



Designation: **B100—13 B100 – 20**

# Standard Specification for Wrought Copper-Alloy Bearing and Expansion Plates and Sheets for Bridge and Other Structural Use<sup>1</sup>

This standard is issued under the fixed designation B100; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope\*

1.1 This specification establishes the requirements for wrought copper-alloy bearing plate and bearing sheets for application in bridges and other structures. Specifically, the plates and sheets are to be used for fixed or expansion bearings where the motion is slow and intermittent with pressures not exceeding 3 ksi (20 MPa).

1.2 ~~Units—Values~~—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.

1.2.1 ~~Exception—~~Values given in inch-pound units are the standard except for grain size, which is stated in SI units.

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 *ASTM Standards:*<sup>2</sup>

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

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

[E8E8/E8M](#) Test Methods for Tension Testing of Metallic Materials—~~[Metric]~~ ~~E0008~~ ~~E0008M~~

[E9](#) Test Methods of Compression Testing of Metallic Materials at Room Temperature

[E10](#) Test Method for Brinell Hardness 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

[E54](#) Test Methods for Chemical Analysis of Special Brasses and Bronzes (Withdrawn 2002)<sup>3</sup>

[E62](#) Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods) (Withdrawn 2010)<sup>3</sup>-20

[E255](#) Practice for Sampling Copper and Copper Alloys for the Determination of Chemical Composition

[E478](#) Test Methods for Chemical Analysis of Copper Alloys

## 3. General Requirements

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

3.1.1 ~~Terminology;~~ Terminology;

3.1.2 ~~Workmanship, Finish, and Appearance;~~ Appearance;

3.1.3 ~~Sampling;~~ Sampling;

3.1.4 ~~Number of Tests and Retests;~~ Retests;

3.1.5 ~~Specimen Preparation;~~ Preparation;

3.1.6 ~~Test Methods;~~ Methods;

3.1.7 ~~Significance of Numerical Limits;~~ Limits;

3.1.8 ~~Inspection;~~ Inspection;

<sup>1</sup> 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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<sup>2</sup> 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~~ ~~standard's~~ Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](#).

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

- 3.1.9 Rejection and Rehearing; Rehearing;
- 3.1.10 Certification; Certification;
- 3.1.11 Test Reports; Reports;
- 3.1.12 Packaging and Package Marking; Marking; and
- 3.1.13 Supplementary Requirements.

3.2 In addition, when a section with a title identical to one of those referenced in 3.1 appears in this specification, it contains additional requirements that supplement those appearing in Specification B248.

**4. Terminology**

4.1 For definitions of terms related to copper and copper alloys, refer to Terminology B846.

**5. Ordering Information**

5.1 ~~Orders for product to this specification should include the following information:~~ Include the following specified choices when placing orders for product under this specification, as applicable:

- 5.1.1 ASTM designation and year of ~~issue~~; issue;
- 5.1.2 Copper Alloy UNS No. designation (for example, ~~C51000~~); C51000);
- 5.1.3 Dimensions: length, width, thickness (Section 11 and Table 1); );
- 5.1.4 Quantity or weight for each ~~size~~; size;
- 5.1.5 Temper (Section 8); );
- 5.1.6 When product produced of Copper Alloy UNS No. C61300 is to be used in applications requiring welding (Table 2, footnote B); B); and
- 5.1.7 ~~When product is purchased for agencies of the U.S. government (Section 10).~~

5.2 The following options are ~~available under this specification and should be specified in the contract or purchase available,~~ but may not be included unless specified at the time of placing of the order when required:

- 5.2.1 When product is purchased for agencies of the U.S. Government (Section 10).
- 5.2.2 Heat identification or traceability (Section 6.1.2),
- 5.2.3 Certification (Specification B248), and
- 5.2.4 Test Report (Specification B248).

**6. Materials and Manufacture**

6.1 *Material:*

6.1.1 The material of manufacture shall be ~~cast a form (cast bar, slab, cake, billets, and so forth etc.)~~ of Copper Alloy UNS No. C51000, C51100, C61300, C61400, or C65500 of such purity and soundness as to be suitable for processing into the products prescribed herein.

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

**TABLE 1 Thickness and Weight Tolerances**

Ordered Weight lb/ft <sup>2</sup> (kg/m <sup>2</sup> ) <sup>A</sup>	Weight Tolerance, %		Ordered Thickness, in. (mm)	Thickness Tolerance, %	
	Over	Under		Over	Under
	Plates and Sheets 20 in. (508 mm) and Under in Width				
5.0 to 7.5 (24.4 to 36.6), excl	4.5	3.5	Under 1/8 (3.18)	9	0
7.5 to 10.0 (36.6 to 48.8), excl	4	3	1/8 to 3/16 (3.18 to 4.76), excl	8	0
10.0 to 12.5 (48.8 to 61.0), excl	4	2.5	3/16 to 1/4 (4.76 to 6.35), excl	7	0
12.5 to 15.0 (61.0 to 73.2), excl	3.5	2.5	1/4 to 5/16 (6.35 to 7.94), excl	6	0
15.0 to 17.5 (73.2 to 85.4), excl	2.5	2.5	5/16 to 3/8 (7.94 to 9.52), excl	5	0
17.5 to 20.0 (85.4 to 97.6), excl	2.5	2.0	3/8 to 7/16 (9.52 to 11.1), excl	4.5	0
20 (97.6) or over	2.5	2.0	7/16 to 1/2 (11.1 to 12.7), excl	4 <sup>B</sup>	0
			1/2 to 5/8 (12.7 to 15.9), excl	3.5 <sup>B</sup>	0
			5/8 to 3/4 (15.9 to 19.0), excl	3 <sup>B</sup>	0
			3/4 to 1 (19.0 to 25.4), excl	2.5 <sup>B</sup>	0
			1 (25.4) or over	2.5 <sup>B</sup>	0
	Plates and Sheets Over 20 in. (508 mm) in Width				
All weights	5.0	5.0	All thicknesses	10.0	0

<sup>A</sup> For purposes of calculating weights, cross section, etc., the density of rolled phosphor bronze (Copper Alloy UNS Nos. C51000 and C51100) shall be taken as 0.320 lb/in.<sup>3</sup> (8.86 g/cm<sup>3</sup>) and the density of rolled copper silicon alloy (Copper Alloy UNS No. C65500) as 0.308 lb/in.<sup>3</sup> (8.53 g/cm<sup>3</sup>).

<sup>B</sup> These "Over" thickness tolerances apply to plates and sheets 10 in. (254 mm) and under in width. For plates and sheets over 10 to 20 in. (254 to 508 mm), incl. in width the "Over" thickness tolerances shall be as follows:

Ordered Thickness, in. (mm).....Thickness (mm).....Thickness Tolerance, Over, %	
7/16 to 5/8 (11.1 to 15.9), excl.....4.5	
5/8 to 3/4 (15.9 to 19.0), excl.....4.0	
3/4 (19.0) or over.....3.5	

**TABLE 2 Chemical Requirements**

Element	Composition %				
	C51000	C51100	C61300	C61400	C65500
Copper (incl Silver)	remainder <sup>A</sup>	remainder <sup>A</sup>	remainder	remainder	remainder
Phosphorus	0.03–0.35	0.03–0.35	0.015 max.	0.015 max.	...
Tin	4.2–5.8	3.5–4.9	0.20–0.50	...	...
Silicon	...	...	0.10 max.	...	2.8–3.8
Aluminum	...	...	6.0–7.5	6.0–8.0	...
Iron	0.10 max.	0.10 max.	2.0–3.0	1.5–3.5	0.8 max.
Manganese	...	...	0.20 max.	1.0 max.	0.5–1.3
Zinc, max.	0.30	0.30	0.10	0.20	1.5 max.
Lead, max.	0.05	0.05	0.01	0.01	0.05
Nickel, max.	...	...	0.15 <sup>A</sup>	...	0.6 <sup>A</sup>
Nickel, max.	...	...	0.15 <sup>B</sup>	...	0.6 <sup>B</sup>
Other named elements	...	...	<sup>B</sup>	...	...
Other named elements	...	...	<sup>C</sup>	...	...

<sup>A</sup> Cu value does not include Ag.

<sup>B</sup> Ni value includes Co.

<sup>C</sup> When the product is for subsequent welding applications and is so specified by the purchaser, chromium, cadmium, zirconium, and zinc shall each be 0.05 % max.

## 6.2 Manufacture:

6.2.1 The product shall be manufactured by hot working, cold working, and annealing processes as to produce a uniform wrought structure in the finished product.

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

## 7. Chemical Composition

7.1 The material shall conform to the chemical composition requirements prescribed in Table 2 for the Copper Alloy UNS No. designation specified in the ordering information.

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

7.3 ~~Copper, given as the remainder, may be taken as the~~ For alloys in which copper is listed as “remainder,” copper is the difference between the sum of results of all elements ~~analyzed~~ determined and 100 %.

7.4 When all elements listed in Table 2 for the specified Copper Alloy UNS No. designation are determined, the sum of results shall be 99.5 % min except for C61300 which shall be 99.8 %.

## 8. Temper

8.1 The temper of product furnished to this specification, and as defined in Practice B601, shall be as follows:

UNS Alloy No.	Temper
C51000	H03 (¾ hard)
C51100	H03 (¾ hard)
C65500	H01 (¼ hard)
C61300	M20 (as hot rolled) or 061 (annealed)
C61400	M20 (as hot rolled) or 061 (annealed)

## 9. Mechanical Property Requirements

9.1 Product in final form shall conform to the requirements of Table 3.

9.1.1 Product in plate form less than ¾ in. (20 mm) in thickness and product in sheet form shall conform to the tensile requirements when tested in accordance with Test Method Methods ~~E8E8/E8M~~.

9.1.2 Product in plate form ¾ in. (20 mm) or over in thickness shall conform to either tensile or compression requirements when tested in accordance with Test Method Methods ~~E8E8/E8M~~ or Test Method Methods ~~E9~~ respectively.

9.1.2.1 In case of dispute, Test Method Methods ~~E8E8/E8M~~ shall govern.

9.1.3 The properties of product over 18 in. (460 mm) in width and over ¾ in. (20 mm) in thickness shall be subject to agreement between the manufacturer and the purchaser.

## 10. Purchases for U.S. Government Agencies

10.1 When identified in the contract or purchase order, product purchased for agencies of the U.S. ~~government~~ Government shall conform to the requirements stipulated in the Supplemental Requirements section of Specification ~~B248~~.