



Designation: A 1022/A 1022M – 06

Standard Specification for Deformed and Plain Stainless Steel Wire and Welded Wire for Concrete Reinforcement¹

This standard is issued under the fixed designation A 1022/A 1022M; 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 stainless steel wire and welded wire reinforcement produced from hot-rolled stainless steel rod. The stainless steel wire is cold-worked, drawn or rolled, plain (non-deformed) or deformed or a combination of deformed and plain. It is used as concrete reinforcement for applications requiring resistance to corrosion and/or controlled magnetic permeability. Common wire sizes and dimensions are found in this specification. Actual wire sizes are not restricted to those shown in the tables.

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 supplier.

1.2.1 A supplementary requirement (S2) of an optional nature is provided. It shall apply only when specified by the purchaser. In order to obtain a corrosion tested or controlled magnetic permeability product, steel conforming to Supplementary Requirement S2 should be ordered.

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 brackets. 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.

1.4 The chemical composition of the steel (stainless grade) shall be selected for suitability to the application involved by agreement between the manufacturer and the purchaser. Use Specification A 276 for chemical requirements. The UNS designations are to be included with the type number and noted in brackets, i.e. austenitic stainless steels as Type 304 [S30400], 304L [S30403], 316 [S31600], 316L [S31603], 316N [S31651], 316LN [S31653] and duplex stainless steels, Types 2205 [S32205] and 329 [S32900].

NOTE 1—Only austenitic and duplex stainless steels are usually recommended for use as reinforcement in concrete because of their high corrosion resistance. Austenitic stainless steels have good general corro-

sion resistance, strength characteristics which can be improved by cold working, good toughness and ductility properties at low temperatures, and low magnetic permeability. Duplex stainless steels have generally a corrosion resistance greater than that of most austenitic steels and are magnetic. Other stainless steels with different chemical compositions than the series and types mentioned above, may be used for less restrictive applications.

1.5 Wire for welded wire reinforcement is generally manufactured at 520 MPa [75 ksi] yield strength level. Other strength levels shall be by agreement between the purchaser and manufacturer.

NOTE 2—The term used to refer to yield strength levels are the same as those in ASTM Standards for welded wire reinforcement.

2. Referenced Documents

2.1 ASTM Standards:²

A 82/A 82M Specification for Steel Wire, Plain, for Concrete Reinforcement

A 185/A 185M Specification for Steel Welded Wire Reinforcement, Plain, for Concrete

A 276 Specification for Stainless Steel Bars and Shapes

A 342/A 342M Test Methods for Permeability of Feebly Magnetic Materials

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

A 496/A 496M Specification for Steel Wire, Deformed, for Concrete Reinforcement

A 497/A 497M Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete

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

E 83 Practice for Verification and Classification of Extensometer Systems

2.2 Military Standards:

MIL-STD-129 Marking for Shipment and Storage³

MIL-STD-163 Steel Mill Products Preparation for Shipment and Storage³

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.

Current edition approved Sept. 1, 2006. Published September 2006. Originally approved in 2001. Last previous edition approved in 2001 as A 1022 – 01.

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

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



2.3 Federal Standard:

Fed. Std. No. 123 Marking for Shipments (Civil Agencies)³

2.4 Other Standard:

ACI 318 Building Code Requirements for Structural Concrete⁴

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 stainless steel plain wire and welded plain wire reinforcement—as used within the scope and intent of this specification, designates a material composed of cold-worked stainless steel wire, as cold-drawn or cold-rolled from stainless steel hot-rolled rod. The welded intersections provide the bond strength for shear resistance.

3.1.2 stainless steel deformed wire and welded deformed wire reinforcement—as used within the scope and intent of this specification, designates a material composed of cold-worked deformed stainless steel wire as cold-drawn or cold-rolled from stainless steel hot-rolled rod. Deformations shall be permitted to be indented or raised rib (protrusion) types. As with plain stainless steel welded wire, the welded intersections provide bond strength for shear resistance and the deformations add to the bond strength.

3.1.3 convoluted wire—when wire for welded wire reinforcement is formed into a sinusoidal wave shape, it is commonly referred to as convoluted wire. The wire is used in the manufacture of cages for certain applications of concrete pipe reinforcement. Only plain wire is normally subject to convolution.

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 requirement shall include but are not limited to the following:

4.1.1 Quantity—mass (weight) or square area.

4.1.2 Name of material (Ex: stainless steel welded wire for concrete reinforcement).

4.1.3 Wire spacing and wire sizes.

4.1.4 Exclusion of over-steeling or using a larger area of steel than specified.

4.1.5 Length and width of sheets or rolls.

4.1.6 ASTM designation and year of issue.

4.1.7 Application (corrosion resistance or magnetic permeability).

4.1.8 Grade (strength level).

4.1.9 Chemical composition (stainless steel grade).

4.1.10 Heat treatment condition.

4.1.11 Supplementary requirements (if desired).

NOTE 3—A typical ordering description is as follows: For metric units: 10,000 square meters of welded wire for concrete reinforcement, 305×305-MW65×MW65, in flat sheets 2438 mm wide by 4.6 mm long in secured bundles for crane or forklift truck lifts. For in-lbs units: (100,000 square feet of welded wire for concrete reinforcement, 12×12-W10×W10 in flat sheets 96 in. wide by 15 ft long) in secured bundles for

crane or forklift truck lifts. Testing shall be in accordance with Test Methods A 370.

NOTE 4—Longitudinal wires can be variably spaced. (Ex: 305×305-MW65×MW65, 12×12-W10×W10 or V×305-MD65×MD65 or V×12-D10×D10). See the Tables 1 and 2 for wire sizes.

5. Materials

5.1 Stainless steel wire for welded wire reinforcement shall be cold worked, either drawn or rolled from steel rod, which is rolled from properly identified heats of mold or strand cast steel.

5.2 Cold worked wire or rod used in the manufacture of stainless steel welded reinforcement shall follow the chemical and physical requirements of Specification A 276.

6. Manufacture

6.1 The wire or rod shall be assembled by automatic machines or by other suitable mechanical means which will assure accurate spacing and alignment of all wires of the finished welded wire reinforcement. The finished welded wire reinforcement shall be furnished in flat or bent sheets or in rolls as specified by the purchaser.

6.2 Longitudinal and transverse wires shall be securely connected at every intersection by a process of electrical-resistance welding which employs the principle of fusion combined with pressure.

6.3 Wire of proper grade and quality when fabricated in the manner herein required shall result in a strong, serviceable product having substantially square or rectangular openings. It shall be fabricated and finished in a quality manner and conform to this specification.

6.4 General Requirements for Plain Wire:

6.4.1 Plain Wire Criteria:

TABLE 1 Dimensional Requirements for Plain Wire—SI Units

Size Number ^A	Nominal Diameter, mm	Nominal Area, mm ²
MW 5	2.50	5
MW 10	3.60	10
MW 15	4.40	15
MW 20	5.00	20
MW 25	5.60	25
MW 30	6.20	30
MW 35	6.70	35
MW 40	7.10	40
MW 45	7.60	45
MW 50	8.00	50
MW 55	8.40	55
MW 60	8.70	60
MW 65	9.10	65
MW 70	9.40	70
MW 80	10.10	80
MW 90	10.70	90
MW 100	11.30	100
MW 120	12.40	120
MW 130	12.90	130
MW 200	15.95	200
MW 290	19.22	290

^A This table represents a hard metrication of the most readily available sizes in the welded wire reinforcement industry. Table 1 shall be used in projects that are designed using SI units; Table 2 shall be used on projects designed using inch-pound units. Areas of wire shall 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 increments.

⁴ Available from ACI International, PO Box 9094, Farmington Hills, MI 48333.

**TABLE 2 Dimensional Requirements for Plain Wire—Inch-pound Units**

Size Number ^A	Nominal Diameter, in.	Nominal Area, in ²
W 0.5	0.080	0.005
W 1.2	0.124	0.012
W 1.4	0.134	0.014
W 2	0.160	0.020
W 2.5	0.178	0.025
W 2.9	0.192	0.029
W 3.5	0.211	0.035
W 4	0.226	0.040
W 4.5	0.239	0.045
W 5	0.252	0.050
W 5.5	0.265	0.055
W 6	0.276	0.060
W 8	0.319	0.080
W 10	0.357	0.100
W 11	0.374	0.110
W 12	0.391	0.120
W 14	0.422	0.140
W 16	0.451	0.160
W 18	0.479	0.180
W 20	0.505	0.200
W 22	0.529	0.220
W 24	0.533	0.240
W 26	0.575	0.260
W 28	0.597	0.280
W 30	0.618	0.300
W 31	0.628	0.310
W 45	0.757	0.450

^A This table represents the most readily available sizes in the welded wire reinforcement industry in sizes using inch-pound units. Areas of wire shall be checked with the most efficient and readily available material from producers. Other wire sizes are available and many manufacturers can produce them in 0.0015-in.² increments.

TABLE 3 Bend Test Requirements—Plain Wire

Size Number Of Wire	Bend Test
MW45 [W7] and smaller	Bend around a pin the diameter that is equal to the diameter of the specimen
Larger than MW45 [W7]	Bend around a pin the diameter that is equal to twice the diameter (2d) of the specimen

6.4.1.1 When plain wire is ordered by size number, the relation between size number, diameter, and area shown in **Tables 1 and 2** shall apply.

6.4.2 Testing:

6.4.2.1 Specimens for mechanical properties testing shall be full wire sections and shall be obtained from ends of wire coils as drawn. The specimens shall be of sufficient length to perform testing described in Test Methods **A 370**.

6.4.2.2 Test specimens for determining weld-shear properties shall be obtained by cutting from the finished welded wire, a full width section of sufficient length to perform testing described in Specification **A 185** or Specification **A 497/A 497M**.

6.4.2.3 Measurements for conformance to dimensional characteristics shall be made on full sheets or rolls.

6.4.2.4 If any test specimen exhibits obvious isolated imperfections not representative of the product, it shall be discarded and another specimen substituted.

6.4.2.5 *Reduction of Area*—Shall be determined as described in Test Methods and Definitions **A 370**. The wire shall conform to the reduction of area requirements in **Tables 5 and 6**.

6.4.2.6 One tension and one bend test shall be made from each 9000 kg [10 tons] or less of each size of wire or fraction thereof.

TABLE 4 Permissible Variation in Wire Diameter—Plain Wire

Size Number metric [in.-lbs.]	Nominal Diameter, mm [in.]	Permissible Variation Plus and Minus, mm [in.]
Smaller than MW32 [W5], MW32 [W5] to MW77 [W12], incl	Under 6.4 [0.252] 6.4 [0.252] to 9.93 [0.391], incl	0.08 [0.003] 0.10 [0.004]
Over to MW130 [W20], incl	Over 9.93 [0.391] to 12.83 [0.505], incl	0.15 [0.006]
Over MW130 [W20]	Over 12.83 [0.505]	0.20 [0.008]