaking load of a test specimen obtained adjacent to the specimen being tested.

S6.4 Over-stressing of the test specimen during the loading operation shall not be permitted.

S6.5 Duration of the test shall be 1000 h or a shorter computed period extrapolated to 1000 h which can be shown by test data to provide similar relaxation values.

S6.6 The test gage length shall be at least 60 times the nominal diameter of the strand. If this gage length exceeds the capacity of the extensometer or testing machine, then it is permitted to substitute a gage length of 40 times the nominal diameter of the strand.

S7. Relaxation Properties

S7.1 Low-relaxation, compacted strand shall meet the dimensional, breaking load, and elongation requirements of this specification with the added requirement that the relaxation loss after 1000 h under conditions of Section S 6 shall be not more than 2.5 %.

SUMMARY OF CHANGES

Committee A01 has identified the location of selected changes to this standard since the last issue (A 779/A 779M – 00) that may impact the use of this standard.

(1) Revised sections 5.1, 8.3.1, 10.1.2, 15.1, S6.4, and S6.6

(2) Added section 15.2 and Note 2.

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