



Designation: **B248M—17** **B248M – 22**

Standard Specification for General Requirements for Wrought Copper and Copper- Alloy Plate, Sheet, Strip, and Rolled Bar (Metric)¹

This standard is issued under the fixed designation B248M; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

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

1. Scope*

1.1 This specification establishes the general requirements common to several wrought product specifications. Unless otherwise specified in the purchase order or in an individual specification, these general requirements shall apply to copper and copper-alloy plate, sheet, strip, and rolled bar supplied under each of the following product specifications issued by ASTM: ~~B19, B36/B36M, B96/B96M, B103/B103M, B121/B121M, B122/B122M, B130, B152/B152M, B169/B169M, B194, B422/B422M, B465, B534, B591, B592, B694, B740, B747, B768, B888/B888M, and B936.~~²

1.2 *Units*—This specification is the companion specification to inch-pound Specification **B248**.

1.3 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 The following documents of the issue in effect on date of material purchase form a part of this specification to the extent referenced herein:

2.2 *ASTM Standards:*³

- ~~B19 Specification for Cartridge Brass Sheet, Strip, Plate, Bar, and Disks~~
- ~~B36/B36M Specification for Brass Plate, Sheet, Strip, and Rolled Bar~~
- ~~B96/B96M Specification for Copper-Silicon Alloy Plate, Sheet, Strip, and Rolled Bar for General Purposes and Pressure Vessels~~
- ~~B103/B103M Specification for Phosphor Bronze Plate, Sheet, Strip, and Rolled Bar~~
- ~~B121/B121M Specification for Leaded Brass Plate, Sheet, Strip, and Rolled Bar~~
- ~~B122/B122M Specification for Copper-Nickel-Tin Alloy, Copper-Nickel-Zinc Alloy (Nickel Silver), and Copper-Nickel Alloy Plate, Sheet, Strip, and Rolled Bar~~
- ~~B130 Specification for Commercial Bronze Strip for Bullet Jackets~~
- ~~B152/B152M Specification for Copper Sheet, Strip, Plate, and Rolled Bar~~

¹ This specification is under the jurisdiction of ASTM Committee **B05** on Copper and Copper Alloys and is the direct responsibility of Subcommittee **B05.01** on Plate, Sheet, and Strip.

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² The UNS system for copper and copper alloys (see Practice **E527**) 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 For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.

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

- [B169/B169M Specification for Aluminum Bronze Sheet, Strip, and Rolled Bar](#)
[B193 Test Method for Resistivity of Electrical Conductor Materials](#)
~~[B194 Specification for Copper-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar](#)~~
[B248 Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar](#)
[B422/B422M Specification for Copper-Aluminum-Silicon-Cobalt Alloy, Copper-Nickel-Silicon-Magnesium Alloy, Copper-Nickel-Silicon Alloy, Copper-Nickel-Aluminum-Magnesium Alloy, and Copper-Nickel-Tin Alloy Sheet and Strip](#)
~~[B465 Specification for Copper-Iron Alloy Plate, Sheet, Strip, and Rolled Bar](#)~~
[B534 Specification for Copper-Cobalt-Beryllium Alloy and Copper-Nickel-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar](#)
~~[B591 Specification for Copper-Zinc-Tin and Copper-Zinc-Tin-Iron-Nickel Alloys Plate, Sheet, Strip, and Rolled Bar](#)~~
~~[B592 Specification for Copper-Zinc-Aluminum-Cobalt Alloy, Copper-Zinc-Tin-Iron Alloy Plate, Sheet, Strip, and Rolled Bar](#)~~
[B694 Specification for Copper, Copper-Alloy, Copper-Clad Bronze \(CCB\), Copper-Clad Stainless Steel \(CCS\), and Copper-Clad Alloy Steel \(CAS\) Sheet and Strip for Electrical Cable Shielding](#)
~~[B740 Specification for Copper-Nickel-Tin Spinodal Alloy Strip](#)~~
~~[B747 Specification for Copper-Zirconium Alloy Sheet and Strip](#)~~
~~[B768/B820 Specification for Copper-Cobalt-Beryllium Alloy and Copper-Nickel-Beryllium Alloy Strip and Sheet](#)~~
[Test Method for Bend Test for Determining the Formability of Copper and Copper Alloy Strip](#)
[B846 Terminology for Copper and Copper Alloys](#)
[B888/B888M Specification for Copper Alloy Strip for Use in Manufacture of Electrical Connectors or Spring Contacts](#)
[B936 Specification for Copper-Chromium-Iron-Titanium Alloy Plate, Sheet, Strip and Rolled Bar](#)
[E8/E8M Test Methods for Tension Testing of Metallic Materials](#)
[E18 Test Methods for Rockwell Hardness of Metallic Materials](#)
[E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications](#)
[E50 Practices for Apparatus, Reagents, and Safety Considerations for Chemical Analysis of Metals, Ores, and Related Materials](#)
[E53 Test Method for Determination of Copper in Unalloyed Copper by Gravimetry \(Withdrawn 2022\)⁴](#)
[E54 Test Methods for Chemical Analysis of Special Brasses and Bronzes \(Withdrawn 2002\)⁴](#)
[E62 Test Methods for Chemical Analysis of Copper and Copper Alloys \(Photometric Methods\) \(Withdrawn 2010\)⁴](#)
[E75 Test Methods for Chemical Analysis of Copper-Nickel and Copper-Nickel-Zinc Alloys \(Withdrawn 2010\)⁴](#)
[E106 Test Methods for Chemical Analysis of Copper-Beryllium Alloys \(Withdrawn 2011\)⁴](#)
[E112 Test Methods for Determining Average Grain Size](#)
[E118 Test Methods for Chemical Analysis of Copper-Chromium Alloys \(Withdrawn 2010\)⁴](#)
[E121 Test Methods for Chemical Analysis of Copper-Tellurium Alloys \(Withdrawn 2010\)⁴](#)
[E255 Practice for Sampling Copper and Copper Alloys for the Determination of Chemical Composition](#)
[E478 Test Methods for Chemical Analysis of Copper Alloys](#)
[E527 Practice for Numbering Metals and Alloys in the Unified Numbering System \(UNS\)](#)
[E1004 Test Method for Determining Electrical Conductivity Using the Electromagnetic \(Eddy Current\) Method](#)

3. Terminology

3.1 For definitions of terms related to copper and copper alloys, refer to Terminology [B846](#).

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *lengths, mill, n*—straight lengths, including ends, that can be conveniently manufactured in the mills. Full length pieces are usually ~~2400, 3000,~~2400 mm, 3000 mm, or 3600 mm and subject to established length tolerances.

3.2.1.1 *lengths, stock, n*—straight lengths that are mill cut and stored in advance of orders. They are usually ~~2400, 3000,~~2400 mm, 3000 mm, or 3600 mm and subject to established length tolerances.

3.2.2 *rolled bar, n*—a rolled flat product over 5 mm thick and up to and including 300 mm wide, with sheared, sawed, or machined edges, in straight lengths or coils (rolls).

4. Materials and Manufacture

4.1 *Materials:*

4.1.1 The material of manufacture shall be a cast bar, cake, slab of such purity and soundness as to be suitable for processing into the products to the product specification listed in Section 1.

⁴ The last approved version of this historical standard is referenced on www.astm.org.

4.1.2 When specified in the contract or purchase order that the heat identification or traceability is required, the purchaser shall specify the details desired.

4.2 *Manufacture:*

4.2.1 The product shall be manufactured by such hot-working, cold-working, and annealing process as to produce a uniform wrought structure in the finished product.

4.2.2 The product shall be hot- or cold-worked to the finished size and subsequently annealed, when required, to meet the temper properties specified.

4.3 *Edges*—The edges shall be slit, shared, sawed, or rolled edges, as specified. Slit edges shall be furnished unless otherwise specified in the contract or purchase order. See 5.6 for edge descriptions and corresponding tables for tolerances.

5. Dimensions, Mass, and Permissible Variations

5.1 *General*—For the purpose of determining conformance with the dimensional requirements prescribed in this specification, any measured value outside the specified limiting values for any dimension may be cause for rejection.

NOTE 1—Blank spaces in the tolerance tables indicate either that the material is not available or that no tolerances have been established.

5.2 *Thickness*—The standard method of specifying thickness shall be in decimal fractions of a millimetre. For material 0.50 mm and under in thickness, it is recommended that the nominal thicknesses be stated not closer than the nearest 0.01 mm. A list of preferred thicknesses is shown in Appendix X1. The thickness tolerances shall be those shown in Tables 1-3 for the product specification indicated:

5.2.1 **Table 1**—Thickness tolerances applicable to Specifications **B36/B36M, B103/B103M, B121/B121M, B152/B152M, B465, B591, B592, B747, and B888/B888M.**

5.2.2 **Table 2**—Thickness tolerances applicable to Specifications **B96/B96M, B122/B122M, B169/B169M, B194, B422/B422M, B534, and B740B534, and B768.**

TABLE 1 Thickness Tolerances

(Applicable to Specifications **B36/B36M, B103/B103M, B121/B121M, B152/B152M, B465, B591, B592, B747, B888/B888M, and B936**)

Thickness, mm		Thickness Tolerances, Plus and Minus, mm						
Over	Through	Strip			Sheet			
		Up to 200 mm, incl, in Width	Over 200 mm to 300 mm, incl, in Width	Over 300 mm to 600 mm, incl, in Width	Over 600 mm to 700 mm, incl, in Width	Over 700 mm to 900 mm, incl, in Width	Over 900 mm to 1200 mm, incl, in Width	Over 1200 mm to 1600 mm, incl, in Width
	0.10	0.007	0.015	...	...	...	...	...
0.10	0.20	0.01	0.02	0.03	...	...	...	...
0.20	0.30	0.015	0.025	0.035	...	...	...	...
0.30	0.40	0.02	0.03	0.045	0.06	0.08	0.09	0.10
0.40	0.50	0.025	0.035	0.05	0.06	0.08	0.09	0.11
0.50	0.60	0.03	0.04	0.05	0.08	0.09	0.10	0.12
0.60	0.70	0.035	0.05	0.06	0.08	0.09	0.10	0.12
0.70	1.0	0.045	0.05	0.06	0.09	0.10	0.12	0.15
1.0	1.3	0.05	0.06	0.07	0.10	0.12	0.15	0.17
1.3	2.0	0.06	0.07	0.08	0.12	0.15	0.17	0.20
2.0	3.5	0.07	0.08	0.10	0.15	0.17	0.20	0.25
3.5	5.0	0.08	0.10	0.11	0.17	0.20	0.25	0.30
		Rolled Bar			Plate			
5.0	8.0	0.10	0.11	0.12	0.22	0.25	0.30	0.35
8.0	13.0	0.11	0.12	0.15	0.30	0.35	0.40	0.45
13.0	20.0	0.13	0.17	0.22	0.40	0.45	0.50	0.60
20.0	30.0	0.17	0.22	0.27	0.45	0.55	0.60	0.75
30.0	40.0	0.55	0.55	0.55	0.55	0.65	0.75	0.90
40.0	60.0	0.65	0.65	0.65	0.65	0.75	0.90	1.1

TABLE 2 Thickness Tolerances

(Applicable to Specifications **B96/B96M**, **B122/B122M**, **B169/B169M**, **B194**, **B422/B422M**, **B534**, and **B740/B534**, and **B768**)

Thickness, mm		Thickness Tolerances, Plus and Minus, mm						
Over	Through	Strip			Sheet			
		Up to 200 mm, incl, in Width	Over 200 mm to 300 mm, incl, in Width	Over 300 mm to 600 mm, incl, in Width	Over 600 mm to 700 mm, incl, in Width	Over 700 mm to 900 mm, incl, in Width	Over 900 mm to 1200 mm, incl, in Width	Over 1200 mm to 1600 mm, incl, in Width
0.10	0.10	0.01	0.02	...	...	...	...	...
0.10	0.20	0.015	0.025	0.035	...	...	...	...
0.20	0.30	0.02	0.03	0.05	...	...	...	...
0.30	0.40	0.025	0.035	0.06	...	...	...	...
0.40	0.50	0.03	0.05	0.06	...	...	...	...
0.50	0.60	0.035	0.06	0.07	...	...	...	...
0.60	0.70	0.05	0.06	0.07	0.10	0.13	0.15	0.18
0.70	1.0	0.06	0.07	0.08	0.13	0.15	0.18	0.20
1.0	1.3	0.07	0.08	0.10	0.15	0.18	0.20	0.25
1.3	2.0	0.08	0.10	0.11	0.18	0.20	0.25	0.30
2.0	3.5	0.10	0.11	0.12	0.20	0.25	0.30	0.35
3.5	5.0	0.11	0.13	0.15	0.25	0.30	0.35	0.40
		Rolled Bar			Plate			
5.0	8.0	0.13	0.15	0.18	0.30	0.35	0.40	0.45
8.0	13.0	0.15	0.18	0.20	0.40	0.45	0.50	0.60
13.0	20.0	0.20	0.25	0.30	0.50	0.55	0.60	0.75
20.0	30.0	0.30	0.40	0.50	0.60	0.65	0.75	0.95
30.0	40.0	0.70	0.70	0.70	0.70	0.80	0.95	1.2
40.0	60.0	0.85	0.85	0.85	0.85	0.95	1.1	1.4

TABLE 3 Special Thickness Tolerances

Thickness, mm	Tolerances Applicable to Copper Alloy UNS No. C72500, Specifications B122/B122M	Tolerances Applicable to Specifications B194 , B534 , B740 , and B768
	Tolerances, Plus and Minus, ^A mm for Strip 200 mm and Under in Width	Tolerances, Plus and Minus, ^A mm for Strip 100 mm and Under in Width
0.10 and under	0.005	0.005
Over 0.10 to 0.16, incl	0.008	0.008
Over 0.16 to 0.22, incl	0.010	0.013
Over 0.22 to 0.35, incl	0.013	0.015
Over 0.35 to 0.45, incl	0.018	0.018
Over 0.45 to 0.55, incl	0.020	0.020
Over 0.55 to 0.60, incl	0.025	0.025
Over 0.65 to 0.80, incl	0.033	0.025
Over 0.80 to 1.2, incl	0.038	...

^A If tolerances are specified as all plus or all minus, double the values given.

5.2.3 **Table 3**—Special thickness tolerances applicable to Copper Alloy UNS No. C72500 when ordered to Specification **B122/B122M**, and to Specifications **B194**, **B534**, **B740**, and **B768** as noted in the table.

5.3 **Width**—The width tolerances shall be those shown in **Tables 4-6** depending on the type of edge required (see **5.3.1**, **5.3.2**, and

TABLE 4 Width Tolerances for Slit Metal and Slit Metal with Rolled Edges

(Applicable to all specifications listed in **1.1**)

Width, mm	Width Tolerances, ^A Plus and Minus, mm			
	For Thicknesses 0.102 to 0.80 mm, incl	For Thicknesses Over 0.80 to 3.2 mm, incl	For Thicknesses Over 3.2 to 5.0 mm, incl	For Thicknesses Over 5.0 to 12.0 mm, incl
50.8 and under	0.13	0.25	0.30	0.38
Over 50.8 to 200, incl	0.20	0.33	0.38	0.38
Over 200 to 600, incl	0.40	0.40	0.40	0.79
Over 600 to 1270, incl	0.79	0.79	0.79	1.19

^A If tolerances are specified as all plus or all minus, double the values given.

TABLE 5 Width Tolerances for Square-Sheared Metal
(Applicable to all specifications listed in 1.1)

NOTE 1—All lengths up to 3.05 m, inclusive.

Width, mm	Width Tolerances, ^A Plus and Minus, mm		
	1.59 mm and Under in Thickness	Over 1.5 mm to 3.5 mm, incl, in Thickness	Over 3.5 mm in Thickness
500 and under	0.79	1.2	1.6
Over 500 to 900, incl	1.2	1.2	1.6
Over 900 to 3000, incl	1.6	1.6	1.6

^A If tolerances are specified as all plus or all minus, double the values given.

TABLE 6 Width Tolerances for Sawed Metal
(Applicable to all specifications listed in 1.1)

Width, mm	Width Tolerances, ^A Plus and Minus, mm		
	For Lengths Up to 3000 mm, incl		For Length Over 3000 mm
	For Thicknesses Up to 38 mm, incl	For Thicknesses Over 38.1 mm	All Thicknesses
Up to 300, incl	0.79	1.6	1.6
Over 300 to 3000, incl	1.6	1.6	1.6

^A If tolerances are specified as all plus or all minus, double the values given.

5.3.3):

5.3.1 **Table 4**—Width tolerances for slit metal and slit metal with rolled edges.

5.3.2 **Table 5**—Width tolerances for square-sheared metal.

5.3.3 **Table 6**—Width tolerances for sawed metal.

5.4 **Length**—The material shall be furnished in coils or straight lengths of plate, sheet, strip, or rolled bar as specified. The length tolerances for straight lengths shall be those shown in **Tables 7-10** depending on the method of cutting required (see 5.4.1 – 5.4.4). When ends are permitted, the length and quantity of the ends shall be in accordance with the schedule in **Table 8**.

5.4.1 **Table 7**—Length tolerances for straight lengths.

5.4.2 **Table 8**—Schedule of minimum length and maximum weight of ends for mill lengths, specific lengths with ends, and stock lengths with ends.

5.4.3 **Table 9**—Length tolerances for square-sheared metal in all widths 3000 mm and under.

5.4.4 **Table 10**—Length tolerances for sawed metal.

TABLE 7 Length Tolerances for Straight Lengths
(Applicable to all specifications listed in 1.1 except B694)

NOTE 1—The following length tolerances are all plus; if all minus tolerances are desired, use the same values; if tolerances are desired plus and minus, halve the values given.

Length, mm	Length Tolerances, mm
Specific lengths, mill lengths, multiple lengths, and specific lengths with ends	
3000 and under	6.4
Over 3000 to 6000, incl	13
Stock lengths and stock lengths with ends	25 ^A

^A As stock lengths are cut and placed in stock in advance of orders, departure from this tolerance is not practicable.

TABLE 8 Schedule of Minimum Length and Maximum Weight of Ends for Mill Lengths, Specific Lengths with Ends, and Stock Lengths with Ends
(Applicable to all specifications listed in 1.1 except B694)

Nominal Length, mm	1.3 mm and Under in Thickness		Over 1.3 to 3.2 mm, incl, in Thickness		Over 3.2 to 6.5 mm, incl, in Thickness	
	Minimum Length of Shortest Piece, mm	Maximum Permissible Weight of Ends, % of Lot Weight	Minimum Length of Shortest Piece, mm	Maximum Permissible Weight of Ends, % of Lot Weight	Minimum Length of Shortest Piece, mm	Maximum Permissible Weight of Ends, % of Lot Weight
1800 to 2400, incl	1200	20	1200	25	900	30
2400 to 3000, incl	1800	25	1500	30	1200	35
3000 to 4300, incl	2000	30	1800	35	1500	40

TABLE 9 Length Tolerances for Square-Sheared Metal in All Widths 3000 mm and Under
(Applicable to all specifications listed in 1.1 except B694)

Length, mm	Length Tolerance, ^A Plus and Minus, mm		
	For Thick-nesses Up to 1.6 mm, incl	For Thick-nesses Over 1.6 to 3.2 mm, incl	For Thick-nesses Over 3.2 mm-3.2 mm
508 and under	0.8	1.2	1.6
Over 508 to 914, incl	1.2	1.2	1.6
Over 914 to 3048, incl	1.6	1.6	1.6

^A If tolerances are specified as all plus or all minus, double the values given.

TABLE 10 Length Tolerances for Sawed Metal
(Applicable to all specifications listed in 1.1 except B694)

NOTE 1—The following tolerances are all plus; if all minus tolerances are desired, use the same values; if tolerances are desired plus and minus, halve the values given.

Width, mm	Length Tolerance, mm
Up to 3000, incl	64

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5.5 *Straightness*—The straightness tolerances which are the maximum edgewise curvature (depth of arc) in any 1800-~~mm~~1800 mm portion of the total length, shall be those shown in Tables 11-13 depending on the type of edge required.

5.5.1 **Table 11**—Straightness tolerances for metal as slit, or as slit and straightened, or as slit and edge-rolled, or metal with drawn edges.

5.5.2 **Table 12**—Straightness tolerances for square-sheared metal.

TABLE 11 Straightness Tolerances for Slit Metal or Slit Metal Either Straightened or Edge-Rolled
(Applicable to all specifications listed in 1.1)

Width, mm	Straightness Tolerance, mm		
	As Slit Only		As Slit and Either Straightened or Edge Rolled
	Shipped in Rolls	Shipped Flat	Shipped Flat, in Rolls, or on Bucks
Over 6 to 10, incl	51	38	13
Over 10 to 12, incl	38	25	13
Over 12 to 25, incl	25	19	13
Over 25 to 50, incl	16	16	9.5
Over 50 to 100, incl	13	13	9.5
Over 100	9.5	9.5	9.5

TABLE 12 Straightness Tolerances for Square-Sheared Metal
(Applicable to all specifications listed in 1.1)
(Not applicable to metal over 3000 mm in length)

Thickness, mm	Maximum Edgewise Curvature (Depth of Arc) in any 1800 mm Portion of the Total Length	
	Straightness Tolerances, mm	
	Up to 250 mm, incl, in Width	Over 250 mm in Width
3.2 and under	1.6	0.79
Over 3.2 to 5.0, incl	3.2	1.2
Over 5.0	3.2	1.6

TABLE 13 Straightness Tolerances for Sawed Metal
(Applicable to all specifications listed in 1.1)
(Not applicable to metal over 3600 mm in length)

Width, mm	Maximum Edgewise Curvature (Depth of Arc) in Any 2000 mm Portion of the Total Length	
	Straightness Tolerances, mm	
80 and under	1.6	
Over 80	1.2	

5.5.3 **Table 13**—Straightness tolerances for sawed metal.

5.6 *Edges*—When rolled edges are required, they may be produced by either rolling or drawing to one of the following specified edge contours:

5.6.1 *Square Edges (Square Corners)*—Edges shall have commercially-squared corners with a permissible maximum radius as prescribed in **Table 14**.

5.6.2 *Rounded Corners*—Edges shall have rounded corners as shown in **Fig. 1** with a radius as prescribed in **Table 15**.

5.6.3 *Rounded Edges*—Edges shall be rounded as shown in **Fig. 2** with a radius as prescribed in **Table 16**.

5.6.4 *Full-Rounded Edges*—Edges shall be full-rounded as shown in **Fig. 3** with a radius as prescribed in **Table 17**.

5.7 *Weight Tolerances for Hot-Rolled Material:*

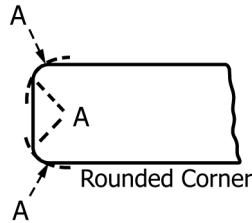
5.7.1 **Table 18**—Lot weight tolerances for hot-rolled sheet and plate applicable to Specifications **B36/B36M**, **B96/B96M** (Copper Alloy UNS No. C65500), **B103/B103M**, **B122/B122M**, **B152/B152M**, and **B59/B152/B152M**.

5.7.2 The weight of each lot of five or more plates or sheets of the same type and the same specified dimensions, when ordered to thickness, shall not vary from the theoretical by more than the amount prescribed in **Table 18** for the product specification indicated. The weight of any individual plate or sheet may vary from the nominal by not more than one third in excess of the tolerances prescribed in **Table 18** for the product specification indicated. The tolerances for lots of less than five plates or sheets shall be governed by the tolerances for individual plates or sheets.

5.7.3 For the purpose of calculation, the densities of the materials covered by these specifications are listed in **Appendix X2**.

**TABLE 14 Tolerances for Radius of Commercially Square
Corners of Rolled or Drawn Edges with Square Corners**
(Applicable to all specifications listed in 1.1 except **B694**)

Thickness, mm	Permissible Radius of Corners, max, mm
0.8 to 1.6, incl	0.25
Over 1.6 to 4.8, incl	0.40
Over 4.8 to 25, incl	0.8



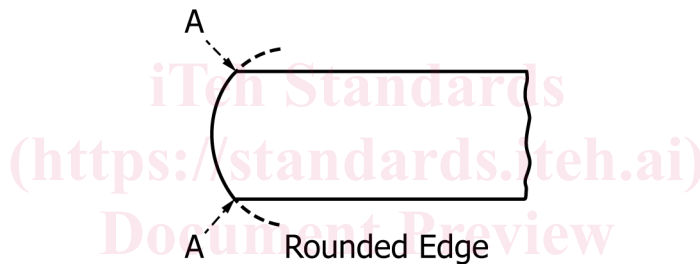
NOTE 1—The arc of the rounded corner shall not necessarily be tangent at points “A,” but the product shall be commercially free from sharp, rough, or projecting edges.

FIG. 1 Rounded Corners

TABLE 15 Tolerances for Radius on Corners of Rolled or Drawn Edges with Rounded Corners
(Applicable to all specifications listed in 1.1 except B694)

Thickness, mm	Radius of Corners, mm	
	Min	Max
Up to 3.2, incl ^A	...	...
Over 3.2 to 4.8, incl	0.40	1.2
Over 4.8 to 25, incl	0.80	2.4
Over 25 to 50, incl	1.6	4.8

^A Not available.



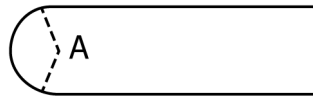
NOTE 1—The arc of the rounded edge shall be substantially symmetrical with the axis of the product. The corners “A” will usually be sharp but shall not have rough or projecting edges.

FIG. 2 Rounded Edge

TABLE 16 Tolerances for Radius of Rolled or Drawn Rounded Edges
(Applicable to all specifications listed in 1.1 except B694)

Thickness, mm	Radius of Edges ^A	
	Min	Max
Up to 4.78, incl	$\frac{1}{4} t$	$1\frac{3}{4} t$
Over 4.78	$1 t$	$1\frac{1}{2} t$

^A The t refers to the measured thickness of the test specimen.



Full Rounded Edge

NOTE 1—The arc of the rounded edge shall not necessarily be tangent at points “A” but shall be substantially symmetrical with the axis of the product, and the product shall be commercially free from sharp, rough, or projecting edges.

FIG. 3 Full Rounded Edge

6. Workmanship, Finish, and Appearance

6.1 The product shall be free of defects, but blemishes of a nature that do not interfere with the intended application are acceptable. A superficial film of residual light lubricant is normally present and is acceptable unless otherwise specified.

TABLE 17 Tolerances for Radius of Rolled or Drawn Full-Rounded Edges
(Applicable in all specifications listed in 1.1)

Thickness, mm	Radius of Edges ^A	
	Min	Max
All thicknesses	$\frac{1}{2} t$	$\frac{3}{4} t$

^A The *t* refers to the thickness of the test specimen.

7. Sampling

7.1 *Sampling*—The lot size, portion size, and selection of sample pieces shall be as follows:

7.1.1 *Lot Size*—An inspection lot shall be 5000 kg or less material of the same mill form, alloy, temper and nominal dimensions, subject to inspection at one time, or shall be the product of one cast bar from a single melt charge, whose weight shall not exceed 12 000 kg that has been continuously processed and subject to inspection at one time.

7.1.2 *Portion Size*—A portion shall be two representative samples taken from the product of one cast bar that has been continuously processed to the finished temper and dimensions.

7.1.2.1 *Chemical Analysis*—A sample for chemical analysis shall be taken in accordance with Practice E255 for product in its final form. Unless required otherwise by the purchaser at the time the order is placed, the manufacturer shall have the option of determining conformance to chemical composition by analyzing samples taken at the time the castings are poured or samples taken from the semi-finished product, if heat identity can be maintained throughout all operations. If the manufacturer determines the chemical composition of the material during the course of manufacture, he shall not be required to sample and analyze the finished product. The minimum weight of the composite sample in accordance with Practice E255 shall be as follows:

ASTM Designation	Weight of Sample, min, g
https://standards.iteh.ai B36/B36M, B96/B96M, B103/B103M, B121/B121M, B122/B122M, B152/B152M, B169/B169M, B194, B422/B422M, B465, B534, B591, B592, B740, B747, B768, B888/B888M, and B936	150
https://standards.iteh.ai B36/B36M, B96/B96M, B103/B103M, B121/B121M, B122/B122M, B152/B152M, B169/B169M, B422/B422M, B534, B888/B888M, and B936	150

7.1.2.2 *Samples for All Other Tests*—Samples for all other tests shall be taken from the sample portion in 7.1.2 and be of a convenient size to accommodate the test and comply with the requirements of the appropriate ASTM standard and test methods.

8. Number of Tests and Retests

8.1 *Chemical Requirements:*

8.1.1 When samples are taken at the time the castings are poured, at least one sample shall be analyzed for each group of castings poured simultaneously from the same source of molten metal.

8.1.2 When samples are taken from the semi-finished or finished product, at least one sample representative of the product of each cast bar from a single melt charge continuously processed with heat identity maintained shall be analyzed.

8.1.3 When samples are taken from the semi-finished or finished product and heat identity has not been maintained, a single sample representative of each 5000 kg lot, or fraction thereof, shall be analyzed. When the product piece is greater than 5000 kg, one sample to be representative of the product piece shall be analyzed.

8.2 *Mechanical and Electrical Requirements and Grain Size*—Unless otherwise provided in the product specification, test specimens shall be taken from each of the two sample pieces selected in accordance with 7.1.2. The required tests shall be made on each of the specimens. In the case of copper alloy Specifications Specification B194, B534, and B740, one specimen shall be

TABLE 18 Lot Weight Tolerances for Hot-Rolled Sheet and Plate

 (Applicable to Specifications **B36/B36M**, **B96/B96M** (Copper Alloy UNS Nos. C65500), **B103/B103M**, **B122/B122M**, **B152/B152M**, and **B59+B152/B152M**)

Thickness, mm	Weight Tolerances, Plus and Minus, Percentage of Theoretical Weight				
	1200 mm and Under in Width	Over 1200 mm to 1500 mm, incl, in Width	Over 1500 mm to 1800 mm, incl, in Width	Over 1800 mm to 2200 mm, incl, in Width	Over 2200 mm to 2800 mm, incl, in Width
3.18 and under	8	9.5	11	12.5	14
Over 3.18 to 4.78, incl	6.5	8	9.5	11	12.5
Over 4.78 to 6.35, incl	6	7.5	8.5	9	10
Over 6.35 to 7.92, incl	5.5	7	8	8.5	9
Over 7.92 to 9.53, incl	5	6	7	7.5	8
Over 9.53 to 11.1, incl	4.5	5	6	7	7.5
Over 11.1 to 12.7, incl	4	4.5	5.5	6	6.5
Over 12.7 to 15.9, incl	3.5	4.5	5	5.5	6
Over 15.9 to 19.1, incl	3	4	4.5	5	5.5
Over 19.1 to 25.4, incl	2.75	3.5	4	4.5	5
Over 25.4 to 38.1, incl	2.5	3	3.5	4	4.5
Over 38.1 to 50.8, incl	2.25	2.75	3.25	3.75	4.25

tested without further treatment, and the other specimen shall be tested after precipitation hardening. In the case of the requirements in **Table 4**, Mill Hardened Tempers, in Specifications **B194** and **B740**, the two specimens need to be tested, because the product is in the precipitation hardened temper as supplied. The reported value shall be the arithmetic average of the readings. In the case of hardness, three readings shall be taken and averaged for each sample.

8.3 Retests:

8.3.1 ~~If the chemical analysis of the specimens prepared from samples selected in accordance with~~ When requested by the manufacturer or supplier, a retest shall be permitted when results of tests obtained by the purchaser fail 7.1.2 fails to conform to the specified limits, analysis shall be made on a new composite sample prepared from the samples selected in accordance with requirements of the product specification. 7.1.2.

8.3.2 ~~If one of the two tests made to determine if any of the mechanical or physical properties fail to meet a specified limit, this test shall be repeated on the remaining sample pieces, selected in accordance with~~ The retest shall be as directed in the product specification for the initial test, except 7.1.2 and the results of these tests shall comply with the specified requirements: the number of test specimens shall be twice that normally required for the specified test.

8.3.3 If any test specimen shows defective machining or develops flaws, it may be discarded and another specimen substituted.

8.3.4 If the percent elongation of any tension test specimen is less than that specified and any part of the fracture is outside the middle two thirds of the gage length or in a punched or scribed mark within the reduced section, a retest shall be allowed.

8.3.5 If a bend test specimen fails, due to conditions of bending more severe than required by the specification, a retest shall be permitted, either on a duplicate specimen or on a remaining portion of the failed specimen.

8.3.6 After removal of defective specimens and correction of test methods, only one retest cycle is permitted. If after the retest the material fails to meet the requirements of this specification, it shall be rejected.

8.3.7 All test specimens shall conform to the product specification requirement(s) in retest. Failure to conform shall be cause for rejection.

9. Specimen Preparation

9.1 *Chemical Analysis*—A composite sample of the semi-finished or finished product shall be prepared in accordance with Practice **E255** or as described in **7.1.2.1**.

9.2 Specimens shall be prepared in accordance with the method prescribed in **10.3** for all other tests. Full cross section specimens shall be used whenever possible. Samples shall be representative of the condition of the material, and particular specimen preparation techniques shall be stated in the specific product specification.

10. Test Methods

10.1 ~~The test method used for routine chemical analysis for specification compliance and preparation of certifications and test reports, when required, shall be at the discretion of the reporting laboratory.~~ method(s) quality control or production control, or both, for determination of conformance with product property requirements are discretionary.

10.1.1 ~~Commonly accepted techniques for routine chemical analysis of copper and copper alloys include, but are not limited to, X-ray fluorescence spectroscopy, atomic absorption spectrophotometry, argon plasma spectroscopy, and emission spectroscopy.~~ The test method(s) used to obtain data for preparation of certification or test report, or both, shall be made available to the purchaser upon request.

10.2 ~~In case of disagreement concerning chemical composition, an applicable test method for chemical analysis may be found in Test Methods E53, E54, E62, E75, E106, E118, E121, or E478.~~ Chemical Composition:

10.2.1 ~~The specific~~ In case of disagreement, test method(s) to be used for chemical analysis shall be stated in the particular product specification. ~~subject to agreement between the manufacturer or supplier and the purchaser.~~

10.2.2 The following Test Methods E53, E54, E62, E75, E106, E118, E121, or E478 include published test methods, which may no longer be viable, for reference.

10.2.3 The specific method to be used for each specified element may be prescribed in the product specification.

10.2.4 Test method(s) to be followed for the determination of element(s) resulting from contractual or purchase order agreement shall be as agreed upon between the manufacturer or supplier and purchaser.

10.2.5 In case of disagreement concerning sulfur content, the test method described in the Annex of this specification shall be used.

10.3 ~~The following test methods shall be used for determining the mechanical and physical properties required in the specifications listed in Section 1:~~

Tension	<u>E8/E8M</u>
Grain size	<u>E112</u>
Rockwell hardness	<u>E18</u>
Electrical resistivity	<u>B193</u>

Other Tests:

10.3.1 The product in final form shall conform with physical, mechanical, and other requirements specified in the product specification when subjected to test in accordance with the appropriate test method in the following table:

<u>Tension</u>	<u>E8/E8M</u>
<u>Grain size</u>	<u>E112</u>
<u>Rockwell hardness</u>	<u>E18</u>
<u>Electrical resistivity</u>	<u>B193</u>
<u>Electrical conductivity</u>	<u>E1004</u>
<u>Bend test</u>	<u>B820</u>

10.3.2 The testing procedure used for a particular property is dependent upon alloy, temper, and configuration of the product. The manufacturer shall have the option of selecting the most representative procedure unless a specific procedure is specified at the time the contract is placed.

11. Significance of Numerical Limits

11.1 For the purposes of determining compliance with the specified limits for requirements of the properties listed in the following table and for dimensional tolerances, an observed value or a calculated value shall be rounded as indicated in accordance with the rounding method of Practice E29:

Property	Rounded Unit for Observed or Calculated Value
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