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Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete[1]

This standard is issued under the fixed designation A1064/A1064M; 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 carbon-steel wire and welded wire reinforcement produced from hot-rolled rod to be used for the reinforcement of concrete. The steel wire is cold-worked, drawn or rolled, plain (non-deformed, as-drawn or galvanized), or deformed. Welded wire reinforcement is made from plain or deformed wire, or a combination of plain and deformed wire. Common wire sizes and dimensions are given in Table 1, Table 2, Table 3, and Table 4. Actual wire sizes are not restricted to those shown in the tables.

NOTE 1—Welded wire for concrete reinforcement has historically been described by various terms: welded wire fabric, WWF, fabric, and mesh. The wire reinforcement industry has adopted the term *welded wire reinforcement* (WWR) as being more representative of the applications of the products being manufactured. Therefore, the term *welded wire fabric* has been replaced with the term *welded wire reinforcement* in this specification and in related specifications.

~~1.2 Supplementary Requirements describe high-strength wire, which manufacturers furnish when specifically ordered. Manufacturers furnish high-strength wire in place of regular wire if mutually agreed to by the purchaser and the manufacturer.~~

1.2 The values stated in either inch-pound or SI units are to be regarded separately as standard. Within the text the SI units are shown in brackets (except in Table 2 and Table 4). 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.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A370 Test Methods and Definitions for Mechanical Testing of Steel Products

A641/A641M Specification for Zinc–Coated (Galvanized) Carbon Steel Wire

A700 Guide for Packaging, Marking, and Loading Methods for Steel Products for Shipment

E83 Practice for Verification and Classification of Extensometer Systems

2.2 *U.S. Military Standard:*[3]

MIL-STD-129 Marking for Shipment and Storage

2.3 *U.S. Military Standard:*[3]

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

2.4 *American Concrete Institute (ACI) Standard:*[4]

ACI 318 Building Code Requirements for Structural Concrete

2.5 *Adjuncts:*

Weld Tester Drawing [5]

[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~~standard's Document Summary page on the ASTM website.

[3] Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, http://www.dodssp.daps.mil.

[4] Available from American Concrete Institute (ACI), P.O. Box 9094, Farmington Hills, MI 48333-9094, http://www.concrete.org.

[5] Available from ASTM International Headquarters. Order Adjunct No. ADJA0185. Original adjunct produced in 1967.

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

TABLE 1 Dimensional Requirements for Plain Wire—Inch-Pound Units[A]

colwidth="34.91*"/COLSPEC Size Number[B, C, D]	Nominal Diameter in. [mm][E]	Nominal Area in.^{2} [mm^2]
W 0.5	0.080 [2.03]	0.005 [3.23]
W 1.2	0.124 [3.14]	0.012 [7.74]
W 1.4	0.134 [3.39]	0.014 [9.03]
~~W 2~~	~~0.160 [4.05]~~	~~0.020 [12.9]~~
W 2	0.160 [4.05]	0.020 [12.9]
W 2.5	0.178 [4.53]	0.025 [16.1]
W 2.9	0.192 [4.88]	0.029 [18.7]
W 3.5	0.211 [5.36]	0.035 [22.6]
~~W 4~~	~~0.226 [5.73]~~	~~0.040 [25.8]~~
W 4	0.226 [5.73]	0.040 [25.8]
W 4.5	0.239 [6.08]	0.045 [29.0]
~~W 5~~	~~0.252 [6.41]~~	~~0.050 [32.3]~~
W 5	0.252 [6.41]	0.050 [32.3]
W 5.5	0.265 [6.72]	0.055 [35.5]
~~W 6~~	~~0.276 [7.02]~~	~~0.060 [38.7]~~
W 6	0.276 [7.02]	0.060 [38.7]
~~W 8~~	~~0.319 [8.11]~~	~~0.080 [51.6]~~
W 8	0.319 [8.11]	0.080 [51.6]
W 10	0.357 [9.06]	0.100 [64.5]
W 11	0.374 [9.50]	0.110 [71.0]
W 12	0.391 [9.93]	0.120 [77.4]
W 14	0.422 [10.7]	0.140 [90.3]
W 16	0.451 [11.5]	0.160 [103]
W 18	0.479 [12.2]	0.180 [116]
W 20	0.505 [12.8]	0.200 [129]
W 22	0.529 [13.4]	0.220 [142]
W 24	0.553 [14.0]	0.240 [155]
W 26	0.575 [14.6]	0.260 [168]
W 28	0.597 [15.2]	0.280 [181]
W 30	0.618 [15.7]	0.300 [194]
W 31	0.628 [16.0]	0.310 [200]
W 45	0.757 [19.2]	0.450 [290]

[A] Table 1 should be used on projects that are designed using inch-pound units; Table 2 should be used on projects that are designed using SI units.
[B] The number following the prefix indicates the nominal cross-sectional area of the wire in square inches multiplied by 100.
[C] For sizes other than those shown above, the Size Number shall be the number of one hundredth of a square inch in the nominal area of the wire cross section, prefixed by the W.
[D] These sizes represent the most readily available sizes in the welded wire reinforcement industry. Other wire sizes are available and many manufactures can produce them in 0.0015 in.^{2} increments.
[E] The nominal diameter is based on the nominal area of the wire.

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *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. Deformed wire is not subject to convolution unless agreed upon by the purchaser and manufacturer.

3.1.2 *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 steel wire as cold-drawn or cold-rolled from hot-rolled steel rod. Deformations can be indented or raised rib (protrusion) types. The deformations and the welded intersections provide bond strength for shear resistance.

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

4. Ordering Information

4.1 It is the responsibility of the purchaser to specify all requirements that are necessary for the manufacture and delivery of the wire and welded wire reinforcement under this specification. Such requirements to be considered include, but are not limited to, the following:

4.1.1 Quantity (weight [mass]) or square area for welded wire reinforcement;

4.1.2 Name of material (cold-drawn or rolled steel wire, or welded wire reinforcement, plain or deformed, for concrete);

4.1.3 Wire size number (see Section 7), wire spacing, and sheet or roll width and length for welded wire reinforcement;

4.1.4 Minimum yield strength ~~if Supplementary Requirements apply;~~or Grade;

4.1.5 Yield strength measurement. The purchaser shall specify the method for measuring yield strength (see 7.1.4.2, 7.2.5.2, or 8.1.2) and has the options described in 12.3;

TABLE 2 Dimensional Requirements for Plain Wire—SI Units[A]

Size Number[B, C, D]	Nominal Diameter mm [in.][E]	Nominal Area mm² [in.²]
~~MW 5~~	~~2.52 [0.099]~~	~~5 [0.008]~~
~~MW 10~~	~~3.57 [0.140]~~	~~10 [0.016]~~
~~MW 15~~	~~4.37 [0.172]~~	~~15 [0.023]~~
~~MW 20~~	~~5.05 [0.199]~~	~~20 [0.031]~~
~~MW 25~~	~~5.64 [0.222]~~	~~25 [0.039]~~
~~MW 30~~	~~6.18 [0.243]~~	~~30 [0.047]~~
~~MW 35~~	~~6.68 [0.263]~~	~~35 [0.054]~~
~~MW 40~~	~~7.14 [0.281]~~	~~40 [0.062]~~
~~MW 45~~	~~7.57 [0.298]~~	~~45 [0.070]~~
~~MW 50~~	~~7.98 [0.314]~~	~~50 [0.078]~~
~~MW 55~~	~~8.37 [0.329]~~	~~55 [0.085]~~
~~MW 60~~	~~8.74 [0.344]~~	~~60 [0.093]~~
~~MW 65~~	~~9.10 [0.358]~~	~~65 [0.101]~~
~~MW 70~~	~~9.44 [0.372]~~	~~70 [0.109]~~
~~MW 80~~	~~10.1 [0.397]~~	~~80 [0.124]~~
~~MW 90~~	~~10.7 [0.421]~~	~~90 [0.140]~~
~~MW 100~~	~~11.3 [0.444]~~	~~100 [0.155]~~
~~MW 120~~	~~12.4 [0.487]~~	~~120 [0.186]~~
~~MW 130~~	~~12.9 [0.507]~~	~~130 [0.202]~~
~~MW 200~~	~~16.0 [0.628]~~	~~200 [0.310]~~
~~MW 290~~	~~19.2 [0.757]~~	~~290 [0.450]~~

TABLE 2 Dimensional Requirements for Plain Wire—SI Units[A]

Size Number[B, C, D]	Nominal Diameter mm [in.][E]	Nominal Area mm² [in.²]
MW 5	2.52 [0.099]	5 [0.008]
MW 10	3.57 [0.140]	10 [0.016]
MW 15	4.37 [0.172]	15 [0.023]
MW 20	5.05 [0.199]	20 [0.031]
MW 25	5.64 [0.222]	25 [0.039]
MW 30	6.18 [0.243]	30 [0.047]
MW 35	6.68 [0.263]	35 [0.054]
MW 40	7.14 [0.281]	40 [0.062]
MW 45	7.57 [0.298]	45 [0.070]
MW 50	7.98 [0.314]	50 [0.078]
MW 55	8.37 [0.329]	55 [0.085]
MW 60	8.74 [0.344]	60 [0.093]
MW 65	9.10 [0.358]	65 [0.101]
MW 70	9.44 [0.372]	70 [0.109]
MW 80	10.1 [0.397]	80 [0.124]
MW 90	10.7 [0.421]	90 [0.140]
MW 100	11.3 [0.444]	100 [0.155]
MW 120	12.4 [0.487]	120 [0.186]
MW 130	12.9 [0.507]	130 [0.202]
MW 200	16.0 [0.628]	200 [0.310]
MW 290	19.2 [0.757]	290 [0.450]

[A] The wire sizes in Table 1 should be used on projects that are designed using inch-pound units; the wire sizes in Table 2 should be used on projects that are designed using SI units.
[B] The number following the prefix indicates the nominal cross-sectional area of the wire in square milimetres.
[C] For sizes other than those shown above, the Size Number shall be the number of square millimetres in the nominal area of the wire cross section, prefixed by the MW.
[D] These sizes represent the most readily available sizes in the welded wire reinforcement industry. Other wire sizes are available and many manufactures can produce them in 1 mm² increments.
[E] The nominal diameter is based on the nominal area of the wire.

4.1.6 Request for outside inspection (if not requested, 14.1 applies);
4.1.7 Exclusion of over-steeling, if required (see 10.4.2 and 10.5.1);
4.1.8 Packaging (see Section 15);
4.1.9 ASTM designation and year of issue; and
4.1.10 Special requirements, if any. ~~(See Supplementary Requirements.)~~

5. Materials

5.1 The steel shall be made by any commercially accepted process.

5.2 Unless otherwise specified, the wire shall be supplied uncoated. When plain wire is specified as galvanized, it shall be galvanized at finish size as described in Specification A641/A641M.

5.3 Wire used in the manufacture of welded wire reinforcement shall conform to this specification ~~and its Supplementary Requirements if so ordered,~~ either solely or in combination of plain or deformed wire, or both.

TABLE 3 Dimensional Requirements for Deformed Wire—Inch-Pound Units

	Nominal Dimensions			Deformation Requirements
Deformed Wire Size[A, B, C, D]	Unit Weight, lb/ft	Diameter, in.[E]	Cross-Sectional Area, in.^{2} [F]	Minimum Average Height of Deformations, in.[G, H, I]
~~D1~~	~~0.034~~	~~0.113~~	~~0.010~~	~~0.0045~~
~~D2~~	~~0.068~~	~~0.160~~	~~0.020~~	~~0.0063~~
~~D3~~	~~0.102~~	~~0.195~~	~~0.030~~	~~0.0078~~
~~D4~~	~~0.136~~	~~0.226~~	~~0.040~~	~~0.0101~~
~~D5~~	~~0.170~~	~~0.252~~	~~0.050~~	~~0.0113~~
~~D6~~	~~0.204~~	~~0.276~~	~~0.060~~	~~0.0124~~
~~D7~~	~~0.238~~	~~0.299~~	~~0.070~~	~~0.0134~~
~~D8~~	~~0.272~~	~~0.319~~	~~0.080~~	~~0.0143~~
~~D9~~	~~0.306~~	~~0.339~~	~~0.090~~	~~0.0152~~
~~D10~~	~~0.340~~	~~0.357~~	~~0.100~~	~~0.0160~~
~~D11~~	~~0.374~~	~~0.374~~	~~0.110~~	~~0.0187~~
~~D12~~	~~0.408~~	~~0.391~~	~~0.120~~	~~0.0195~~
~~D13~~	~~0.442~~	~~0.407~~	~~0.130~~	~~0.0203~~
~~D14~~	~~0.476~~	~~0.422~~	~~0.140~~	~~0.0211~~
~~D15~~	~~0.510~~	~~0.437~~	~~0.150~~	~~0.0218~~
~~D16~~	~~0.544~~	~~0.451~~	~~0.160~~	~~0.0225~~
~~D17~~	~~0.578~~	~~0.465~~	~~0.170~~	~~0.0232~~
~~D18~~	~~0.612~~	~~0.479~~	~~0.180~~	~~0.0239~~
~~D19~~	~~0.646~~	~~0.492~~	~~0.190~~	~~0.0245~~
~~D20~~	~~0.680~~	~~0.505~~	~~0.200~~	~~0.0252~~
~~D21~~	~~0.714~~	~~0.517~~	~~0.210~~	~~0.0259~~
~~D22~~	~~0.748~~	~~0.529~~	~~0.220~~	~~0.0265~~
~~D23~~	~~0.782~~	~~0.541~~	~~0.230~~	~~0.0271~~
~~D24~~	~~0.816~~	~~0.553~~	~~0.240~~	~~0.0277~~
~~D25~~	~~0.850~~	~~0.564~~	~~0.250~~	~~0.0282~~
~~D26~~	~~0.884~~	~~0.575~~	~~0.260~~	~~0.0288~~
~~D27~~	~~0.918~~	~~0.586~~	~~0.270~~	~~0.0293~~
~~D28~~	~~0.952~~	~~0.597~~	~~0.280~~	~~0.0299~~
~~D29~~	~~0.986~~	~~0.608~~	~~0.290~~	~~0.0304~~
~~D30~~	~~1.02~~	~~0.618~~	~~0.300~~	~~0.0309~~
~~D31~~	~~1.05~~	~~0.628~~	~~0.310~~	~~0.0314~~
~~D45~~	~~1.53~~	~~0.757~~	~~0.450~~	~~0.0379~~

TABLE 3 Dimensional Requirements for Deformed Wire—Inch-Pound Units

	Nominal Dimensions			Deformation Requirements
Deformed Wire Size[A, B, C, D]	Unit Weight, lb/ft	Diameter, in.[E]	Cross-Sectional Area, in.^{2} [F]	Minimum Average Height of Deformations, in.[G, H, I]
D 1	0.034	0.113	0.010	0.0045
D 2	0.068	0.160	0.020	0.0063
D 3	0.102	0.195	0.030	0.0078
D 4	0.136	0.226	0.040	0.0101
D 5	0.170	0.252	0.050	0.0113
D 6	0.204	0.276	0.060	0.0124
D 7	0.238	0.299	0.070	0.0134
D 8	0.272	0.319	0.080	0.0143
D 9	0.306	0.339	0.090	0.0152
D 10	0.340	0.357	0.100	0.0160
D 11	0.374	0.374	0.110	0.0187
D 12	0.408	0.391	0.120	0.0195
D 13	0.442	0.407	0.130	0.0203
D 14	0.476	0.422	0.140	0.0211
D 15	0.510	0.437	0.150	0.0218
D 16	0.544	0.451	0.160	0.0225
D 17	0.578	0.465	0.170	0.0232
D 18	0.612	0.479	0.180	0.0239
D 19	0.646	0.492	0.190	0.0245
D 20	0.680	0.505	0.200	0.0252
D 21	0.714	0.517	0.210	0.0259
D 22	0.748	0.529	0.220	0.0265
D 23	0.782	0.541	0.230	0.0271
D 24	0.816	0.553	0.240	0.0277
D 25	0.850	0.564	0.250	0.0282
D 26	0.884	0.575	0.260	0.0288
D 27	0.918	0.586	0.270	0.0293
D 28	0.952	0.597	0.280	0.0299
D 29	0.986	0.608	0.290	0.0304
D 30	1.02	0.618	0.300	0.0309
D 31	1.05	0.628	0.310	0.0314
D 45	1.53	0.757	0.450	0.0379

[A] The wire sizes in Table 3 should be used on projects that are designed using inch-pound units; the wire sizes in Table 4 should be used on projects that are designed using SI units.
[B] The number following the prefix indicates the nominal cross-sectional area of the deformed wire in square inches multiplied by 100.

[C] 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.
[D] 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 0.0015 $in.^2$ increments.
[E] The nominal diameter of a deformed wire is equivalent to the nominal diameter of a plain wire having the same weight per foot as the deformed wire.
[F] The cross-sectional area is based on the weight of the wire. 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).
[G] 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 7.2.4.7.
[H] Spacing of deformations shall not be greater than 0.285 in. nor less than 0.182 in. for all wire sizes.
[I] See 7.2.4.3 for average number of deformations per unit length.

TABLE 4 Dimensional Requirements for Deformed Wire—SI Units

Nominal Dimensions					Deformation Requirements
Deformed Wire Size[A, B, C, D]	D [$in.^2$ × 100]	Unit Mass, kg/m	Diameter, mm[E]	Cross-Sectional Area, mm^2 [F]	Minimum Average Height of Deformations, mm[G, H, I]
~~MD 25~~	~~[D 3.9]~~	~~0.196~~	~~5.64~~	~~25~~	~~0.252~~
~~MD 30~~	~~[D 4.7]~~	~~0.235~~	~~6.18~~	~~30~~	~~0.279~~
~~MD 35~~	~~[D 5.4]~~	~~0.275~~	~~6.68~~	~~35~~	~~0.302~~
~~MD 40~~	~~[D 6.2]~~	~~0.314~~	~~7.14~~	~~40~~	~~0.320~~
~~MD 45~~	~~[D 7.0]~~	~~0.353~~	~~7.57~~	~~45~~	~~0.342~~
~~MD 50~~	~~[D 7.8]~~	~~0.392~~	~~7.98~~	~~50~~	~~0.360~~
~~MD 55~~	~~[D 8.5]~~	~~0.432~~	~~8.37~~	~~55~~	~~0.378~~
~~MD 60~~	~~[D 9.3]~~	~~0.471~~	~~8.74~~	~~60~~	~~0.392~~
~~MD 65~~	~~[D 10.1]~~	~~0.510~~	~~9.10~~	~~65~~	~~0.455~~
~~MD 70~~	~~[D 10.9]~~	~~0.549~~	~~9.44~~	~~70~~	~~0.470~~
~~MD 80~~	~~[D 12.4]~~	~~0.628~~	~~10.1~~	~~80~~	~~0.505~~
~~MD 90~~	~~[D 14.0]~~	~~0.706~~	~~10.7~~	~~90~~	~~0.535~~
~~MD 100~~	~~[D 15.5]~~	~~0.785~~	~~11.3~~	~~100~~	~~0.565~~
~~MD 120~~	~~[D 18.6]~~	~~0.942~~	~~12.4~~	~~120~~	~~0.620~~
~~MD 130~~	~~[D 20.2]~~	~~1.02~~	~~12.9~~	~~130~~	~~0.645~~
~~MD 200~~	~~[D 31.0]~~	~~1.57~~	~~16.0~~	~~200~~	~~0.800~~
~~MD 290~~	~~[D 45.0]~~	~~2.28~~	~~19.2~~	~~290~~	~~0.961~~

TABLE 4 Dimensional Requirements for Deformed Wire—SI Units

Nominal Dimensions					Deformation Requirements
Deformed Wire Size[A, B, C, D]	D [$in.^2$ × 100]	Unit Mass, kg/m	Diameter, mm[E]	Cross-Sectional Area, mm^2 [F]	Minimum Average Height of Deformations, mm[G, H, I]
MD 25	[D 3.9]	0.196	5.64	25	0.252
MD 30	[D 4.7]	0.235	6.18	30	0.279
MD 35	[D 5.4]	0.275	6.68	35	0.302
MD 40	[D 6.2]	0.314	7.14	40	0.320
MD 45	[D 7.0]	0.353	7.57	45	0.342
MD 50	[D 7.8]	0.392	7.98	50	0.360
MD 55	[D 8.5]	0.432	8.37	55	0.378
MD 60	[D 9.3]	0.471	8.74	60	0.392
MD 65	[D 10.1]	0.510	9.10	65	0.455
MD 70	[D 10.9]	0.549	9.44	70	0.470
MD 80	[D 12.4]	0.628	10.1	80	0.505
MD 90	[D 14.0]	0.706	10.7	90	0.535
MD 100	[D 15.5]	0.785	11.3	100	0.565
MD 120	[D 18.6]	0.942	12.4	120	0.620
MD 130	[D 20.2]	1.02	12.9	130	0.645
MD 200	[D 31.0]	1.57	16.0	200	0.800
MD 290	[D 45.0]	2.28	19.2	290	0.961

[A] The wire sizes in Table 3 should be used on projects that are designed using inch-pound units; the wire sizes in Table 4 should be used on projects that are designed using SI units.
[B] The number following the prefix indicates the nominal cross-sectional area of the deformed wire in square millimetres.
[C] For sizes other than those shown above, the Size Number shall be the number of square millimetres in the nominal area of the deformed wire cross section, prefixed by the MD.
[D] 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.
[E] The nominal diameter of a deformed wire is equivalent to the nominal diameter of a plain wire having the same weight per metre as the deformed wire.
[F] The cross-sectional area is based on the mass of the wire. The area in square millimetres 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).
[G] 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 7.2.4.7.
[H] Spacing of deformations shall not be greater than 7.24 mm nor less than 4.62 mm for all wire sizes.
[I] See 7.2.4.3 for average number of deformations per unit length.

6. Manufacture

6.1 The wire shall be cold-worked, drawn or rolled, from rods that have been hot-rolled from billets.

6.2 For welded wire reinforcement, the wires 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 product. The finished welded wire reinforcement shall be furnished in flat or bent sheets or in rolls as specified by the purchaser.

6.3 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.

6.4 Welded wire reinforcement of proper yield strength and quality when manufactured in the manner herein required shall result in a strong, serviceable mat-type product having substantially square or rectangular openings, and shall conform to this specification.

NOTE 2—A variation of manufacturing includes the application of one or more longitudinal convoluted wires at one edge of welded wire reinforcement for concrete pipe reinforcing cages. This shape allows the cage ends to be expanded to a larger diameter to accommodate the bell-shaped ends of concrete pipe.

7. Mechanical Property Requirements—Wire, Plain and Deformed

7.1 *General Requirements for Plain Wire:*

7.1.1 The relation between size number, diameter, and area shown in Table 1 or Table 2 shall apply, whichever is applicable.

7.1.2 Specimens for mechanical properties testing shall be full wire sections and shall be obtained from ends of wire coils as drawn or rolled. The specimens shall be of sufficient length to perform testing described in Test Methods and Definitions A370.

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

7.1.4 *Tension Test:*

7.1.4.1 When tested as described in Test Methods and Definitions A370, the material, except as specified in 7.1.4.2, shall conform to the tensile property requirements in Table 5 or Table 6, whichever is applicable, based on the nominal area of the wire.

7.1.4.2 When required by the purchaser, yield strength shall be determined as described using a Class B-l extensometer as described in Practice E83. The yield strength shall be determined as described in Test Methods and Definitions A370 at an extension under load of 0.5 % of gage length or by the offset method (0.2 %). It shall be permissible to remove the extensometer after the yield strength has been determined. The wire shall meet the requirements of Table 5 or Table 6, whichever is applicable.

7.1.4.3 For wire to be used in the manufacture of welded wire reinforcement, the tensile and yield strength properties shall conform to the requirements given in Table 6, based on the nominal area of the wire.

7.1.4.4 The wire shall not be required to exhibit a definite yield point as evidenced by a distinct ~~drop of the beam~~ arrest or halt in the ~~gage~~ load indication gauge of the testing machine prior to reaching ultimate tensile load. The purchaser shall have the option to accept this feature as sufficient evidence of compliance with the specified minimum yield strength tests covered in this specification.

7.1.5 *Bend Test*—The bend test specimen shall withstand being bent at room temperature through 180° without cracking on the outside of the bent portion, as prescribed in Table 8.

7.1.6 *Reduction of Area Test*—The reduction of area shall be determined as described in Test Methods and Definitions A370. The wire shall conform to the reduction of area requirements in Table 5 or Table 6, whichever is applicable.

7.1.7 *Permissible Variation in Wire Diameter:*

7.1.7.1 The permissible variation in wire diameter shall conform to the requirements in Table 7.

7.1.7.2 The difference between the maximum and minimum diameters, as measured on any given cross section of the wire, shall not exceed the tolerances listed in Table 7 for the given wire size.

7.2 *General Requirements for Deformed Wire:*

7.2.1 The relation between size number, diameter, and area shown in Table 3 or Table 4 shall apply, whichever is applicable.

7.2.2 Specimens for mechanical properties testing shall be full wire sections and shall be obtained from ends of wire coils as rolled. The specimens shall be of sufficient length to perform testing described in Test Methods and Definitions A370.

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

TABLE 5 Tension Test Requirements—Plain Wire

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Tensile strength, min, psi [MPa]	80 000 [550]
Yield strength, min, psi [MPa]	70 000 [485]
Reduction of area, min, %	30[A]

TABLE 5 Tension Test Requirements—Plain Wire

	Grade 70 [485]	Grade 72.5 [500]	Grade 75 [515]	Grade 77.5 [533]	Grade 80 [550]
Tensile strength, min, psi [MPa]	80 000 [550]	82 500 [568]	85 000 [585]	87 500 [603]	90 000 [620]
Yield strength, min, psi [MPa]	70 000 [485]	72 500 [500]	75 000 [515]	77 500 [533]	80 000 [550]
Reduction of area, min, %	30[A]	30[A]	30[A]	30[A]	30[A]

[A] For material testing over 100 000 psi [690 MPa] tensile strength, the reduction of area shall be not less than 25 %.