Designation: A 1022 – 01

Standard Specification for Deformed and Plain Stainless Steel Wire and Welded Wire for Concrete Reinforcement[1]

This standard is issued under the fixed designation A 1022; 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 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.

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 corrosion 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:*

A 82 Specification for Steel Wire, Plain, for Concrete Reinforcement[2]

A 185 Specification for Steel Welded Wire, Plain for Concrete Reinforcement[2]

A 262 Practices for detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels[3]

A 276 Specification for Stainless Steel Bars and Shapes[3]

A 314 Specification for Stainless Steel Billets and Bars for Forging[3]

A 342 Test Methods for Permeability of Feebly Magnetic Materials[4]

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products[3]

A 496 Specification for Steel Wire, Deformed, for Concrete Reinforcement[2]

A 497 Specification for Steel Welded Wire, Deformed, for Concrete Reinforcement[2]

A 700 Practices for Packaging, Marking and Loading Methods for Steel Products for Domestic Shipment[5]

A 704 Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement[2]

A 955 Deformed and Plain Stainless Steel Bars for concrete Reinforcement (Metric)[2]

[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 03.04

[5] *Annual Book of ASTM Standards*, Vol 01.05

E 83 Practice for Verification and Classification of Extensometers[6]

2.2 *Military Standards:*

MIL-STD-129 Marking for Shipment and Storage[7]

MIL-STD-163 Steel Mill Products Preparation for Shipment and Storage[7]

2.3 *Federal Standard:*

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

2.4 *Other Standard:*

ACI 318 Building Code Requirements for Structural Concrete[8]

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 may 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.

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-mm^2 increments.

[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.

[8] 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, in²
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 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

6.3 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*:

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.

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 may 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),	Under 6.4 (0.252)	0.08 (0.003)
MW32 (W5) to MW77 (W12), incl	6.4 (0.252) to 9.93 (0.391), incl	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)

TABLE 5 Tension Test Requirement—Plain Wire

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

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

TABLE 6 Tension Test Requirement Plain Wire (Material for Welded Wire)

	Size MW8 (W1.2) and Larger	Smaller than Size MW8(W1.2)
Tensile strength, min, MPa (ksi)	515 (75)	485 (70)
Yield strength, min, MPa (ksi)	450 (65)	385 (56)
Reduction of area, min. %	30[A]	30[A]

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

6.5 *General Requirements for Deformed Wire*:

6.5.1 *Deformation Criteria*:

6.5.1.1 Deformations shall be spaced along the wire at a substantially uniform distance and shall be symmetrically disposed around the perimeter. The deformations on all longitudinal lines of the wire shall be similar in size and shape. A minimum of 25 % of the total surface area shall be deformed by measurable deformations.

6.5.1.2 Deformed wire shall have two or more lines of deformations.

6.5.1.3 The average longitudinal spacing of deformations shall be not less than 3.5 nor more than 5.5 deformations per 25 mm (1 in.) in each line of deformations on the wire.

6.5.1.4 The minimum average height of the center of typical deformations based on the nominal wire diameters shown in Tables 7 and 8 shall be as follows:

Wire Sizes	Minimum Average Height of Deformations, Percent of Nominal Wire Diameter
MD 19 (D 3) and finer	4
Coarser than MD 19 (D 3) through MD 65 (D 10)	4½
Coarser than MD 65 (D 10)	5

6.5.1.5 The deformations shall be placed with respect to the axis of the wire so that the included angle is not less than 45º; or if deformations are curvilinear, the angle formed by the transverse axis of the deformation and the wire axis shall be not less than 45º. Where the line of deformations forms an included angle with the axis of the wire from 45º to 70º inclusive, the deformations shall alternately reverse in direction on each side, or those on one side shall be reversed in direction from those on the opposite side. Where the included angle is over 70º, a reversal in direction is not required.

6.5.1.6 The average spacing of deformations shall be determined by dividing a measured length of the wire specimen by the number of individual deformations in any one row of deformations on any side of the wire specimens. A measured length of the wire specimen shall be considered the distance from a point on a deformation to a corresponding point on any other deformation in the same line of deformations on the wire.

6.5.1.7 The minimum average height of deformations shall be determined from measurements made on not less than two typical deformations from each line of deformations on the wire. Measurements shall be made at the center of indentations or raised ribs.

TABLE 7 Dimensional Requirements for Deformed Wire for Concrete Reinforcement in SI Units

Nominal Dimensions					Deformation Requirements
Deformed Wire Size[A,B,C]	D (in^2 X 100)	Unit Mass, kg/m	Diameter, mm[D]	Cross-Sectional Area, mm^2[E]	Minimum Average Height of Deformations, mm[F,G,H]
MD 25	(D 3.9)	0.1962	5.60	25	0.25
MD 30	(D 4.6)	0.2355	6.20	30	0.28
MD 35	(D 5.4)	0.2747	6.70	35	0.30
MD 40	(D 6.2)	0.3140	7.10	40	0.32
MD 45	(D 7.0)	0.3532	7.60	45	0.34
MD 50	(D 7.7)	0.3925	8.00	50	0.36
MD 55	(D 8.5)	0.4317	8.40	55	0.38
MD 60	(D 9.3)	0.4709	8.70	60	0.39
MD 65	(D 10.1)	0.5102	9.10	65	0.46
MD 70	(D 10.8)	0.5494	9.40	70	0.47
MD 80	(D 12.4)	0.6279	10.10	80	0.50
MD 90	(D 13.9)	0.7065	10.70	90	0.54
MD 100	(D 15.5)	0.7849	11.30	100	0.57
MD 120	(D 18.6)	0.9419	12.40	120	0.62
MD 130	(D 20.1)	1.0204	12.90	130	0.64
MD 200	(D 31.0)	1.5700	15.95	200	0.80
MD 290	(D 45.0)	2.2700	19.22	290	0.96

[A] The number following the prefix indicates the nominal cross-sectional area of the deformed wire in square millimeters.
[B] For sizes other than those shown above, the Size Number shall be the number of square millimeters in the nominal area of the deformed wire cross section, prefixed by the letters MD.
[C] These sizes represent the most readily available sizes in the welded wire reinforcement industry. Other wire sizes are available and many manufacturers can produce them in 1 mm^2 increments.
[D] The nominal diameter of a deformed wire is equivalent to the diameter of a plain wire having the same mass per meter as the deformed wire.
[E] The cross-sectional area is based on the nominal diameter. The area in square millimeters may be calculated by dividing the unit mass in kg/mm by 7.849×10^{-6}(mass of 1 mm^3 of steel) or by dividing the unit mass in kg/m by 0.007849 (mass of steel 1 mm square and 1 m long).
[F] The minimum average height of the deformations shall be determined from measurements made on not less than two typical deformations from each line of deformations on the wire. Measurements shall be made at the center of indentation as described in 6.5.1.7.
[G]Spacing of deformations shall not be greater than 7.24 mm nor less than 4.62 mm for all wire sizes.
[H]See 6.5.1.6 for average longitudinal number of deformations per unit length.

TABLE 8 Dimensional Requirements for Deformed Wire for Concrete Reinforcement in in.-lb Units

Nominal Dimensions				Deformation Requirements
Deformed Wire Size[A,B,C]	Unit Weight, lb/ft	Diameter, in.[D]	Cross-Sectional Area, in.[E]	Minimum Average Height of Deformations, in.[F,G,H]
D 1	0.034	0.113	0.01	0.0045
D 2	0.068	0.159	0.02	0.0063
D 3	0.102	0.195	0.03	0.0078
D 4	0.136	0.225	0.04	0.0101
D 5	0.170	0.252	0.05	0.0113
D 6	0.204	0.276	0.06	0.0124
D 7	0.238	0.299	0.07	0.0134
D 8	0.272	0.319	0.08	0.0143
D 9	0.306	0.338	0.09	0.0152
D 10	0.340	0.356	0.10	0.0160
D 11	0.374	0.374	0.11	0.0187
D 12	0.408	0.390	0.12	0.0195
D 13	0.442	0.406	0.13	0.0203
D 14	0.476	0.422	0.14	0.0211
D 15	0.510	0.437	0.15	0.0218
D 16	0.544	0.451	0.16	0.0225
D 17	0.578	0.465	0.17	0.0232
D 18	0.612	0.478	0.18	0.0239
D 19	0.646	0.491	0.19	0.0245
D 20	0.680	0.504	0.20	0.0252
D 21	0.714	0.517	0.21	0.0259
D 22	0.748	0.529	0.22	0.0265
D 23	0.782	0.541	0.23	0.0271
D 24	0.816	0.553	0.24	0.0277
D 25	0.850	0.564	0.25	0.0282
D 26	0.884	0.575	0.26	0.0288
D 27	0.918	0.586	0.27	0.0293
D 28	0.952	0.597	0.28	0.0299
D 29	0.986	0.608	0.29	0.0304
D 30	1.020	0.618	0.30	0.0309
D 31	1.054	0.628	0.31	0.0314
D 45	1.530	0.757	0.45	0.0379

[A] The number following the prefix indicates the nominal cross-sectional area of the deformed wire in square inches multiplied by 100.
[B] For sizes other than those shown above, the Size Number shall be the number of one hundredths of a square inch in the nominal area of the deformed wire cross section, prefixed by the D.
[C] These sizes represent the most readily available sizes in the welded wire reinforcement industry. Other wire sizes are available and many manufacturers can produce them in 1 mm^2 increments.
[D] The nominal diameter of a deformed wire is equivalent to the diameter of a plain wire having the same weight per foot as the deformed wire.
[E] The cross-sectional area is based on the nominal diameter. The area in square inches may be calculated by dividing the weight in pounds by 0.2833 (weight of 1 $in.^3$ of steel) or by dividing the weight per lineal foot of specimen in pounds by 3.4 (weight of steel 1 in. square and 1 foot long).
[F] The minimum average height of the deformations shall be determined from measurements made on not less than two typical deformations from each line of deformations on the wire. Measurements shall be made at the center of indentation or between two raised ribs as described in 6.5.1.7.
[G] Spacing of deformations shall not be greater than 0.285 in. nor less than 0.182 in. for all wire sizes.
[H] See 6.5.1.6 for average longitudinal number of deformations per unit length.

6.5.2 *Mechanical Property Requirements for Deformed Wire*:

6.5.2.1 *Testing*:

(1) When tested as described in Test Methods and Definitions A 370, the material, except as specified in 6.5.2.1.2 shall conform to the tensile property requirements in Table 9, based on nominal area of wire.

TABLE 9 Tension Test Requirements—Deformed Wire

	MPa (psi) min
Tensile strength	585 (85 000)
Yield strength	515 (75 000)

(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. For determining the yield strength use a Class B-1 extensometer as described in E 83.

(3) For material to be used in the fabrication of welded wire, the tensile and yield strength properties shall conform to the requirements given in Table 6, based on nominal area of the wire.

(4) Materials shall be measured at extension under load and 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, at his

option, accept this feature as sufficient evidence of compliance with the specified minimum yield strength tests covered in this specification.

(5) *Bend Test*—The bend test specimen shall be bent at room temperature through 90° without cracking on the outside of the bent portion, as prescribed in Table 11.

6.5.3 *Permissible Variation in Mass (Weight)*:

6.5.3.1 The permissible variation in mass (weight) of any deformed wire is ±6 % of its normal mass (weight). The theoretical mass (weights) shown in Table 7 and Table 8, or similar calculations on unlisted sizes, shall be used to establish the variation.

6.5.4 *Quality, Finish and Appearance*:

6.5.4.1 The wire shall be free of detrimental imperfections and shall have a smooth surface of 3.2 µm (125 µin.) or better. See 10.1 also.

7. Mechanical Property Requirements—Deformed Wire, Except as Noted for Plain Wire (Material for Welded Wire)

7.1 *Tensile*—Wire for the production of welded wire, deformed, is described in Section 6. Tensile tests shall be made on wire cut from the welded wire and tested either across or between the welds; no less than 50 % shall be across welds. Tensile tests across a weld shall have the welded joint located approximately at the center of the wire being tested and the cross wire forming the welded joint shall extend approximately 25 mm (1 in.) beyond each side of the welded joint.

7.1.1 The yield strength shall be determined as described in Test Methods and Definitions A 370 at an extenstion 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 provisions of 13.3. 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 yield strength has been determined.

7.2 *Bend Test*—The wire shall withstand the bend test as described in Table 11 and shall be performed on a specimen taken from between the welds.

7.3 *Weld Shear Strength*—The weld shear strength between longitudinal and transverse wires shall be tested as described in Section 8. For structural applications, the minimum average shear value shall not be less than 241 newtons (35 000 pounds-force) multiplied by the nominal area of the larger wire in square millimeters (inches), where the smaller wire is not less than size MD26 (D4) and has an area of 40 % or more of the area of the larger wire.

7.3.1 For other than structural applications, welded wire having a relationship of larger and smaller wires other than those covered in 7.4 shall meet an average weld shear strength requirement of not less than 3.6 kN (800 lbf) provided that the smaller wire is not smaller than MD26 (D4).

7.3.2 Weld-shear tests for determination of conformance to the requirements of 7.4 shall be conducted using a fixture as described in Section 8.

7.3.3 Four welds selected at random from the specimen described in 11.2 shall be tested for weld shear strength. The transverse wire of each test specimen shall extend approximately 25 mm (1 in.) on each side of the longitudinal wire. The longitudinal wire of each test specimen shall be of such length below the transverse wire so as to be adequately engaged by the grips of the testing machine. It shall be of such length above the transverse wire that its end shall be above the center line of the upper bearing of the testing device.

7.3.4 The material shall be deemed to conform to the requirements for weld shear strength if the average of the four samples complies with the value stipulated in 7.3. If the average fails to meet the prescribed value, all the welds across the specimen shall then be tested. The welded wire shall be acceptable if the average of all weld shear test values across the specimen meets the prescribed minimum value.

TABLE 10 Tension Test Requirements—Deformed Wire (Material for Welded Wire)

	MPa (psi) min
Tensile strength	550 (80 000)
Yield strength	485 (70 000)

TABLE 11 Bend Test Requirements—Deformed Wire

Size Number of Wire	Bend Test
MD 40 (D 6) and smaller	Bend around a pin the diameter that is equal to twice (2d) the diameter of the specimen
Coarser than MD 40 (D 6)	Bend around a pin the diameter that is equal to four times (4d) the diameter of the specimen

8. Weld Shear Test Apparatus and Methods

8.1 As the welds in welded wire contribute to the bonding and anchorage value of the wires in concrete, it is imperative that the weld acceptance tests be made in a jig which will stress the weld in a manner similar to which it is stressed in concrete. In order to accomplish this, the vertical wire in the jig must be stressed in an axis close to its center line. Also the horizontal wire must be held closely to the vertical wire, and in the same relative position, so as to prevent rotation of the horizontal wire. When the welded wire is designed with different wire sizes, the larger diameter wire is the "vertical wire" when tested (see Fig. 1).

8.2 Fig. 1 shows the details of a typical testing jig together with two anvils, which make it possible to test welds for wire up to 19.05 mm (¾ in.) in diameter. This testing jig can be used in most tension testing machines and should be hung in a ball and socket arrangement at the center of the machine. This, or a similarly effective fixture designed on the same principle, shall be acceptable.

8.3 Test specimens shall be inserted through the notch in the anvil using the smallest notch available in which the vertical wire will fit loosely. The vertical wire shall be in contact with the surface of the free rotating rollers while the horizontal wire shall be supported by the anvil on each side of the slot. The bottom jaws of the testing machine shall grip the lower end of the vertical wire and the load shall be applied at a rate of stressing not to exceed 686 MPa/min, (100 000 psi/min).