



Standard Specification for Steel Wire, Plain, for Concrete Reinforcement¹

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This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This specification covers cold-drawn steel wire, as-drawn or galvanized, to be used as such, or in fabricated form, for the reinforcement of concrete, in sizes not less than 2.03 mm (0.080 in.) nominal diameter.

1.2 Supplement S1 describes high-strength wire, which shall be furnished when specifically ordered. It shall be permissible to furnish high-strength wire in place of regular wire if mutually agreed to by the purchaser and the supplier.

1.3 The values stated in either inch-pound units 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 must be used independently of the other. Combining values may result in nonconformance with the specification.

2. Referenced Documents

2.1 ASTM Standards:

A 185 Specification for Steel Welded Wire Reinforcement, Plain, for Concrete²

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products³

A 641 Specification for Zinc-Coated (Galvanized) Carbon Steel Wire⁴

A 700 Practices for Packaging, Marking, and Loading Methods for Steel Products for Domestic Shipment⁵

E 83 Practice for Verification and Classification of Extensometers⁶

2.2 U.S. Military Standards:

MIL-STD-129 Marking for Shipment and Storage⁷

MIL-STD-163 Steel Mill Products Preparation for Shipment and Storage⁷

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 *Annual Book of ASTM Standards*, Vol 01.04.

³ *Annual Book of ASTM Standards*, Vol 01.03.

⁴ *Annual Book of ASTM Standards*, Vol 01.06.

⁵ *Annual Book of ASTM Standards*, Vol 01.05.

⁶ *Annual Book of ASTM Standards*, Vol 03.01.

⁷ Available from Standardization Documents Order Desk, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094.

2.3 U.S. Federal Standard:

Fed. Std. No. 123 Marking for Shipments (Civil Agencies)⁷

2.4 Other Standard:

ACI 318 Building Code Requirements for Structural Concrete⁸

3. Ordering Information

3.1 Orders for material to this specification should include the following information:

3.1.1 Quantity (weight),

3.1.2 Name of material (cold-drawn steel wire for concrete reinforcement),

3.1.3 Wire size number (see Section 8),

3.1.4 Packaging (see Section 15), and

3.1.5 ASTM designation and year of issue.

3.1.6 Special requirements, if any. (See Supplement S1.)

NOTE 1—A typical ordering description is as follows: 100 000 lb cold-drawn steel wire for concrete reinforcement, Size No. W5 in 500 lb secured coils, to ASTM – _____.

4. Materials and Manufacture

4.1 The steel shall be made by one of the following processes: open-hearth, electric furnace, or basic-oxygen.

4.2 The wire shall be cold drawn from rods that have been hot rolled from billets.

4.3 Unless otherwise specified, the wire shall be supplied uncoated. When specified as galvanized, it shall be galvanized at finish size.

5. Mechanical Property Requirements

5.1 Tension Tests:

5.1.1 When tested as described in Test Methods and Definitions **A 370**, the material, except as specified in 5.1.2, shall conform to the tensile property requirements in **Table 1** based on nominal area of wire.

5.1.2 The yield strength shall be determined as described in Test Methods and Definitions **A 370** at an extension of 0.5 % of gage length. The manufacturer is not required to test for yield strength, but is responsible for supplying a product that will meet the stipulated limit when tested in conformance with the

⁸ Available from American Concrete Institute, P. O. Box 9094, Farmington Hills, MI 48333-9094.

TABLE 1 Tension Test Requirements

Tensile strength, min, ksi (MPa)	80 (550)
Yield strength, min, ksi (MPa)	70 (485)
Reduction of area, min, %	30 ^A

^AFor material testing over 100 ksi (690 MPa) tensile strength, the reduction of area shall be not less than 25 %.

provisions of 11.3. For determining the yield strength, use a Class B-1 extensometer as described in Practice E 83. The extensometer should be removed from the specimen after the yield strength has been determined.

5.1.3 For material to be used in the fabrication of welded wire reinforcement, the tensile and yield strength properties shall conform to the requirements given in Table 2, based on nominal area of the wire.

5.1.4 The material shall not exhibit a definite yield point as evidenced by a distinct drop of the beam or halt in the gage of the testing machine prior to reaching ultimate tensile load. The purchaser may opt to accept this feature as sufficient evidence of compliance with the specified minimum yield strength tests covered in 11.3.

5.2 *Bend Test*—The bend test specimen shall stand being bent at room temperature through 180° without cracking on the outside of the bent portion, as prescribed in Table 3.

5.3 *Reduction of Area Test*—The reduction of area shall be determined as described in Test Methods and Definitions A 370, and the wire shall conform to the reduction of area requirements in Table 1 and Table 2.

6. Permissible Variation in Wire Diameter

6.1 The permissible variation in the diameter of the wire shall conform to the requirements given in Table 4.

6.2 The difference between the maximum and minimum diameters, as measured on any given cross section of the wire, shall be no more than the tolerances listed in Table 4 for the given wire size.

7. Workmanship, Finish, and Appearance

7.1 The wire shall be free of detrimental imperfections and shall have a workmanlike finish.

7.2 Galvanized wire shall be produced as described in Specification A 641, regular coating.

7.3 Rust, surface seams, or surface irregularities shall not be a cause for rejection provided the requirements of 7.4 are met, and the minimum dimensions and mechanical properties of a hand wire-brushed test specimen are not less than the requirements of this specification.

TABLE 2 Tension Test Requirements (Material for Welded Wire Reinforcement)

	Size W1.2 and Larger	Smaller than Size W1.2
Tensile strength, min, ksi (MPa)	75 (515)	70 (485)
Yield strength, min, ksi (MPa)	65 (450)	56 (385)
Reduction of area, min, %	30 ^A	30 ^A

^AFor material testing over 100 ksi (690 MPa) tensile strength, the reduction of area shall be not less than 25 %.

TABLE 3 Bend Test Requirements

Size Number of Wire	Bend Test
W7 and smaller	Bend around a pin the diameter that is equal to the diameter of the specimen
Coarser than W7	Bend around a pin the diameter that is equal to twice the diameter of the specimen

TABLE 4 Permissible Variation in Wire Diameter

Size Number	Nominal Diameter, in. (mm)	Permissible Variation Plus and Minus, in. (mm)
Smaller than W5	under 0.252 (6.40)	0.003 (0.08)
W5 to W12, incl	0.252 (6.40) to 0.391 (9.93), incl	0.004 (0.10)
Over to W20, incl	over 0.391 (9.93) to 0.505 (12.83), incl	0.006 (0.15)
Over W20	over 0.505 (12.83)	0.008 (0.20)

7.4 Wire intended for welded wire reinforcement shall be sufficiently free of rust and drawing lubricant so as not to interfere with electric resistance welding.

8. General Requirements

8.1 When wire for concrete reinforcement is ordered by size number, the relation between size number, diameter, and area shown in Table 5 and Table 6 shall apply.

9. Sampling

9.1 Test specimens for testing mechanical properties shall be full wire sections and shall be obtained from ends of wire coils as drawn or as galvanized. The specimens shall be of sufficient length to perform testing described in 5.1 and 5.2.

TABLE 5 Dimensional Requirements for Plain Wire—SI Units, Wire Sizes

Size Number ^A	Nominal Diameter mm (in.)	Nominal Area mm ² (in. ²)
MW 5	2.50 (0.100)	5 (0.008)
MW 10	3.60 (0.142)	10 (0.016)
MW 15	4.40 (0.173)	15 (0.024)
MW 20	5.00 (0.197)	20 (0.030)
MW 25	5.60 (0.220)	25 (0.039)
MW 30	6.20 (0.244)	30 (0.046)
MW 35	6.70 (0.264)	35 (0.054)
MW 40	7.10 (0.280)	40 (0.062)
MW 45	7.60 (0.299)	45 (0.070)
MW 50	8.00 (0.315)	50 (0.077)
MW 55	8.40 (0.331)	55 (0.085)
MW 60	8.70 (0.343)	60 (0.093)
MW 65	9.10 (0.358)	65 (0.101)
MW 70	9.40 (0.370)	70 (0.108)
MW 80	10.1 (0.397)	80 (0.124)
MW 90	10.70 (0.421)	90 (0.139)
MW 100	11.30 (0.445)	100 (0.155)
MW 120	12.40 (0.488)	120 (0.186)
MW 130	12.90 (0.508)	130 (0.201)
MW 200	15.95 (0.628)	200 (0.310)
MW 290	19.22 (0.757)	290 (0.450)

^AThis table represents a hard metrication of the most readily available sizes in the welded wire reinforcement industry. Table 5 should be used in projects that are designed using SI units; Table 6 should be used on projects designed using inch-pound units. Areas of wire should be checked with the most efficient and readily available material from producers. Other wire sizes are available and many manufacturers can produce them in 1-mm²(0.0015-in.²) increments.