QQ-W-321d
May 10, 1967
SUPERSEDING
Fed. Spec. QQ-W-321c
July 5, 1961,
Fed. Spec. QQ-W-340a
September 10, 1964, and
Fed. Spec. QQ-W-401a
April 8, 1963

FEDERAL SPECIFICATION

WIRE, COPPER ALLOY

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers fourteen alloys of round, hexagonal, octagonal, and flat (rectangular and square) copper alloy wire.

1.2 Classification.

1.2.1 Alloys and tempers. The wire covered by this specification shall be furnished in the alloys and tempers shown below.

Alloy No.	Temper								
	Annealed	*Eighth* hard	*Quarter* hard	*Half* hard	Three *Quarter* hard	*Hard*	*Extra* hard	*Spring*	*Extra* spring
210	x	x	x	x	x	x	x	x	x
220	x	x	x	x	x	x	x	x	x
230	x	x	x	x	x	x	x	x	x
240	x	x	x	x	x	x	x	x	x
260	x	x	x	x	x	x	x	x	x
270	x	x	x	x	x	x	x	x	x
274	x	x	x	x	x	x	x	x	x
510								x	
745			x	x		x		x	
752			x	x		x			
757			x	x		x		x	
764			x	x		x		x	
770			x	x		x		x	
794				x					

1.2.2 Forms. Copper alloy wire shall be furnished in the following forms:

Round—all alloys.

Hexagonal—all alloys except 510.

Octagonal—all alloys except 510.

Flat (rectangular and square)—all listed 200 series alloys.

2. APPLICABLE DOCUMENTS

2.1 The following specifications and standards, of the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

Federal Standards:

Fed. Std. No. 123—Marking for Domestic Shipment (Civilian agencies).
Fed. Std. No. 146—Tolerances for Copper and Copper Base Alloy Mill Products.
Fed. Test Method Std. No. 151—Metals; Test Methods.
Fed. Std. No. 185—Identification Marking of Copper and Copper Base Alloy Mill Products.

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

(Single copies of this specification and other product specifications required by activities outside the Federal Government for bidding purposes are available without charge at the General Services Administration Regional Offices in Boston, New York, Washington, D. C., Atlanta, Chicago, Kansas City, Mo., Dallas, Denver, San Francisco, and Auburn, Washington.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

Military Specification:

MIL-C-3993—Copper and Copper Base Alloy Mill Products; Packaging of.

Military Standards:

MIL-STD-105—Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129—Marking for Shipment and Storage.

(Copies of specifications, standards, drawings and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 Chemical composition. The material shall conform to the chemical requirements specified in table I.

TABLE I. Chemical requirements, percent maximum unless range is indicated

Copper alloy No.	Copper	Nickel [a]	Lead	Iron	Manganese	Tin	Zinc	Phosphorus	Total other elements
210	94.0 to 96.0	—	0.05	0.05	—	—	Rem.	—	0.10
220	89.0 to 91.0	—	.05	.05	—	—	Rem.	—	.10
230	84.0 to 86.0	—	.05	.05	—	—	Rem.	—	.15
240	78.5 to 81.5	—	.05	.05	—	—	Rem.	—	.15
260	68.5 to 71.5	—	.07	.05	—	—	Rem.	—	.15
270	63.0 to 68.5	—	.10	.05	—	—	Rem.	—	.15
274	61.0 to 64.0	—	.10	.05	—	—	Rem.	—	.20
510	[b]	—	.05	.10	—	3.5 to 5.8	0.30	0.03 to 0.35	—
745	63.5 to 68.5	9.0 to 11.0	.10	.25	0.50	—	Rem.	—	.50
752	63.0 to 66.5	16.5 to 19.5	.10	.25	.50	—	Rem.	—	.50
757	63.5 to 66.5	11.0 to 13.0	.05	.25	.50	—	Rem.	—	.50
764	58.5 to 61.5	16.5 to 19.5	.05	.25	.50	—	Rem.	—	.50
770	53.5 to 56.5	16.5 to 19.5	.10	.25	.50	—	Rem.	—	.50
794	59.0 to 66.5	16.5 to 19.5	0.8 to 1.2	.25	.50	—	Rem.	—	.50

[a] Cobalt plus nickel.
[b] Copper plus tin plus phosphorus—99.5 percent minimum.

3.1.1 Analysis shall be made regularly only for the elements specifically mentioned in table I. If, however, the presence of other elements is suspected, or indicated in the course of routine analysis, further analysis shall be made to determine that the total of other elements is not in excess of the limits specified.

3.2 Mechanical properties.

3.2.1 Tensile properties. Wire 0.02 inch and over in diameter or distance between parallel surfaces shall conform to the tensile requirements of tables II, III, IV, and V for the temper specified. However, these requirements shall not apply to hard, extra-hard, and spring temper wire in any sizes beyond the limits of availability defined in table II for these respective tempers. Tensile-strength requirements for wire under 0.02 inch in diameter or distance between parallel surfaces (other than alloy No. 510) shall be as specified in the invitation for bids or in the contract or order.

TABLE II. Tensile strength, round, hexagonal, and octagonal wire, 200 series alloys, 0.02 inch and over in diameter or distance between parallel faces

Temper	Tensile strength, k.s.i.				
	Alloy No. 210	Alloy No. 220	Alloy No. 230	Alloy No. 240	Alloy Nos. 260, 270, 274
Eighth hard	35 to 45	38 to 50	43 to 57	50 to 65	50 to 65
Quarter hard	41 to 51	45 to 57	53 to 65	62 to 75	62 to 77
Half hard	49 to 58	56 to 67	66 to 77	78 to 90	79 to 94
Three quarter hard	57 to 64	64 to 74	76 to 86	90 to 101	92 to 107
Hard [a]	61 to 68	70 to 79	83 to 92	100 to 110	102 to 117
Extra hard [b]	66 to 73	78 to 86	94 to 102	112 to 121	115 to 129
Spring [c]	72 min.	84 min.	100 min.	116 min.	120 min.

[a] Hard temper wire is not generally available in sizes over ½ inch in diameter.
[b] Extra hard temper wire is not generally available in sizes over ⅜ inch in diameter.
[c] Spring temper wire is not generally available in sizes over ¼ inch in diameter.

TABLE III. Tensile strength and elongation, round, wire, alloy number 510, up to 0.50 inch in diameter

Diameter, inch	Tensile strength, k.s.i., min.	Elongation in 4 times diameter, percent
Up to and including 0.025	145	—
Over 0.025 to 0.0625, incl.	135	—
Over .0625 to .125, incl.	130	—
Over .125 to .250, incl.	125	—
Over .250 to .375, incl.	120	5.0
Over .375 to .500, incl.	105	9.0

TABLE IV. Tensile strength, round, hexagonal, and octagonal wire, 700 series alloys, 0.02 to 0.250 inch, incl. in diameter or distance between parallel faces [a]

Temper	Diameter or distance between parallel faces, inch	Tensile strength, k.s.i.			
		Alloy Nos. 745, 757	Alloy No. 752	Alloy Nos. 764, 770	Alloy No. 794
Quarter hard	0.02 to 0.250, incl.	73 to 88	68 to 84	74 to 93	—
Half hard	.02 to .250, incl.	88 to 103	83 to 97	92 to 110	75 to 95
Hard	.02 to .250, incl.	108 to 123	99 to 111	112 to 128	—
Spring	.02 to .0253, incl.	130 min.	—	130 min.	—
	Over 0.0253 to 0.0625, incl.	125 min.	—	125 min.	—
	Over .0625 to .125, incl.	120 min.	—	120 min.	—
	Over .125 to .250, incl.	112 min.	—	120 min.	—

[a] Hexagonal and octagonal wire are normally furnished only in the quarter hard temper.

TABLE V. Tensile strength, flat wire, 0.02 inch and over in thickness

Rolled temper	Tensile strength, k.s.i.					
	Alloy No. 210	Alloy No. 220	Alloy No. 230	Alloy No. 240	Alloy No. 260	Alloy Nos. 270, 274
Quarter hard	37 to 47	40 to 50	44 to 54	48 to 58	49 to 59	49 to 59
Half hard	42 to 52	47 to 57	51 to 61	55 to 65	57 to 67	55 to 65
Three quarter hard	46 to 56	52 to 62	57 to 67	61 to 71	64 to 74	62 to 72
Hard	50 to 59	57 to 66	63 to 72	68 to 77	71 to 81	68 to 78
Extra hard	56 to 64	64 to 72	72 to 80	78 to 87	83 to 92	79 to 89
Spring	60 to 68	69 to 77	78 to 86	85 to 93	91 to 100	86 to 95
Extra spring	61 min.	72 min.	82 min.	89 min.	95 min.	90 min.

3.2.2 Bend properties. Spring temper wire up to 0.250 inch shall withstand without cracking, being bent at room temperature through an angle of 120° around a radius equal to the diameter or distance between parallel faces of the wire.

3.3 Grain size. Annealed wire shall conform to the grain size requirements shown in table VI.

TABLE VI. Grain size requirements for annealed wire

Alloy No.	Grain size, mm.		
	Nominal	Minimum	Maximum
210, 220	0.050	0.035	0.090
	.035 [a]	.025	.050
	.025 [a]	.015	.035
	.015 [a]	[b]	.025
230	0.070	0.050	0.100
	.050 [a]	.035	.070
	.035 [a]	.025	.050
	.025 [a]	.015	.035
	.015 [a]	[b]	.025
240	0.070	0.050	0.120
	.050 [a]	.035	.070
	.035 [a]	.025	.050
	.025 [a]	.015	.035
	.015 [a]	[b]	.025
260, 270, 274	0.120	0.070	—
	.070	.050	0.120
	.050	.035	.070
	.035	.025	.050
	.025	.015	.035
	.015	[b]	.025

[a] These nominal grain sizes are those in which wire other than flat are normally available. Flat wire is normally available in any of the nominal grain sizes listed.
[b] No minimum required, but material shall be fully recrystallized.

3.4 Internal stresses. When specified (see 6.2), alloy series 200 wire, except annealed, shall withstand the mercurous-nitrate test without cracking (see 4.6.5).

3.5 Dimensional tolerances. The following references of Fed. Std. No. 146 shall apply:

Dimension	Reference
Round, hexagonal, or octagonal wire:	
Diameter or distance between parallel surfaces	
Alloy Nos. 210, 220, 230, 240, 260, 270, 274	24a(1)
Alloy Nos. 510, 745, 752, 757, 764, 770, 794	24b(1)
Flat wire:	
Thickness	2a(1)
Width	2a(2)
Length	2a(3)
Length schedule	2a(4)
Straightness	2a(5)
Edge contours	2a(6)

3.6 Identification marking. When specified (see 6.2), product identification marking shall be in accordance with Fed. Std. No. 185 (see 6.2 and 6.3).

3.7 Workmanship. Material shall be uniform in quality and temper, clean, sound, smooth, and free from foreign material, pipes, slivers, laps, cracks, seams, scale, burrs, buckles, damaged ends, and other defects which due to their nature, degree, or extent, detrimentally affect the serviceability for the intended use.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Lot. Unless otherwise specified (see 6.2), a lot shall consist of 10,000 pounds or fraction thereof, of material of the same alloy, form, temper, and size, subjected to inspection at one time.

4.3 Sampling. Samples taken for the purpose of the tests prescribed in this specification shall be selected in a manner that will represent correctly the material furnished and avoid needless destruction of finished material when samples representative of the material are available from other sources.

4.3.1 For chemical analysis. The number of samples specified in table VII shall be selected from a different piece in each lot. From each sample, not less than 2 ounces of copper alloy material shall be obtained either as cleaned millings, drillings, or clippings.

TABLE VII. Sampling for chemical analysis

Pounds of material in lot	Number of samples *
Up to 5,000	2
5,001 to 10,000	4

* If the number of original bar, billets, or cakes from which the material is processed is less than the number of samples specified, not more than one sample need to be taken from each piece.

4.3.2 For mechanical properties.

4.3.2.1 Tension test. Two tension test specimens shall be taken from each lot. Each specimen shall be taken from a different piece.

4.3.2.2 Bend test. Two samples of 510 alloy wire and one sample of 700 series alloy wire in the spring temper shall be taken from each lot.

4.3.3 For grain size. Three samples shall be selected from each lot of annealed wire up to 0.150-inch diameter or thickness, and two samples from each lot of annealed wire over 0.150 to 0.750-inch diameter or thickness, inclusive. Each sample shall be selected from a different piece.

4.3.4 For mercurous-nitrate test. When required, unless otherwise specified (see 6.2), one sample shall be selected for mercurous-nitrate test from each lot.

4.3.5 For visual and dimensional examination. From each lot of material, a representative sample shall be selected in accordance with MIL-STD-105, inspection level II, with an acceptable quality level (AQL) of 1.5 percent. The samples selected for dimensional examination may be the same as those selected for visual examination, but shall be evaluated separately.

4.3.5.1 When material is furnished on spools, reels, or hucks, the sample for examination shall be taken from within 10 feet of the outer end. If the sample is rejected due to handling marks, an additional 20 feet shall be selected for examination.

4.4 Examination.

4.4.1 Visual and dimensional. Pieces selected in accordance with 4.3.4 shall be visually examined to determine compliance with the requirements for identification marking (see 3.6), and workmanship (see 3.7), and shall be measured for compliance with the dimensional requirements (see 3.5).

4.4.2 Straightness. Straightness shall be determined by placing the piece on a level surface so that the arc or departure from straightness is horizontal. The maximum depth of the arc shall be measured to the nearest $\frac{1}{32}$ inch by means of a straightedge and a steel scale.

4.4.3 Preparation for shipment. Examination of the packing and marking for shipment shall be made for conformance to the requirements of section 5.

4.5 Test specimens.

4.5.1 Tension test specimens. Tension test specimens for wire shall be full cross section and not less than 15 inches in length. Specimens shall be free from bends or kinks. The distance between the jaws of the testing machine with the specimen in place ready for testing shall be not less than 10 inches.

4.5.2 Mercurous-nitrate test specimens. The test specimen shall be the full cross-section size of the material approximately 6 inches in length, but shall not exceed 12 inches in length. The sawed or cut edges may be removed by machining or smoothing with a file, but the specimens shall receive no annealing, bending, springing, polishing, or other preparation preliminary to this test.

4.6 Test procedures.

4.6.1 Chemical analysis. The samples selected in accordance with 4.3.1 shall be analyzed by the wet chemical method in accordance with method 111 of Fed. Test Method Std. No. 151 or the spectrochemical method in accordance with method 112 of Fed. Test Method Std. No. 151 to determine conformance to 3.1. A single analysis of a composite sample may be made when emission methods are not used. In case of dispute, the analysis by the wet method (method 111) shall be the basis for acceptance.

4.6.2 Tension tests. Specimens from samples selected in accordance with 4.3.2 shall be tested in accordance with method 211 of Fed. Test Method Std. No. 151.

4.6.3 Bend tests. Specimens selected in accordance with 4.3.2.2 shall be tested in accordance with method 231 of Fed. Test Method Std. No. 151.

4.6.4 Grain size determination. Grain size shall be determined in accordance with method 312 of Fed. Test Method Std. No. 151.

4.6.5 Mercurous-nitrate test. When required (see 3.4), the mercurous nitrate test shall be conducted in accordance with method 831 of Fed. Test Method Std. No. 151.

4.7 Rejection.

4.7.1 Examination defects. Any sample unit having one or more defects shall be rejected. If the number of nonconforming sample units in the sample exceeds the acceptance number specified in 4.3.5

for that sample size, the entire lot shall be rejected subject to the provisions of the section on "Acceptance and Rejection" of MIL-STD-105.

4.7.2 Test failures. A lot shall be rejected for failure to meet any of the test requirements when tested in accordance with 1.6, subject to the provisions of the section on "Rejection and Retests" of Fed. Test Method Std. No. 151.

5. PREPARATION FOR DELIVERY

5.1 Packing (see 6.2).

5.1.1 Levels A and B. The material shall be packed in accordance with MIL-C-3993.

5.1.2 Level C. The products shall be separated by size, composition, and temper and packed in accordance with the manufacturer's standard practice into containers of a type and size commonly used for the purpose, to insure acceptance by carrier for transportation at the lowest rate applicable and to afford maximum protection from normal hazards of transportation.

5.2 Marking (see 6.2 and 6.3).

5.2.1 Civil agencies. In addition to any special marking required by the contract or order, shipping containers shall be marked in accordance with Fed. Std. No. 123.

5.2.2 Military agencies. In addition to any special marking required by the contract or order, shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use.

6.1.1 Alloy number 210 is malleable and suitable for drawing. It is used in making firing pins and primers.

6.1.2 Alloy number 220 is used in making grillwork, screen cloth, rivets, screws, and screen wire.

6.1.3 Alloy number 230 has excellent cold working properties and is used in making fasteners.

6.1.4 Alloy number 240 has excellent soldering properties and ability for being cold worked. It is used for ornamental metal work.

6.1.5 Alloy number 260 is used for grillwork, bead chain, fasteners, pins, rivets, screws, and springs.

6.1.6 Alloy number 270 is used for grillwork, bead chain, fasteners, pins, rivets, screws, and springs.

6.1.7 Alloy number 274 is used for grillwork, bead chain, springs, fasteners, pins, rivets, and screws.

6.1.8 Alloy number 510 is used in the manufacture of phosphor bronze helical springs.

6.1.9 Series 700 alloys are suitable for various hardware and instrument parts in which color and corrosion resistance are factors in their application. Alloys 745, 752, and 757 are for general use, it being intended that alloy 745 would be used wherever applicable in the interest of conserving nickel. Alloys 761 and 770 are for use generally in the hard or spring temper. Alloy 794 is for use where ease of machining is important.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

(a) Title, number, and date of this specification.
(b) Alloy, temper, and form required (see 1.2).
(c) Size required (see 3.2.1 and 3.5).
(d) Tensile strength of wire under 0.02 inch in diameter or distance between parallel faces (except alloy No. 510) when required (see 3.2.1).
(e) Grain size of annealed temper (see 3.3).
(f) If a mercurous-nitrate test is required (see 3.4 and 4.3.4).
(g) When product identification marking in accordance with Fed. Std. No. 185 is required (see 3.6).
(h) Whether material is to be packed by level A, B, or C, (see 5.1).
(i) Maximum gross weight of container (see 5.1).
(j) Special marking, if required (see 5.2).

6.3 The requirements for product identification marking (see 3.6), for packing (see 5.1), and marking (see 5.2), for shipment specified herein apply to direct shipment for Government activities and apply

also, when specified, to contracts or orders between the manufacturer and the Government prime contractor.

6.4 The compositions covered by this specification are similar to the compositions of wire of the following specifications as indicated in table VIII.

TABLE VIII. Similar alloys

QQ-W-321d alloy No.	QQ-W-321c comp.	QQ-W-340a alloy No.	QQ-W-401a	ASTM designation and alloy
210	1			B 134,1
220	2			B 134,2
230	3			B 134,3
240	4			B 134,4
260	6			B 134,6
270	7			B 134,7
274	8			B 134,8
510				B 159,A
745		745		B 206,E
752		752		B 206,A
757		757		B 206,D
764		764		B 206,B-1
770		770		B 206,B
794		794		B 206,C

[a] Only alloy covered.

TABLE IX. Approximate Rockwell hardness for annealed flat wire

Alloy No.	Grain size, mm., nominal	Approximate Rockwell hardness [a]	
		F scale	30-T scale
210	0.050	40 to 52 [b]	4 max.
	.035	47 to 54 [b]	7 max.
	.025	50 to 61 [b]	1 to 17
	.015	54 to 64 [b]	7 to 23
220	0.050	50 to 60	1 to 16
	.035	54 to 64	7 to 21
	.025	58 to 70	13 to 31
	.015	62 to 75	19 to 39
230	0.070	53 to 60	6 to 16
	.050	56 to 63	10 to 20
	.035	58 to 66	13 to 24
	.025	60 to 72	16 to 34
	.015	62 to 79	19 to 48
240	0.070	53 to 64	2 to 21
	.050	57 to 67	8 to 27
	.035	61 to 72	16 to 35
	.025	63 to 77	20 to 42
	.015	66 to 83	25 to 50
260, 270, 274	0.120	50 to 62	21 max.
	.070	52 to 67	3 to 27
	.050	61 to 73	20 to 35
	.035	65 to 76	25 to 38
	.025	67 to 79	27 to 42
	.015	72 to 85	33 to 50

[a] Rockwell hardness values apply as follows: The F scale is used for wire 0.020 inch in thickness and over, and the 30-T scale is used for wire 0.015 inch in thickness and over. Where possible, the F scale should be used.
[b] This alloy in these several annealed tempers is too soft for Rockwell F hardness tests below 0.030 inch in thickness.

6.5 Since the Rockwell hardness tests offer a quick and convenient method of checking brass alloys of any temper for general conformity to the requirements for tensile strength of grain size, the approximate Rockwell hardness values for each temper of flat wire are given in tables IX and X for general information.

TABLE X. Approximate Rockwell hardness for flat wire

Alloy No.	Rolled temper	Tensile strength, k.s.i.	Approximate Rockwell hardness [a]		
			B scale	F scale	30-T scale
210	Quarter hard	37 to 47	20 to 52	69 to 88 [b]	29 to 51
	Half hard	42 to 52	40 to 60	82 to 95 [b]	43 to 56
	Three quarter hard	46 to 56	50 to 64	—	50 to 60
	Hard	50 to 59	57 to 67	—	54 to 62
	Extra hard	56 to 64	65 to 72	—	60 to 65
	Spring	60 to 68	68 to 75	—	62 to 67
	Extra spring	61 to 69	69 to 76	—	63 to 68
220	Quarter hard	40 to 50	27 to 56	70 to 90 [b]	34 to 54
	Half hard	47 to 57	50 to 66	88 to 98 [b]	50 to 61
	Three quarter hard	52 to 62	59 to 71	—	56 to 64
	Hard	57 to 66	65 to 75	—	60 to 67
	Extra hard	64 to 72	72 to 79	—	65 to 70
	Spring	69 to 77	76 to 81	—	68 to 71
	Extra spring	72 to 80	78 to 83	—	69 to 72
230	Quarter hard	44 to 54	33 to 62	78 to 94 [b]	38 to 58
	Half hard	51 to 61	56 to 71	92 to 102 [b]	54 to 64
	Three quarter hard	57 to 67	66 to 76	—	60 to 68
	Hard	63 to 72	72 to 80	—	65 to 70
	Extra hard	72 to 80	78 to 85	—	69 to 74
	Spring	78 to 86	82 to 87	—	72 to 75
	Extra spring	82 to 90	84 to 89	—	73 to 76
240	Quarter hard	48 to 58	38 to 65	80 to 95 [b]	42 to 60
	Half hard	55 to 65	59 to 73	93 to 102 [b]	56 to 66
	Three quarter hard	61 to 71	69 to 79	—	63 to 70
	Hard	68 to 77	76 to 84	—	68 to [illegible]
	Extra hard	78 to 87	83 to 89	—	72 to 76
	Spring	85 to 93	87 to 92	—	75 to 78
	Extra spring	89 to 97	88 to 93	—	76 to 79
260	Quarter hard	49 to 59	40 to 65	—	43 to 60
	Half hard	57 to 67	60 to 77	—	56 to 68
	Three quarter hard	64 to 74	72 to 82	—	65 to 72
	Hard	71 to 81	79 to 86	—	70 to 74
	Extra hard	83 to 92	85 to 91	—	74 to 77
	Spring	91 to 100	89 to 93	—	75 to 78
	Extra spring	95 to 104	91 to 95	—	77 to 79
270 and 274	Quarter hard	49 to 59	40 to 65	—	43 to 60
	Half hard	55 to 65	57 to 74	—	54 to 66
	Three quarter hard	62 to 72	70 to 80	—	65 to 71
	Hard	68 to 78	76 to 84	—	68 to 73
	Extra hard	79 to 89	83 to 89	—	73 to 76
	Spring	86 to 95	87 to 92	—	75 to 78
	Extra spring	90 to 99	88 to 93	—	76 to 79

[a] Rockwell hardness values apply as follows: The B and F scales are used for wire 0.020 inch in thickness and over. The 30-T scale is used for wire 0.012 inch in thickness and over. Where possible, the B scale should be used.
[b] The Rockwell B scale is preferred for testing material in these tempers.

6.6 Definition. Wire is a solid section, other than strip, furnished in coils or on spools, reels, or bucks.

6.7 When the terms "200 series alloys" or "700 series alloys" are used in this specification, they are intended to cover only those alloys specifically listed herein.

6.8 With reference to tensile strength values, the term "k.s.i." replaces the former term "p.s.i.". It is defined as "thousand pounds per square inch".

6.9 Metric equivalents. To obtain tensile strength values in kilograms per square millimeter (kg.f/mm.^{2}), multiply the values in tables II, III, and IV by 703.

Custodians:
Army—MR
Navy—AS
Air Force—6

Review activities:
Army—MI, MR, AV, WC, GL, MU
Navy—AS
Air Force—69

User activities:
Army—ME
Navy—SH
Air Force—None

Preparing activity
Army—MR

Civil Interest:
GSA
COM
JUS
HEW
AGR

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