



Designation: **B 197/B 197M – 9301**

Standard Specification for Copper-Beryllium Alloy Wire¹

This standard is issued under the fixed designation B 197/B 197M; 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.

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

1. Scope*

1.1 This specification ~~covers~~ establishes the requirements for copper-beryllium alloy wire in coils, spools, or other than straight

¹ This specification is under the jurisdiction of ASTM Committee ~~B-5~~ B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.02 on Rod, Bar, Wire, Shapes, and Forgings.

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

lengths, of any uniform cross section. Copper Alloy UNS Nos. C17200 and C17300² are included. ~~NOTE 1—A complete metric companion to~~

~~1.2 Unless otherwise required, Copper Alloy UNS No. C17200 shall be the alloy furnished whenever Specification B 197 has been developed—B 197M; therefore, no metric equivalents B 197/B 197M is specified without any alloy designation.~~

~~1.3 The values stated in either inch-pounds or SI units are to be regarded separately as the standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the specification.~~

~~1.4 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 The following documents of in the current issue in effect on date of material purchase the Book of Standards form a part of this specification to the extent referenced herein:

2.2 ASTM Standards:

~~B 197M4~~ Specification for Copper-Beryllium Alloy ~~Wire (Metric)~~ Plate, Sheet, Strip, and Rolled Bar³

B 250 Specification for General Requirements for Wrought Copper-Alloy Wire³

B 601 Practice for Temper Designations for Copper and Copper Alloys—Wrought and Cast³

B 846 Terminology for Copper and Copper Alloys³

E 8 Test Methods for Tension Testing of Metallic Materials⁴

~~E 55 Practice 8M Test Methods for Sampling Wrought Nonferrous Metals and Alloys for Determination~~ Tension Testing of Chemical Composition⁵ Metallic Materials [Metric]⁴

~~E 106 Test Methods for Chemical Analysis of Copper Beryllium Alloys⁵~~

E 112 Test Methods for Determining Average Grain Size⁴

E 527 Practice for Numbering Metals and Alloys (UNS)⁵

² The UNS system for copper and copper alloys (see Practice E 527) is a simple expansion of the former standard designation system accomplished by the addition of a prefix “C” and a suffix “00.” The suffix can be used to accommodate composition variations of the base alloy.

³ Annual Book of ASTM Standards, Vol 02.01.

⁴ Annual Book of ASTM Standards, Vol 03.01.

⁵ Annual Book of ASTM Standards, Vol ~~03.05:~~ 01.01.

3. Ordering Information

- ~~3.1 Orders for material to this specification shall include the General Requirements~~
- ~~3.1 The following information:~~
- ~~3.1.1 Quantity;~~
 - ~~3.1.2 Copper Alloy UNS Number (see 1.1);~~
 - ~~3.1.3 Form sections of material: cross section such as round, hexagonal, octagonal, etc.;~~
 - ~~3.1.4 Temper (see 5.1);~~
 - ~~3.1.5 Dimensions: diameter or distance between parallel surfaces, and length if applicable;~~
 - ~~3.1.6 How furnished: coils, spools, reels, or bucks, and specific lengths with or without ends or stock lengths with or without ends if applicable.~~
 - ~~3.1.7 Type Specification B 250 constitute a part of edge, if required: square corners, rounded corners, rounded edge, full-rounded edge (see the Edge Contours paragraph in the Dimensions this specification:~~
 - ~~3.1.1 Terminology,~~
 - ~~3.1.2 Material and Manufacturer,~~
 - ~~3.1.3 Chemical Composition,~~
 - ~~3.1.4 Dimensions and Permissible Variations-S₂,~~
 - ~~3.1.5 Workmanship, Finish, and Appearance,~~
 - ~~3.1.6 Sampling,~~
 - ~~3.1.7 Number of Specification B 250);~~
 - ~~3.1.8 Tension test or hardness as applicable (see Section 8);~~
 - ~~3.1.9 Bend test for rectangular cross sections after precipitation heat treatment, if required (see Section 13);~~
 - ~~3.1.10 Package size (see the Packaging Tests and Package Marking Section Retests,~~
 - ~~3.1.8 Specimen Preparation,~~
 - ~~3.1.9 Test Methods,~~
 - ~~3.1.10 Significance of Specification B 250);~~
 - ~~3.1.11 Certification if required (see the Certification Section of Specification B 250);~~
 - ~~3.1.12 Mill test report, if required (see the Mill Numerical Limits,~~
 - ~~3.1.11 Inspection,~~
 - ~~3.1.12 Rejection and Rehearing,~~
 - ~~3.1.13 Certification,~~
 - ~~3.1.14 Mill Test Report Section of Specification B 250);~~
 - ~~3.1.13 Specification number and date, and~~
 - ~~3.1.14 Special tests or exceptions, if any:~~
- ~~3.2 When material is purchased for agencies of the U. S. Government, this shall be specified in the contract or purchase order, and the material shall conform Report, and~~
- ~~3.1.15 Packaging and Package Marking.~~
- ~~3.2 In addition, when a section with a title identical to the Supplementary Requirements as defined that referenced in 3.1 above, appears in this specification, it contains additional requirements which supplement those appearing in Specification B 250.~~

4. Terminology

- ~~4.1 For terms related to copper and copper alloys, refer to Terminology B 846.~~
- ~~4.2 Definition of Term Specific to This Standard:~~
- ~~4.2.1 grain count—the number of grains per stock thickness.~~

5. Ordering Information

- ~~5.1 Orders for products should include the following information:~~
- ~~5.1.1 ASTM specification designation and year of issue,~~
- ~~5.1.2 Copper (Alloy) UNS No. designation,~~
- ~~5.1.3 Temper (Section 7),~~
- ~~5.1.4 Dimensions, diameter, or distance between parallel surfaces, and length if applicable,~~
- ~~5.1.5 Form of material: cross section such as round, hexagonal, octagonal, oval, trapezoidal, and so forth,~~
- ~~5.1.6 How furnished: coils spools, reels, or bucks, and specific lengths with or without ends or stock lengths with or without ends if applicable, and~~
- ~~5.1.7 When material is ordered for agencies of the U.S. Government (see Section 15).~~
- ~~5.2 The following options are available and should be specified in the contract or purchase order when required:~~
- ~~5.2.1 Type of edge: square corners, round edge, full-rounded edge (see the Edge Contours section in the Dimensions and Permissible Variations Section of Specification B 250),~~
- ~~5.2.2 Grain size (Section 9.1),~~
- ~~5.2.3 Grain count (Section 9.2),~~

- 5.2.4 Mechanical properties (tensile strength and hardness) (Section 10),
- 5.2.5 Bend test (after precipitation heat treatment) (11.1),
- 5.2.6 Heat identification or traceability details,
- 5.2.7 Special packaging requirements,
- 5.2.8 Certification, and
- 5.2.9 Mill test report.

6. Chemical Composition

- ~~4.6.1 The material shall conform to the chemical composition requirements shown prescribed in Table 1:~~
- ~~4.2 These specification for copper alloy UNS No. designation specified in the ordering information.~~
- ~~6.2 These composition limits do not preclude the presence of other elements. Limits for unnamed elements may be established and analysis required by agreement between the manufacturer or supplier and the purchaser.~~
- ~~6.3 Copper is customarily be given as remainder and, but may be taken as the difference between the sum of all elements analyzed and 100 %.~~
- ~~6.4 When all the elements in Table 1 are analyzed, their sum shall be 99.5 % minimum.~~
- ~~4.3 Samples for chemical analysis shall be taken during determined, the pouring sum of each heat. One sample per heat results shall be analyzed. The identity of each heat of metal shall be maintained through each stage of the manufacturing process to the final form. Heat size shall be 12 000 lb (5455 kg) or fraction thereof. One heat per lot is processed. When required or when disagreement on analysis occurs, samples for chemical analysis shall be taken and prepared in accordance with Practice E 55. Samples from four individual pieces or lengths of finished product shall be selected. If the lot consists of less than four pieces or lengths, a sample shall be taken from each individual piece or length.~~
- ~~4.4 The determination of chemical composition shall be made in accordance with suitable chemical, spectrochemical, or other methods. In case of disagreement, the composition shall be determined in accordance with Test Methods E 106.~~

5. 99.5 % min.

7. Temper

~~5.7.1 The standard temper designations tempers available under this specification and as specified in Practice B 601 are TB00 (solution heat treated), or with varying degrees of cold work TD00 to TD04 to be precipitation heat treated by the user. Also available are products already precipitation heat-treated by the manufacturer, tempers TF00 (AT), TH00 to TH04. These products meet property requirements in Tables 2 and and Table 3 and generally do not require no further heat treatment by the user. Special or nonstandard tempers are subject to negotiation between the supplier and the purchaser.~~

~~5.2 The user.~~

~~7.2 The pretempered product TL08 shown in Table 4 is prepared by the manufacturer for special applications.~~

~~NOTE 1—Special or nonstandard tempers are subject to negotiation between the supplier and the purchaser.~~

68. GPrecipitation-S Heat Treatment

~~8.1 The precipitation heat treatment is normally performed by the purchaser after forming. The heat treatment specified herein is applicable to mill products. Other treatment times and temperatures may be preferable for end products made from this material.~~

~~8.2 Conformance to the TF00 (AT) through TH04 (HT) specification limits shown in Tables 2 and 3 for products supplied in the TB00 (A) through TD04 (H) tempers, shall be determined by testing test specimens heat-treated at a uniform temperature of 600 to 625°F [316 to 329°C] for the times shown in Table 5.~~

TABLE 1 Chemical Requirements

Element	Composition, %	
	Copper Alloy UNS No. C17200	Copper Alloy UNS No. C17300
Beryllium	1.80–2.00	1.80–2.00
Beryllium	1.80–2.00	1.80–2.00
Additive elements:		
Additive elements:		
Nickel + cobalt, min	0.20	0.20
Nickel + cobalt + iron, max	0.6	0.6
Lead	...	0.20–0.60
Aluminum, max	0.20	0.20
Aluminum, max	0.20	0.20
Silicon, max	0.20	0.20
Silicon, max	0.20	0.20
Copper	remainder	remainder
Copper	remainder	remainder

TABLE 2 Tensile Strength Requirements for Round, Hexagonal, Octagonal, and Square Wire After Precipitation Heat Treatment (See 7 11.2)

Temper Designation		Tensile Strength, ^A ksi ^B	
Standard	Former	ksi ^B	MPa
TF00	Precipitation hardened (AT)	160–200† ^C	
TF00	Precipitation hardened (AT)	160–200 ^C	
TH01	¼ hard and precipitation heat treated (¼ HT)	175–210† ^C	
TH01	¼ hard and precipitation heat treated (¼ HT)	175–210 ^C	
TH02	½ hard and precipitation heat treated (½ HT)	185–215	
TH02	½ hard and precipitation heat treated (½ HT)	185–215	
TH03	¾ hard and precipitation heat treated (¾ HT) ^C	190–230	
TH03	¾ hard and precipitation heat treated (¾ HT) ^D	190–230	
TH04	Hard and precipitation heat treated (HT)	195–230	
TH04	Hard and precipitation heat treated (HT)	195–230	

^AThese values apply to mill products (see 7 11.2).—See 8.3 for exceptions in mill products.

^Bksi = 1000 psi.

^CCorrected editorially.

^DTH03 (¾ HT) condition is generally available up to 0.080 in. [2.0 mm], inclusive, in diameter or distance between parallel surfaces.

†Corrected editorially.

TABLE 3 Mechanical Property Requirements^A for Rectangular Other Than Square Wire After Precipitation Heat Treatment (See 9 11.2)

NOTE 1—Rockwell hardness values apply only to direct determinations, not converted values.

Temper Designation		Tensile Strength ^A ksi ^B		Rockwell-H hardness ^{C,D}		
Standard	Former	ksi ^C	MPa	C Scale, min	30N Scale, min	15N Scale, min
TF00	Precipitation hardened (AT)	165–190		36	56	78
TH01	¼ hard and precipitation heat treated (¼ HT)	175–200		38	58	79
TH01	¼ hard and precipitation heat treated (¼ H)	175–200		38	58	79
TH02	½ hard and precipitation heat treated (½ HT)	185–210		39	59	79.5
TH02	½ hard and precipitation heat treated (½ HT)	185–210		39	59	79.5
TH04	Hard and precipitation heat treated (HT)	190–215		40	60	80

^AThe upper limit in the tensile strength column applies to material thicker than 0.020 in. [0.50 mm].

^BThe thickness of material that may be tested in the case of the Rockwell hardness scales is as follows:

C Scale	0.032 in. and over	= [0.80 mm and over]
30N	0.020 to 0.032 in., excl	[0.50 to 0.80 mm, excl]
15N Scale	0.015 to 0.020 in., excl	[0.38 to 0.50 mm, excl]

^CThe thickness of material that may be tested in the case of the Rockwell hardness scales is as follows:

C Scale	0.032 in. and over
30N	0.020 to 0.032 in., excl
15N Scale	0.015 to 0.020 in., excl

8.3 Special combinations of properties such as increased ductility, electrical conductivity, dimensional accuracy, endurance life, and resistance to elastic drift and hysteresis in springs may be obtained by special precipitation-hardening heat treatments. The mechanical requirements of Tables 2 and 3 do not apply to such special heat treatments.

9. Physical Property Requirements

9.1 *Grain Size*—The average grain size of each of two samples of rectangular other than square wire, in thicknesses over 0.010 in. [0.25 mm] taken after precipitation heat treatment (see 9 8.2), shall not exceed the limits specified in Table 5 6 when determined

TABLE 4 Tensile Strength Requirements for Round, Hexagonal, Octagonal, and Square Wire After Mill Hardening (Pretempered TL08-Former Designation XHT)

Diameter or Distance Between Parallel Surfaces, in.	Tensile Strength, ksi ^A	Diameter or Distance Between Parallel Surfaces, mm	Tensile Strength, MPa
—Over 0.050 to 0.075, excl	140–165	—0.075 to 0.100, excl	120–140
Over 0.050 to 0.075, excl	140–165	0.075 to 0.100, excl	
0.075 to 0.100, excl	120–140	0.100 to 0.114, incl	
0.100 to 0.114, incl	115–130	[2.5 to 2.9, excl]	

^Aksi = 1000 psi.

TABLE 10 5 BeStand Tard Precipit Requation Heat Treatments Time for-Re Acceptangular Other Than Square Wirest

Standard	Temper Designation Before Hardening	Time ^t	
		Round, Hexagonal, Octagonal, and Square Wire	Rectangular Other Than Square Wire
TF00	Precipitation hardened (AT)	5t	3
TB00	Solution heat treated (annealed)	3	3
TH04	hard and precipitation heat treated (¼ HT)	6t	2½
TD01	Quarter-hard	2	2½
TH02	Half-hard	1½ hard and precipitation heat treated (½ HT)	9t
TD02	Half-hard	1½	2
TH04	Hard and precipitation heat treated (HT)	15t	2
TD03	Three-quarter hard	1	2
TD04	Hard	1	2

^AThe t refers to the measured average stock thickness to be tested.

TABLE 5 6 Grain Size Requirements for Rectangular Other Than Square Wire

Thickness, in.	Maximum Average Grain Size, mm	Thickness, mm
Over 0.010 to 0.030, incl	0.035	
Over 0.030 to 0.090, incl	0.045	
Over 0.090 to 0.188, incl	0.060	

in accordance with Test Methods E 112 and taken on a plane perpendicular to the direction of rolling or drawing. 7

9.2 Grain Count:

79.2.1 The grain count of each of two samples of rectangular other than square wire, in thicknesses over 0.004 to 0.010 in. [0.10 to 0.25 mm] inclusive, taken after precipitation heat treatment (see 9.8.2), shall not be less than the limits specified in Table 6 when tested in accordance with 7.2.

TABLE 6 10 GraiBen Count Test Requirements for Rectangular Other Than Square Wire

Thickness, in.	Temper Designation	Minimum Number of Grains	Test Radius ^A
	TF00	Precipitation hardened (AT)	5t
Over 0.006 to 0.008, incl	¾ hard and precipitation heat treated (¾ HT)	7	6t
	TH01	¼ hard and precipitation heat treated (¼ HT)	6t
Over 0.008 to 0.010, incl	½ hard and precipitation heat treated (½ HT)	8	9t
	TH02	½ hard and precipitation heat treated (½ HT)	9t
	TH04	Hard and precipitation heat treated (HT)	15t

^AThe t refers to the measured average stock thickness to be tested.

7.2 Grain count is the number of grains per stock thickness, averaged for five locations one stock thickness apart. Grain count shall be determined in a plane perpendicular to the direction of rolling or drawing.

8. Mechanical Properties

8.1 Round, hexagonal, octagonal, and square wire in all tempers and sizes shall conform to the requirements specified in Table 7 in the solution heat-treated and the solution heat-treated and cold-worked condition; and in Table 2 after precipitation heat treatment. Pretempered (mill-hardened) wire shall conform to the requirements specified in Table 4.

8.2 Rectangular other than square wire in all tempers shall conform to the requirements specified in Table 8 in the solution heat-treated and the solution heat-treated and cold-worked condition; and in Table 3 after precipitation heat treatment. Hardness testing shall be the standard acceptance test for all tempers and applicable sizes of rectangular other than square wire 0.015 in. thick or over unless otherwise specified. When specified by purchaser, or when thickness tested in accordance with 9.2.2.

9.2.2 Grain count is less than 0.015 in., or when agreement on hardness tests cannot be reached, the tensile strength requirements number of Table 8 and Table 3 shall be the basis of acceptance or rejection.

9. Precipitation Heat Treatment

9.1 The precipitation heat treatment is normally performed by the purchaser after machining or forming. The heat treatment specified herein is applicable to mill products. Other treatment times and temperatures may be preferable grains per stock thickness, averaged for end products made from this material.

9.2 Conformance to the TF00 (AT) through TH04 (HT) specification limits shown in Table 2 and Table 3 for products supplied in the TB00 (A) through TD04 (H) tempers; five locations one stock thickness apart. Grain count shall be determined by testing test specimens heat-treated at in a uniform temperature of 600 plane perpendicular to 625°F for the times shown in Table 9.

9.3 Special combinations direction of properties such as increased ductility, electrical conductivity, dimensional accuracy; endurance life, and resistance to elastic drift and hysteresis in springs may be obtained by special precipitation-hardening heat treatments. The mechanical requirements of Table 2 and Table 3 do not apply to such special heat treatments. rolling or drawing.

10. Dimensions and Mass, Permissible Variations Property Requirements

10.1 The dimensions and tolerances property requirement basis for material covered by this specification shall be as specified acceptance or rejection for product in all forms and tempers is listed in the current edition of Specification B 250, with particular reference to Tables as follows:

10.1.1 For round, hexagonal, octagonal, and square wire:

10.1.1.1 In the Dimensions solution heat-treated, and Permissible Variations Section solution heat-treated and cold worked conditioning—Table 8,

10.1.1.2 After precipitation heat-treatment—Table 2,

10.1.1.3 In the following tables of that specification:

10.2 Number of Samples—Examination for dimensional conformance pretempered (mill-hardened) condition—Table 4.

10.1.2 For rectangle other than square wire:

10.1.2.1 Rockwell hardness shall be made to ensure conformance to the tolerance specified. On approval basis of acceptance or rejection for wire 0.015 in. (0.040 mm) thick or over unless otherwise specified—Table 9.

10.1.2.2 For wire less than 0.015 in. (0.40 mm), or when agreement on hardness tests cannot be reached, the consumer tensile strength requirements shall apply.

TABLE 7 Tensile Strength and Grain Count Requirements for Round, Hexagonal, Octagonal, and Square Wire

Temper Designation	Thickness, mm	Tensile Strength, ksi ^A
Standard	St Grains	Former
	Thickness, mm	
TB-00 Over 0.004 to 0.006, incl	— Solution heat treated (annealed)	58–78
	— (A)	58–78
6 TD-04 Over 0.006 to 0.008, incl	— (A)	
	— Quarter-hard (¼ H)	90–115
TD02 7 TD-03 Over 0.008 to 0.010, incl	— Quarter-hard (¼ H)	90–115
	— Half-hard (½ H)	110–135
TD04 8	— Half-hard (½ H)	110–135
	— Three-quarter hard ^B (¾ H)	130–155
	— Three-quarter hard ^B (¾ H)	130–155
	— Hard (H)	140–165
	— Hard (H)	140–165

^A ksi = 1000 psi.

^B TD03 (¾ H) and TD04 (H) tempers are generally available up to 0.080 in., inclusive, in diameter or distance between parallel surfaces.

TABLE 8 Mechanical Property Requirements for Rectangular Other Than Square Wire

NOTE 1—Hardness values shown apply only to direct determinations, not converted values. Wire

Standard	Temper Designation	Tensile Strength, ksi ^A		Elongation ^B in 2 in., min, %	Rockwell Hardness ^B 15T Scale
		B Scale	30T Scale		
FB00	Solution heat treated (annealed) (A)	60–78	35	45–78	46–67
TB00	Solution heat treated (annealed) (A)	58–78	35	45–78	46–67
FD01	Quarter-hard (¼ H)	75–88	40	68–90	62–75
TD01	Quarter-hard (¼ H)	90–115	40	68–90	62–75
FD02	Half-hard (½ H)	85–100			
TD02	Half-hard (½ H)	110–135			
		88–96		88–91	
TD03	Three-quarter hard ^B (¾ H)	130–155			
FD04	Hard (H)	100–120	–2	96–102	79–83
TD04	Hard (H)	140–165	–2	96–102	79–83

^Aksi = 1000 psi.

^BElongation requirement applies only to wire 0.004 in. [0.10 mm] and thicker. The thickness of material that may be tested in the case of the Rockwell hardness scales is as follows:

B Scale	0.032 in. and over	30T Scale	0.020 to 0.032 in., excl
15T Scale	0.015 to 0.020 in., excl		

TABLE 9 Mechanical Property Requirements for Rectangular Other Than Square Wire

NOTE 1—Hardness values shown apply only to direct determinations, not converted values.

Standard	Temper Designation Before Hardening	Tensile Strength			Rockwell Hardness ^B		
		Round, Hexagonal, Octagonal, and Square Wire ^C	ReMPa	Elongation ^A in 2 in. [52F0 mm], min, %	B Scale	30T Scale	15T Scale
FB00	Solution heat treated (annealed)	3		35	45–78	46–67	75–85
TB00	Solution heat treated (annealed) (A)	60–78		35	45–78	46–67	75–85
FD01	Quarter-hard	2	–	40	68–90	62–75	83–89
TD01	Quarter-hard (¼ H)	75–88		10	68–90	62–75	83–89
FD02	Half-hard	4	2				
TD02	Half-hard (½ H)	85–100	2				
	TD03	Three-quarter hard	1	2			
		88–96		88–91			
FD04	Hard	4		2	96–102	79–83	91–94
TD04	Hard (H)	100–120	[690–830]	2	96–102	79–83	91–94

^AElongation requirement applies only to wire 0.004 in. [0.10 mm] and thicker.

^BThe thickness of material that may be tested in the case of the Rockwell hardness scales is as follows:

B Scale	0.032 in. and over	[0.80 mm and over]
30T Scale	0.020 to 0.032 in., excl	[0.50 to 0.80 mm, excl]
15T Scale	0.015 to 0.020 in., excl	[0.38 to 0.50 mm, excl]

^Cksi = 1000 psi.

10.1.2.3 In the manufacturer may use a mutually acceptable system of statistical quality control for such sampling solution heat-treated and examination.

10.3 Diameter or Distance Between Parallel Surfaces—See 5.2, Table 2.

10.4 Thickness⁶—See 5.3, Table 4.

10.5 Width⁷—See 5.4, Table 6.

10.6 Length⁷—See 5.5, Table 7 and Table 8, and

10.7 Straightness⁷—See 5.6, Table solution heat-treated and cold-worked condition—Table 9.

10.1.2.4 After precipitation heat-treatment—Table 3.

11. General Performance Requirements

11.1 Material furnished to this specification

11.1 Bend Tests Requirements:

11.1.1 Round, hexagonal, octagonal, and square wire in tempers shown in Table 8 shall ~~conform~~ withstand being bent cold through five successive turns on a radius equal to the ~~applicable requirements~~ diameter or distance between parallel surfaces of the wire.

11.1.1.1 The specimens shall not develop cracks visible to the unaided eye.

11.2 When specified (see 5.2.5), rectangular other than square wire after precipitation heat treatment, according to Table 5 and having dimensions of ~~Specification B 250~~ 0.004 to 0.020 in. [0.10 to 0.50 mm], inclusive in thickness, and having a width of at least four times its thickness, shall conform to the requirements specified in Table 10 when tested in accordance with 14.2.

12. Dimensions and Permissible Variations

12.1 The dimensions and tolerances for material covered by this specification shall be as specified in the current edition of Specification B 250, with particular reference to the Dimensions and Permissible Variations Section and the following tables of that specification:

12.2 *Diameter or Distance Between Parallel Surfaces*—See 6.2, Table 2.

12.3 *Thickness*⁶—See 6.3, Table 4.

12.4 *Width*⁶—See 6.4, Table 6.

12.5 *Length*⁶—See 6.5, Tables 7 and 8.

12.6 *Straightness*⁶—See 6.6, Table 9.

13. Specimen Preparation

13.1 Tension test specimens, when required, shall be prepared in a full cross-section area if practicable. Full cross-section or machined specimens shall be as specified in Test Methods E 8 and E 8M.

NOTE 2—Mechanical property data determined on other than round cross section, for sizes under 0.125 in. [3.2 mm], may be compromised and be inaccurate due to the stress riser effect on the corner.

13. Bend Tests

13.1 Round, hexagonal, octagonal, and square wire in tempers shown in Table 7 shall withstand being bent cold through five successive turns on a radius equal to the diameter or distance between parallel surfaces of the wire, and shall not develop cracks visible to the unaided eye.

13.2 When specified (see 3.1.9), rectangular other than square wire after precipitation heat treatment, in any temper, 0.004 to 0.020 in., inclusive, in thickness, and having a width of at least four times its thickness, shall conform to the requirements specified in Table 10 when tested in accordance with 13.3.

13.3 Five specimens, not exceeding 0.500 in. in width, of any convenient length shall be precipitation heat-treated in accordance with 18.2. The specimen shall be clamped firmly between a flat jaw and the test radius, as shown in Fig. 1. The test specimen shall be bent approximately 90° around the test radius, using a tangential wiping motion with adequate radial pressure to ensure continuous contact between the specimen and the test radius. To pass the bend test, at least four specimens out of five, and at least 80% of the total specimens tested from a lot must withstand the 90° bend without visible crack or fracture when observed in the full 90° bend position. The test radius shall be within ± 6% of the nominal radius up to 0.010 in., exclusive, and within ± 4% for radii 0.010 in. and over.

14. RTest Mesthods

14.1 *Chemical Analysis*—In case of dispute, the test method in Specification B 194 Annex shall be used for determining chemical requirements for the elements and ranges shown in Table 1.

14.2 *Bend Test*—Five specimens of any convenient length that have been precipitation heat tresated int accordance with Table 5, shall be clamped firmly between a flat jaw and test radius, as shown in Fig. 1. The test radius shall be within ± 6% of the

Annual Book of ASTM Standards, Vol 01.01.

⁶ Applicable to flat (rectangular and square) wire only.

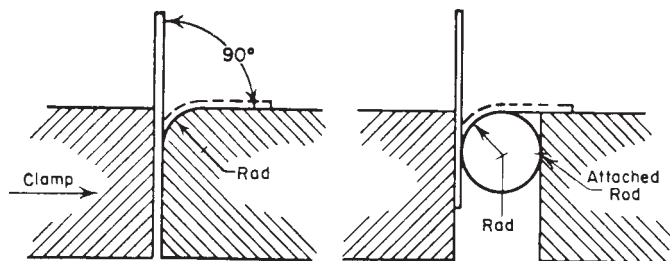


FIG. 1 Methods for Clamping Specimen to Radius for Bend Test

specimen fails thickness up to meet the requirements 0.010 in. [0.25 mm], and within ± 4 % of this specification, the material represented by the specimen thickness 0.010 in. [0.25 mm] and over. The test specimen shall be rejected.

14.2 If any bent approximately 90 degrees around the test radius, using a tangential wiping motion with adequate radial pressure to ensure continuous contact between the specimen shows defective machining or develops flaws, it may be discarded and another specimen substituted.

14.3 If the results of the test radius. To pass the bend test, at least four out of five, and at least 80 % of the specimen fail to meet the specified requirements, two additional total specimens shall be taken tested from different sample pieces and tested. The results of a lot must withstand the 90 degree bend without visible cracks or fractures when observed in the full 90 degree bend position.

15. Orders for U.S. Government Agencies

15.1 Orders for agencies of these specimens shall meet the specified requirements. Failure U.S. Government shall conform to meet the specified special government requirements shall be cause for rejection. stipulated in the Supplement Requirements Section in Specification B 250.

16. Keywords

16.1 copper-beryllium; wire

SUMMARY OF CHANGES

This section identifies the principle changes to B 197/B 197M that have been incorporated since the 1999 version.

- (1) Section 10, Property Requirements, has been changed.
- (2) Paragraph 11.2 was changed.
- (3) Section 12, Dimensions and Permissible Variations, was changed.
- (4) Paragraph 14.2 was changed.

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