



Designation: B194 – 22

Standard Specification for Copper-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar¹

This standard is issued under the fixed designation B194; 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 U.S. Department of Defense.

1. Scope*

1.1 This specification establishes the requirements for copper-beryllium alloy plate, sheet, strip, and rolled bar. The following alloys are specified:

Copper Alloy UNS No.	Nominal Beryllium Composition, %
C17000	1.7
C17200	1.9

1.2 Unless otherwise specified in the contract or purchase order, Copper Alloy UNS No. C17200 shall be the alloy furnished.

1.3 *Units*—The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 The following safety hazard caveat pertains only to the test method(s) described in this specification:

1.4.1 *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, health, and environmental practices and to determine the applicability of regulatory limitations prior to use.*

1.5 *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 ASTM Standards:²

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 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.

[B248](#) Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar

[B248M](#) Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar (Metric)

[B601](#) Classification for Temper Designations for Copper and Copper Alloys—Wrought and Cast

[B820](#) Test Method for Bend Test for Determining the Formability of Copper and Copper Alloy Strip

[B846](#) Terminology for Copper and Copper Alloys

[E8/E8M](#) Test Methods for Tension Testing of Metallic Materials

[E18](#) Test Methods for Rockwell Hardness of Metallic Materials

[E112](#) Test Methods for Determining Average Grain Size

3. General Requirements

3.1 The following sections of Specification [B248](#) or [B248M](#) constitute a part of this specification:

3.1.1 Terminology

3.1.2 Materials and Manufacture

3.1.3 Dimensions, Weights, and Permissible Variations

3.1.4 Workmanship, Finish, and Appearance

3.1.5 Sampling

3.1.6 Number of Tests and Retests

3.1.7 Specimen Preparation

3.1.8 Test Methods

3.1.9 Significance of Numerical Limits

3.1.10 Inspection

3.1.11 Rejection and Rehearing

3.1.12 Certification

3.1.13 Test Reports

3.1.14 Packaging and Package Marking.

3.2 In addition, when a section with a title identical to that referenced in 3.1 above appears in this specification, it contains additional requirements that supplement those appearing in Specification [B248](#) or [B248M](#).

4. Terminology

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

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

5. Ordering Information

5.1 Include the following specified choices when placing orders for product under this specification as applicable:

- 5.1.1 ASTM designation and year of issue,
- 5.1.2 Copper Alloy UNS No. designation,
- 5.1.3 Form of material: plate, sheet, strip, or rolled bar,
- 5.1.4 Temper (Section 7),
- 5.1.5 Dimensions: thickness and width, and length if applicable,
- 5.1.6 How furnished: coils, stock lengths with or without ends, specific lengths with or without ends,
- 5.1.7 Quantity—total weight or total length or number of pieces of each size, and
- 5.1.8 Tension test or hardness as applicable (Section 8).

5.2 The following options are available and should be specified at the time of placing the order when required:

- 5.2.1 Type of edge: slit, sheared, sawed, square corners, rounded corners, rounded edges, or full-rounded edges (Specification **B248** or **B248M**, Subsection 5.6),
- 5.2.2 Special width and straightness tolerances: slit-metal tolerances, square-sheared-metal tolerances, sawed-metal tolerances, straightened or edge-rolled-metal tolerances (Specification **B248** or **B248M**, Subsection 5.3 or 5.5),
- 5.2.3 Special thickness tolerances: (Specification **B248** or **B248M**, Table 3),
- 5.2.4 Bend test (Section 11),
- 5.2.5 Grain size (Section 9),
- 5.2.6 Grain count (Section 10),
- 5.2.7 Certification (Specification **B248** or **B248M**, Section 14),
- 5.2.8 Test Report (Specification **B248** or **B248M**, Section 15),
- 5.2.9 Special tests or exceptions, if any.

5.3 If the product is purchased for agencies of the U.S. Government, see the Supplementary Requirement of Specification **B248** or **B248M** for additional requirements, if specified.

6. Chemical Composition

6.1 The material shall conform to the chemical composition requirements in **Table 1** for the Copper Alloy UNS No. designation specified in the ordering information.

6.1.1 Results of analysis on a product (check) sample shall conform to the composition requirements within the permitted analytical variance specified in **Table 1**.

6.2 These composition limits do not preclude the presence of other elements. By agreement between manufacturer and purchaser, limits may be established and analysis required for unnamed elements.

6.3 For alloys in which copper is listed as “remainder,” copper is the difference between the sum of results of all elements determined and 100 %. When all elements in **Table 1** are determined, the sum of results shall be 99.5 % minimum.

7. Temper

7.1 The standard tempers for products described in this specification are given in **Table 2**, **Table 3**, **Table 4**, and **Table 5**.

- 7.1.1 Solution Heat Treated TB00.
- 7.1.2 Solution Heat Treated and Cold Worked TD00 to TD04.
- 7.1.3 Solution Heat Treated and Precipitation Heat Treated TF00.
- 7.1.4 Solution Heat Treated, Cold Worked and Precipitation Heat Treated TH01 to TH04.
- 7.1.5 Mill Hardened TM00 to TM08.
- 7.1.6 Plate is generally available in the TB00, TD04, TF00, and TH04 tempers.

8. Mechanical Property Requirements

8.1 Tensile Strength Requirements:

8.1.1 Tensile strength for product less than 0.050 in. (1.27 mm) in thickness shall be the standard test, when tested in accordance with Test Methods **E8/E8M**.

8.1.2 The tensile strength requirements are given in **Table 2**, **Table 3**, and **Table 4**.

8.1.3 Acceptance or rejection for products less than 0.050 in. (1.27 mm) in thickness shall depend only on tensile properties.

8.2 Rockwell Hardness Requirements:

8.2.1 Rockwell hardness for product 0.050 in. (1.27 mm) and greater in thickness shall be the standard test, when tested in accordance with Test Methods **E18**.

8.2.2 The Rockwell hardness requirements are given in **Table 2**, **Table 3**, and **Table 4**.

8.2.3 Acceptance or rejection for product 0.050 in. (1.27 mm) and greater in thickness shall depend only on Rockwell hardness.

8.3 In cases of disagreement with Rockwell results, the acceptance or rejection shall be the tensile properties, when tested in accordance with Test Methods **E8/E8M**.

9. Grain Size

9.1 Acceptance or rejection based upon grain size shall depend on the average grain size of a test specimen from each of two sample portions, and each specimen shall be within the limits prescribed in **Table 5** when determined in accordance with Test Methods **E112**.

9.2 The determinations shall be made on samples in a plane perpendicular to the surface and perpendicular to the direction of rolling.

TABLE 1 Chemical Requirements

Element	Composition, %	
	Copper Alloy UNS No. C17000	Copper Alloy UNS No. C17200
Beryllium	1.60–1.85	1.80–2.00
Additive elements:		
Nickel + cobalt, min	0.20	0.20
Nickel + cobalt + iron, max	0.6	0.6
Aluminum, max	0.20	0.20
Silicon, max	0.20	0.20
Copper	remainder	remainder