Designation: B 248 – 98

Standard Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar[1]

This standard is issued under the fixed designation B 248; 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 a group of 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: B 36/B 36M, B 96, B 103/B 103M, B 121/B 121M, B 122/B 122M, B 152, B 169, B 194, B 291, B 422, B 465, B 534, B 591, B 592, B 694, B 740, B 747, and B 768.[2]

NOTE 1—A complete metric companion to Specification B 248 has been developed—B 248M; therefore no metric equivalents are presented in this specification.

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:*

B 36/B 36M Specification for Brass Plate, Sheet, Strip, and Rolled Bar[3]

B 96 Specification for Copper-Silicon Alloy Plate, Sheet, Strip, and Rolled Bar for General Purposes and Pressure Vessels[3]

B 103/B 103M Specification for Phosphor Bronze Plate, Sheet, Strip, and Rolled Bar[3]

B 121/B 121M Specification for Leaded Brass Plate, Sheet, Strip, and Rolled Bar[3]

B 122/B 122M Specification for Copper-Nickel-Tin Alloy, Copper-Nickel-Zinc Alloy (Nickel Silver), and Copper-Nickel Alloy Plate, Sheet, Strip, and Rolled Bar[3]

B 152 Specification for Copper Sheet, Strip, Plate, and Rolled Bar[3]

B 169 Specification for Aluminum Bronze Sheet, Strip, and Rolled Bar[3]

B 193 Test Method for Resistivity of Electrical Conductor Materials[4]

B 194 Specification for Copper-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar[3]

B 291 Specification for Copper-Zinc-Manganese Alloy (Manganese Brass) Sheet and Strip[5]

B 422 Specification for Copper-Aluminum-Silicon-Cobalt Alloy, Copper-Nickel-Silicon-Magnesium Alloy and Copper-Nickel-Aluminum-Magnesium Alloy Sheet and Strip[3]

B 465 Specification for Copper-Iron Alloy Plate, Sheet, Strip, and Rolled Bar[3]

B 534 Specification for Copper-Cobalt-Beryllium Alloy and Copper-Nickel-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar[3]

B 591 Specification for Copper-Zinc-Tin Alloys Plate, Sheet, Strip, and Rolled Bar[3]

B 592 Specification for Copper-Zinc-Aluminum-Cobalt Plate, Sheet, Strip, and Rolled Bar[3]

B 694 Specification for Copper, Copper-Alloy, and Copper-Clad Stainless Steel (CCS) and Copper-Clad Alloy Steel (CAS) Sheet and Strip for Electrical Cable Shielding[3]

B 740 Specification for Copper-Nickel-Tin Spinodal Alloy Strip[3]

B 747 Specification for Copper-Zirconium Alloy Sheet and Strip[3]

B 768 Specification for Copper-Cobalt-Beryllium Alloy Strip and Sheet[3]

E 8 Test Methods for Tension Testing of Metallic Materials[5]

E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials[5]

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications[6]

E 50 Practices for Apparatus, Reagents, and Safety Precautions for Chemical Analysis of Metals[7]

E 53 Test Methods for Chemical Analysis of Copper[7]

[1] This specification is under the jurisdiction of the ASTM Committee B-5 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.01 on Plate, Sheet, and Strip.

Current edition approved Oct. 10, 1998. Published February 1999. Originally published as B 248 – 51 T. Last previous edition B 248 – 96.

[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 02.03.

[5] *Discontinued 1992.*

[6] *Annual Book of ASTM Standards,* Vol 03.01.

[7] *Annual Book of ASTM Standards,* Vol 14.02.

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

E 54 Test Methods for Chemical Analysis of Special Brasses and Bronzes[7]
E 55 Practice for Sampling Wrought Nonferrous Metals and Alloys for Determination of Chemical Composition[7]
E 62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods)[7]
E 75 Test Methods for Chemical Analysis of Copper-Nickel and Copper-Nickel-Zinc Alloys[7]
E 106 Test Methods for Chemical Analysis of Copper-Beryllium Alloys[7]
E 112 Test Methods for Determining the Average Grain Size[5]
E 118 Test Methods for Chemical Analysis of Copper-Chromium Alloys[7]
E 121 Test Methods for Chemical Analysis of Copper-Tellurium Alloys[7]
E 478 Test Methods for Chemical Analysis of Copper Alloys[7]
E 527 Practice for Numbering Metals and Alloys (UNS)[8]

3. Terminology

3.1 *Definitions:*

3.1.1 *blank*—a piece of flat product intended for subsequent fabrication by forming, bending, cupping, drawing, or hot pressing, etc.

3.1.2 *coil*—a length of the product wound into a series of connected turns. The unqualified term "coil" as applied to "flat product" usually refers to a coil in which the product is spirally wound, with the successive layers on top of one another. (Sometimes called a "roll".)

3.1.2.1 *level or traverse wound*—a coil in which the turns are positioned into layers parallel to the axis of the coil such that successive turns in a given layer are next to one another.

3.1.2.2 *level or traverse wound on a reel or spool*—a coil in which the turns are positioned into layers on a reel or spool parallel to the axis of the reel or spool such that successive turns in a given layer are next to one another.

3.1.3 *lengths*—straight pieces of the product.

3.1.3.1 *ends*—straight pieces, shorter than the nominal length, left over after cutting the product into mill lengths, stock lengths, or specific lengths. They are subject to minimum length and maximum weight requirements.

3.1.3.2 *mill*—straight lengths, including ends, that can be conveniently manufactured in the mills. Full-length pieces are usually 8, 10, or 12 ft and subject to established length tolerances.

3.1.3.3 *multiple*—straight lengths of integral multiples of a base length, with suitable allowance for cutting if and as specified.

3.1.3.4 *specific*—straight lengths that are uniform in length, as specified, and subject to established length tolerances.

3.1.3.5 *specific with ends*—specific lengths, including ends.

3.1.3.6 *stock*—straight lengths that are mill cut and stored in advance of orders. They are usually 8, 10, or 12 ft and subject to established length tolerances.

3.1.3.7 *stock with ends*—stock lengths, including ends.

3.1.4 *plate*—a wrought flat product over 0.188 in. thick and over 12 in. wide, in straight lengths or coils (rolls).

3.1.5 *reel or spool*—a cylindrical device that has a rim at each end and an axial hole for a shaft or spindle, and on which the product is wound to facilitate handling and shipping.

3.1.6 *rolled bar*—a rolled flat product over 0.188 in. thick and up to and including 12 in. wide, with sheared, sawed, or machined edges, in straight lengths or coils (rolls).

3.1.7 *sheet*—a rolled flat product up to and including 0.188 in. thick and over 24 in. wide, in straight lengths or coils (rolls).

3.1.8 *strip*—a rolled flat product, other than flat wire, up to and including 0.188 in. thick, in straight lengths, coils (rolls) or traverse wound on reels or spools:

3.1.8.1 *with slit, or sheared edges in widths up to 24 in. inclusive.*

3.1.8.2 *with finished drawn or rolled edges, in widths over 1¼ in. to 12 in. inclusive.*

4. Materials and Manufacture

4.1 *Materials*—The material shall be of such quality and purity that the finished product shall have the properties and characteristics prescribed in the applicable product specification listed in Section 1.

4.2 *Manufacture*—The material shall be produced by either hot- or cold-working operations. It shall be finished, unless otherwise specified, by such hot working, cold working, annealing, or heat treatment as may be necessary to meet the properties specified.

4.3 *Edges*—The edges shall be slit, sheared, sawed, or rolled edges, as specified. Slit edges shall be furnished unless otherwise specified or agreed between purchaser and supplier or manufacturer. See 5.6 for edge descriptions and tolerances.

5. Dimensions, Weights, 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 2—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 an inch. For material 0.021 in. and under in thickness, it is recommended that the nominal thicknesses be stated not closer than the nearest half-thousandth. (For example, specify 0.006 or 0.0065 in., but not 0.0063 in.) For material over 0.021 in. in thickness, it is recommended that the nominal thicknesses be stated not closer than the nearest thousandth. (For example, specify 0.128 or 0.129 in., but not 0.1285 in.) A list of preferred thicknesses is shown in Appendix X1. The thickness tolerances shall be those shown in Tables 1, 2, and 3 for the product specification indicated:

5.2.1 Table 1—Thickness tolerances applicable to Specifications B 36/B 36M, B 121/B 121M, B 152, B 291, B 465, B 591 (Copper Alloy UNS No. C41100), B 592, and B 747.

5.2.2 Table 2—Thickness tolerances applicable to Specifications B 96, B 103/B 103M, B 122/B 122M, B 169, B 194, B 422, B 534, B 591, B 740, and B 768 (except Copper Alloy UNS No. C41100).

[8] *Annual Book of ASTM Standards*, Vol 03.05.

TABLE 1 Thickness Tolerances

(Applicable to Specifications B 36/B 36M, B 121/B 121M, B 152, B 291, B 465, B 591 (Copper Alloy UNS No. C41100), B 592, and B 747)

Thickness, in.	Thickness Tolerances, plus and minus,[A] in.								
	Strip					Sheet			
	8 in. and Under in Width	Over 8 to 12 in., incl, in Width	Over 12 to 14 in., incl, in Width	Over 14 to 20 in., incl, in Width	Over 20 to 24 in., incl, in Width	Over 24 to 28 in., incl, in Width	Over 28 to 36 in., incl, in Width	Over 36 to 48 in., incl, in Width	Over 48 to 60 in., incl, in Width
0.004 and under	0.0003	0.0006	0.0006	. . .	. . .	. . .	. . .	. . .	. . .
Over 0.004 to 0.006, incl	0.0004	0.0008	0.0008	0.0013	. . .	. . .	. . .	. . .	. . .
Over 0.006 to 0.009, incl	0.0006	0.0010	0.0010	0.0015	. . .	. . .	. . .	. . .	. . .
Over 0.009 to 0.013, incl	0.0008	0.0013	0.0013	0.0018	0.0025	0.0025	0.003	0.0035	0.004
Over 0.013 to 0.017, incl	0.0010	0.0015	0.0015	0.002	0.0025	0.0025	0.003	0.0035	0.0045
Over 0.017 to 0.021, incl	0.0013	0.0018	0.0018	0.002	0.003	0.003	0.0035	0.004	0.005
Over 0.021 to 0.026, incl	0.0015	0.002	0.002	0.0025	0.003	0.003	0.0035	0.004	0.005
Over 0.026 to 0.037, incl	0.002	0.002	0.002	0.0025	0.0035	0.0035	0.004	0.005	0.006
Over 0.037 to 0.050, incl	0.002	0.0025	0.0025	0.003	0.004	0.004	0.005	0.006	0.007
Over 0.050 to 0.073, incl	0.0025	0.003	0.003	0.0035	0.005	0.005	0.006	0.007	0.008
Over 0.073 to 0.130, incl	0.003	0.0035	0.0035	0.004	0.006	0.006	0.007	0.008	0.010
Over 0.130 to 0.188, incl	0.0035	0.004	0.004	0.0045	0.007	0.007	0.008	0.010	0.012
	Rolled Bar					Plate			
Over 0.188 to 0.205, incl	0.0035	0.004	0.004	0.0045	0.007	0.007	0.008	0.010	0.012
Over 0.205 to 0.300, incl	0.004	0.0045	0.0045	0.005	0.009	0.009	0.010	0.012	0.014
Over 0.300 to 0.500, incl	0.0045	0.005	0.005	0.006	0.012	0.012	0.013	0.015	0.018
Over 0.500 to 0.750, incl	0.0055	0.007	0.007	0.009	0.015	0.015	0.017	0.019	0.023
Over 0.750 to 1.00, incl	0.007	0.009	0.009	0.011	0.018	0.018	0.021	0.024	0.029
Over 1.00 to 1.50, incl	0.022	0.022	0.022	0.022	0.022	0.022	0.025	0.029	0.036
Over 1.50 to 2.00, incl	0.026	0.026	0.026	0.026	0.026	0.026	0.030	0.036	0.044

[A] When tolerances are specified as all plus or all minus, double the values given.

TABLE 2 Thickness Tolerances

(Applicable to Specifications B 96, B 103/B 103M, B 122/B 122M, B 169, B 194, B 422, B 534, B 591, B 740 (except Copper Alloy UNS No. C41100), and B 768)

Thickness, in.	Thickness Tolerances, Plus and Minus,[A] in.								
	Strip					Sheet			
	8 in. and Under in Width	Over 8 to 12 in., incl, in Width	Over 12 to 14 in., incl, in Width	Over 14 to 20 in., incl, in Width	Over 20 to 24 in., incl, in Width	Over 24 to 28 in., incl, in Width	Over 28 to 36 in., incl, in Width	Over 36 to 48 in., incl, in Width	Over 48 to 60 in., incl, in Width
0.004 and under	0.0004	0.0008	0.0008	. . .	. . .	. . .	. . .	. . .	. . .
Over 0.004 to 0.006, incl	0.0006	0.0010	0.0010	0.0015	. . .	. . .	. . .	. . .	. . .
Over 0.006 to 0.009, incl	0.0008	0.0013	0.0013	0.002	. . .	. . .	. . .	. . .	. . .
Over 0.009 to 0.013, incl	0.0010	0.0015	0.0015	0.0025	. . .	. . .	. . .	. . .	. . .
Over 0.013 to 0.017, incl	0.0013	0.002	0.002	0.0025	. . .	. . .	. . .	. . .	. . .
Over 0.017 to 0.021, incl	0.0015	0.0025	0.0025	0.003	. . .	. . .	. . .	. . .	. . .
Over 0.021 to 0.026, incl	0.002	0.0025	0.0025	0.003	0.004	0.004	0.005	0.006	0.007
Over 0.026 to 0.037, incl	0.0025	0.003	0.003	0.0035	0.005	0.005	0.006	0.007	0.008
Over 0.037 to 0.050, incl	0.003	0.0035	0.0035	0.004	0.006	0.006	0.007	0.008	0.010
Over 0.050 to 0.073, incl	0.0035	0.004	0.004	0.0045	0.007	0.007	0.008	0.010	0.012
Over 0.073 to 0.130, incl	0.004	0.0045	0.0045	0.005	0.008	0.008	0.010	0.012	0.014
Over 0.130 to 0.188, incl	0.0045	0.005	0.005	0.006	0.010	0.010	0.012	0.014	0.016
	Rolled Bar					Plate			
Over 0.188 to 0.205, incl	0.0045	0.005	0.005	0.006	0.010	0.010	0.012	0.014	0.016
Over 0.205 to 0.300, incl	0.005	0.006	0.006	0.007	0.012	0.012	0.014	0.016	0.018
Over 0.300 to 0.500, incl	0.006	0.007	0.007	0.008	0.015	0.015	0.017	0.019	0.023
Over 0.500 to 0.750, incl	0.008	0.010	0.010	0.012	0.019	0.019	0.021	0.024	0.029
Over 0.750 to 1.00, incl	0.010	0.012	0.012	0.015	0.023	0.023	0.026	0.030	0.037
Over 1.00 to 1.50, incl	0.028	0.028	0.028	0.028	0.028	0.028	0.032	0.037	0.045
Over 1.50 to 2.00, incl	0.033	0.033	0.033	0.033	0.033	0.033	0.038	0.045	0.055

[A] When 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 B 122/B 122M, and to Specifications B 194, B 534, B 740, and B 768 as noted in the table.

5.3 *Width*—The width tolerances shall be those shown in Tables 4, 5, and 6, depending on the type of edge required (see 5.3.1, 5.3.2, and 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

TABLE 3 Special Thickness Tolerances

Thickness, in.	Tolerances Applicable to Copper Alloy UNS No. C72500, Specification B 122/B 122M and B 740 Tolerances, Plus and Minus,[A] in., for Strip 8 in. and Under in Width	Tolerances Applicable to Specifications B 194, B 534, and B 768 Tolerances, Plus and Minus,[A] in., for Strip 4 in. and Under in Width
0.004 and under	0.0002	0.0002
Over 0.004 to 0.006, incl	0.0003	0.0003
Over 0.006 to 0.009, incl	0.0004	0.0005
Over 0.009 to 0.013, incl	0.0005	0.0006
Over 0.013 to 0.017, incl	0.0007	0.0007
Over 0.017 to 0.021, incl	0.0008	0.0008
Over 0.021 to 0.026, incl	0.0010	0.0010
Over 0.026 to 0.032, incl	0.0013	0.0010
Over 0.032 to 0.050, incl	0.0015	. . .

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

TABLE 4 Width Tolerances for Slit Metal and Slit Metal with Rolled Edges
(Applicable to all specifications listed in 2.2)

Width, in.	Width Tolerances,[A] Plus and Minus, in.			
	For Thicknesses 0.004 to 0.032 in.	For Thicknesses Over 0.032 to 0.125 in.	For Thicknesses Over 0.125 to 0.188 in.	For Thicknesses Over 0.188 to 0.500 in.
2 and under	0.005	0.010	0.012	0.015
Over 2 to 8, incl	0.008	0.013	0.015	0.015
Over 8 to 24, incl	1/64	1/64	1/64	1/32
Over 24 to 40, incl	1/32	1/32	1/32	3/64

[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 2.2)

NOTE—All lengths up to 120 in., incl.

Width, in.	Width Tolerances,[A] Plus and Minus, in.		
	1/16 in. and Under in Thickness	Over 1/16 to 1/8 in., incl, in Thickness	Over 1/8 in. in Thickness
20 and under	1/32	3/64	1/16
Over 20 to 36, incl	3/64	3/64	1/16
Over 36 to 120, incl	1/16	1/16	1/16

[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 2.2)

Width, in.	Width Tolerances,[A] Plus and Minus, in.		
	For Lengths Up to 10 ft, incl		For Lengths Over 10 ft.
	For Thicknesses Up to 1½ in., incl	For Thicknesses Over 1½ in.	All Thicknesses
Up to 12, incl	1/32	1/16	1/16
Over 12 to 120, incl	1/16	1/16	1/16

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

in Tables 7, 8, or 9, depending on the method of cutting required (see 5.4.1, 5.4.2, and 5.4.3). 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 lengths with ends.

5.4.3 Table 9—Length tolerances for square-sheared metal.

TABLE 7 Length Tolerances for Straight Lengths
(Applicable to all specifications listed in 2.2 except B 694)

NOTE—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 ft.	Length Tolerances in.
Specific lengths, mill lengths, multiple lengths, and specific lengths with ends 10 and under	1/4
Over 10 to 20, incl	1/2
Stock lengths and stock lengths with ends	1[A]

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

5.4.4 Table 10—Length tolerances for sawed metal.

5.5 *Straightness*—The straightness tolerances, which are the maximum edgewise curvature (depth of arc) in any 72-in. portion of the total length, shall be those shown in Tables 11, 12, and 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.

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 square corners with essentially 90° angles and with a maximum corner 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 B 96 (Copper Alloy UNS Nos. C65500 and C65800) and B 152.

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.

6. Workmanship, Finish and Appearance

6.1 The material shall be free of defects, but blemishes of a nature that do not interfere with normal commercial operations are acceptable. It shall be well cleaned and free of dirt. A superficial film of residual light lubricant is normally present

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 2.2 except B 694)

Nominal Length, ft	0.050 in. and Under in Thickness		Over 0.050 to 0.125 in., incl, in Thickness		Over 0.125 to 0.250 in., incl, in Thickness	
	Minimum Length of Shortest Piece, ft	Maximum Permissible Weight of Ends, % of Lot Weight	Minimum Length of Shortest Piece, ft	Maximum Permissible Weight of Ends, % of Lot Weight	Minimum Length of Shortest Piece, ft	Maximum Permissible Weight of Ends, % of Lot Weight
6 to 8, incl	4	20	4	25	3	30
8 to 10, incl	6	25	5	30	4	35
10 to 14, incl	7	30	6	35	5	40

TABLE 9 Length Tolerances for Square-Sheared Metal in All Widths 120 in. (3.05 m) and Under
(Applicable to all specifications listed in 2.2 except B 694)

Length, in.	Length Tolerance,[A] Plus and Minus, in.		
	For Thicknesses Up to 1⁄16 in., incl	For Thicknesses Over 1⁄16 to 1⁄8 in., incl	For Thicknesses Over 1⁄8 in.
20 and under	1⁄32	3⁄64	1⁄16
Over 20 to 36, incl	3⁄64	3⁄64	1⁄16
Over 36 to 120, incl	1⁄16	1⁄16	1⁄16

[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 2.2 except B 694)

NOTE—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, in.	Length Tolerance, in.
Up to 120, incl	1⁄4

TABLE 11 Straightness Tolerances for Slit Metal or Slit Metal Either Straightened or Edge-Rolled
(Applicable to all specifications listed in 2.2)

Width, in.	Maximum Edgewise Curvature (Depth of Arc) in any 72-in. Portion of the Total Length		
	Straightness Tolerance, in.		
	As Slit Only		As Slit and Either Straightened or Edge Rolled
	Shipped in Rolls	Shipped Flat	Shipped Flat, in Rolls, or on Bucks
Over 1⁄4 to 3⁄8, incl	2	1½	½
Over 3⁄8 to ½, incl	1½	1	½
Over ½ to 1, incl	1	3⁄4	½
Over 1 to 2, incl	5⁄8	5⁄8	3⁄8
Over 2 to 4, incl	½	½	3⁄8
Over 4	3⁄8	3⁄8	3⁄8

TABLE 12 Straightness Tolerances for Square-Sheared Metal
(Applicable to all specifications listed in 2.2)
(Not applicable to metal over 120 in. in length)

Thickness, in.	Maximum Edgewise Curvature (Depth of Arc) in any 72-in. Portion of the Total Length	
	Straightness Tolerances, in.	
	Up to 10 in., incl, in Width	Over 10 in., in Width
1⁄8 and under	1⁄16	1⁄32
Over 1⁄8 to 3⁄16, incl	1⁄8	3⁄64
Over 3⁄16	1⁄8	1⁄16

TABLE 13 Straightness Tolerances for Sawed Metal
(Applicable to all specifications listed in 2.2)
(Not applicable to metal over 144 in. in length)

Width, in.	Maximum Edgewise Curvature (Depth of Arc) in any 72-in. Portion of the Total Length
	Straightness Tolerances, in.
3 and under	1⁄16
Over 3	3⁄64

TABLE 14 Tolerances for Radius of Commercially Square Corners of Rolled or Drawn Edges with Square Corners
(Applicable to all specifications listed in 2.2 except B 694)

Thickness, in.	Permissible Radius of Corners, max, in.
0.032 to 0.064, incl	0.010
Over 0.064 to 0.188, incl	0.016
Over 0.188 to 1, incl	1⁄32

and is acceptable unless otherwise specified.

6.2 The surface finish and appearance shall be the normal commercial quality for the alloy, thickness, and temper ordered. When application information is provided with purchase order, the surface shall be that commercially producible for the application. Superficial films of discoloration, or lubricants, or tarnish inhibitors are permissible unless otherwise specified.

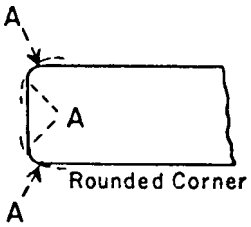
7. Sampling

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 10 000 lb 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 25 000 lb that has been continuously processed and subject to inspection at one time.

7.1.2 *Portion Size*—A portion shall be four or more pieces selected as to be representative of each lot. If the lot consists of less than four pieces, representative samples shall be taken from each piece.

7.1.2.1 *Chemical Analysis*—The sample for chemical analysis shall be taken in accordance with Practice E 55 for product in its final form. Unless otherwise required 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 semifinished product if heat identity



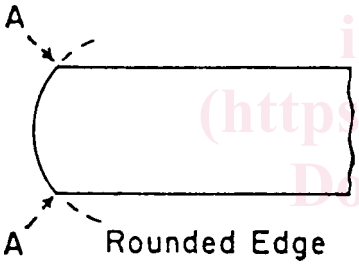
NOTE—The arc of the rounded corner shall not necessarily be tangent at points "A," but the product shall be commercially free from sharp, rough, or projecting edges.

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 2.2 except B 694)

Thickness, in.	Radius of Corners, in.	
	Min	Max
Up to 0.125, incl[A]	. . .	. . .
Over 0.125 to 0.188, incl	0.016	0.048
Over 0.188 to 1, incl	0.031	0.094
Over 1 to 2, incl	0.063	0.188

[A] Not available.



NOTE—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.

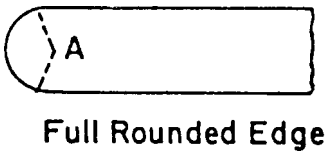
FIG. 2 Rounded Edge

TABLE 16 Tolerances for Radius of Rolled or Drawn Rounded Edges
(Applicable to all specifications listed in 2.2 except B 694)

Thickness, in.	Radius of Edges[A]	
	Min	Max
Up to 0.188, incl	¾ *t*	1¾ *t*
Over 0.188	1 *t*	1½ *t*

[A] The *t* refers to the measured thickness of the test specimen.

can be maintained throughout all operations. If the manufacturer determines the chemical composition during manufacture, he shall not be required to sample and analyze the finished product. The minimum weight of the composite sample in accordance with Practice E 55 that is to be divided into three equal parts shall be as follows:



NOTE—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

TABLE 17 Tolerances for Radius of Rolled or Drawn Full-Rounded Edges
(Applicable to all specifications listed in 2.2 except B 694)

Thickness, in.	Radius of Edges[A]	
	Min	Max
All thicknesses	½ *t*	¾ *t*

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

TABLE 18 Lot Weight Tolerances for Hot-Rolled Sheet and Plate
(Applicable to Specifications B 36/B 36M, B 96 (Copper Alloy UNS Nos. C65500 and C65800), B 103/B 103M, B 122/B 122M, B 152, and B 591)

Thickness, in.	Weight Tolerances, Plus and Minus, Percentage of Theoretical Weight				
	48 in. and Under in Width	Over 48 to 60 in., incl, in Width	Over 60 to 72 in., incl, in Width	Over 72 to 90 in., incl, in Width	Over 90 to 110 in., incl, in Width
⅛ and under	8	9.5	11	12.5	14
Over ⅛ to 3⁄16, incl	6.5	8	9.5	11	12.5
Over 3⁄16 to ¼, incl	6	7.5	8.5	9	10
Over ¼ to 5⁄16, incl	5.5	7	8	8.5	9
Over 5⁄16 to ⅜, incl	5	6	7	7.5	8
Over ⅜ to 7⁄16, incl	4.5	5	6	7	7.5
Over 7⁄16 to ½, incl	4	4.5	5.5	6	6.5
Over ½ to ⅝, incl	3.5	4.5	5	5.5	6
Over ⅝ to ¾, incl	3	4	4.5	5	5.5
Over ¾ to 1, incl	2.75	3.5	4	4.5	5
Over 1 to 1½, incl	2.5	3	3.5	4	4.5
Over 1½ to 2, incl	2.25	2.75	3.25	3.75	4.25

ASTM Designation	Weight of Sample, min, g
B 36/B 36M, B 96, B 121/B 121M, B 122/B 122M, B 152, B 169, B 194, B 291, B 422, B 465, B 534, B 591, B 592, and B 740	150
B 103/B 103M	225

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 Product Standards 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