



Standard Specification for Leaded Brass Plate, Sheet, Strip, and Rolled Bar¹

This standard is issued under the fixed designation B121/B121M; 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 establishes the requirements for copper-zinc-lead alloys (leaded brass) plate, sheet, strip, and rolled bar. The following alloys are covered:

Copper Alloy UNS No. ²	Previously Used Designation	Nominal Composition, %			
		Copper	Zinc	Lead	Iron
C33500	2	65.0	34.5	0.5	...
C34000	3	65.0	34.0	1.0	...
C34200	5	65.0	33.0	2.0	...
C35000	...	61.5	37.4	1.1	...
C35300	4	61.2	37.0	1.8	...
C35600	6	61.2	36.3	2.5	...

1.2 The values stated in either inch-pound units or SI units are to be regarded separately as 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.

2. Referenced Documents

2.1 The following documents in the current issue of Book of Standards form a part of this specification to the extent referenced herein:

2.2 *ASTM Standards*:³

B248 Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, 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 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.

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

B846 Terminology for Copper and Copper Alloys

E8 Test Methods for Tension Testing of Metallic Materials

E8M Test Methods for Tension Testing of Metallic Materials [Metric] (Withdrawn 2008)⁴

E76 Test Methods for Chemical Analysis of Nickel-Copper Alloys (Withdrawn 2003)⁴

E478 Test Methods for Chemical Analysis of Copper Alloys

E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

3. General Requirements

3.1 The following sections of Specification B248 or B248M constitute part of this specification:

- 3.1.1 Terminology—Definitions,
- 3.1.2 Materials and Manufacture,
- 3.1.3 Workmanship, Finish, and Appearance,
- 3.1.4 Sampling—except for chemical analysis,
- 3.1.5 Number of Tests and Retests,
- 3.1.6 Specimen Preparation,
- 3.1.7 Test Methods—except for chemical analysis,
- 3.1.8 Significance of Numerical Limits,
- 3.1.9 Inspection,
- 3.1.10 Rejection and Rehearing,
- 3.1.11 Certification,
- 3.1.12 Test Reports (Mill),
- 3.1.13 Packaging and Package Marking, and
- 3.1.14 Supplementary Requirements.

3.2 In addition, when a section with a title identical to that referenced in 4.1 appears in this specification, it contains additional requirements, which supplement those appearing in Specification B248 or B248M.

⁴ 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



4. Terminology

4.1 *Definitions*—For standard terms related to copper and copper alloys, refer to Terminology B846.

5. Ordering Information

5.1 Orders for product should include the following information, as applicable:

5.1.1 ASTM designation and year of issue (B121/B121M – XX).

5.1.2 Copper (alloy) UNS No. designation,

5.1.3 Temper (Section 8),

5.1.4 Dimensions: thickness and width (see 12.1.1 and 12.1.2),

5.1.5 Type of edge, if required: slit, sheared, sawed, square corners, rounded corners, rounded edges, or full-rounded edges (see 12.1.5),

5.1.6 How furnished (straight lengths or coils),

5.1.7 Lengths (see 12.1.3),

5.1.8 Weight: total for each size, and

5.2 In addition, when product is purchased for agencies of the U. S. government, it shall conform to the Supplementary Requirements as defined in Specification B248 or B248M when specified in the contract or purchase order.

6. Materials and Manufacture

6.1 Material:

6.1.1 The material of manufacture shall be a cast bar, cake, slab, and so forth, of copper alloy UNS No. C33500, C34000, C34200, C35000, C35300, or C35600 as specified in the ordering information.

6.1.2 In the event that heat identification or traceability is required, the purchaser shall specify the details desired.

NOTE 1—Because of the discontinuous nature of the processing of castings into wrought products, it is not always practical to identify a specific casting analysis with a specific quantity of finished material.

6.2 Manufacture:

6.2.1 The product shall be manufactured by such 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 in the ordering information.

6.2.3 *Edges*—Slit edges shall be furnished unless otherwise specified in the contract or purchase order.

7. Chemical Composition

7.1 The materials shall conform to the compositions prescribed in Table 1.

TABLE 1 Chemical Requirements

Copper Alloy UNS No.	Composition			
	Copper	Lead	Iron	Zinc
C33500	62.0–65.0	0.25–0.7	0.10 max	remainder
C34000	62.0–65.0	0.8–1.5	0.10 max	remainder
C34200	62.0–65.0	1.5–2.5	0.10 max	remainder
C35000	60.0–63.0	0.8–2.0	0.10 max	remainder
C35300	60.0–63.0	1.5–2.5	0.10 max	remainder
C35600	60.0–63.0	2.0–3.0	0.10 max	remainder

7.2 These specification limits do not preclude the presence of other elements. Limits for unnamed elements may be established by agreement between manufacturer or supplier and purchaser.

7.3 Either copper or zinc may be taken as the difference between the sum of all elements analyzed and 100 %. When all elements in Table 1 are analyzed, their sum shall be as shown in the table below.

Copper Alloy UNS No.	Copper Plus Named Elements, % min.
C33500	99.6
C34000	99.6
C34200	99.6
C35000	99.6
C35300	99.5
C35600	99.5

8. Temper

8.1 *Rolled Material*—The standard tempers of rolled product are as designated in Table 2 in the column entitled “Temper Standard.” Special or nonstandard tempers are subject to negotiation between manufacturer or supplier and purchaser.

8.2 *Annealed Material*—The standard tempers of annealed product are as designated in Table 3 in the column entitled “Standard Temper Designation.” Special or nonstandard tempers are subject to negotiation between manufacturer or supplier and purchaser.

9. Mechanical Property Requirements

9.1 Tensile Strength:

9.1.1 Products ordered to this specification in inch-pound units shall be tested in accordance with Test Methods E8, and shall conform to tensile strength requirements prescribed in ksi units in Table 2.

9.1.2 Products ordered to this specification in SI units shall be tested in accordance with Test Methods E8M, and shall conform to tensile strength requirements prescribed in MPa units in Table 2.

9.1.3 Acceptance or rejection of roll temper product based on mechanical properties shall depend only on the tensile strength.

9.2 Rockwell Hardness:

9.2.1 Rockwell hardness tests offer a quick and convenient method of checking leaded brass of any temper for general conformity to the requirements for tensile strength or grain size. The approximate Rockwell hardness values for the rolled tempers are given in Table 2, and those for the annealed tempers of material 0.015 in. [0.381 mm] and over in thickness are given in Table 4 for general information and assistance in testing.

9.2.2 Rockwell hardness test results shall not be used as a basis for product rejection.

10. Grain Size for Annealed Tempers

10.1 Grain size shall be the standard requirement for all products in the annealed tempers.

10.2 Acceptance or rejection based upon grain size shall depend only on the average grain size of test specimens taken

**TABLE 2 Tensile Strength Requirements and Approximate Rockwell Hardness Values for Rolled Tempers**

NOTE 1—Plate is generally available in only the O60 (soft), H01 (quarter-hard), and H02 (half-hard) tempers. Required properties for other tempers shall be agreed upon between the manufacturer and the purchaser at the time of placing the order.

Temper Designation ^A		Tensile Strength		Approximate Rockwell Hardness ^B	
Standard	Former	ksi ^C [MPa] ^D		B Scale	Superficial 30-T
		Min	Max		
Copper Alloy UNS Nos. C33500, C34000, C34200, C35000, C35300, and C35600					
H01	quarter-hard	49 [340]	59 [405]	40–65	43–60
H02	half-hard	55 [380]	65 [450]	57–74	54–66
H04	hard	68 [470]	78 [540]	76–84	68–73
H06	extra-hard	79 [545]	89 [615]	83–89	73–76
H08	spring ^E	86 [595]	95 [655]	87–92	75–78
H10	extra-spring ^E	90 [620]	99 [685]	88–93	76–79

^A Standard designations defined in Classification B601.

^B Rockwell Hardness values apply as follows:

The B scale hardness values apply to metal 0.020 in. (0.508 mm) and over in thickness, and

The 30-T scale hardness values apply to metal 0.012 in. (0.305 mm) and over in thickness.

^C ksi = 1000 psi.

^D See Appendix.

^E Spring and extra spring temper are generally furnished only in alloy No. 353.

TABLE 3 Grain Size Requirements for Annealed Material

Copper Alloy UNS No.	Standard Temper Designation	Grain Size, mm		
		Nominal	Min	Max
C33500, C34000, C34200, C35000, C35300, C35600	OS070	0.070	0.050	0.100
	OS050	0.050	0.035	0.070
	OS035	0.035	0.025	0.050
	OS025	0.025	0.015	0.035

TABLE 4 Approximate Rockwell Hardness of Annealed Material

Nominal Grain Size, mm	Standard Temper	Approximate Rockwell Hardness ^A	
	Designation	F Scale	Superficial 30-T
Copper Alloy UNS Nos. C33500, C34000, C34200, C35000, C35300, and C35600			
0.070	OS070	54–67	12–27
0.050	OS050	61–73	20–35
0.035	OS035	65–76	25–38
0.025	OS025	67–69	27–42

^A Rockwell hardness values apply as follows:

The F scale hardness values apply to metal 0.020 in. (0.508 mm) and over in thickness, and

The 30-T scale hardness values apply to metal 0.015 in. (0.381 mm) and over in thickness.

from each of two sampling portions and each specimen shall be within the limits prescribed in Table 3 when determined in accordance with Test Methods E112.

10.3 Grain size shall be determined on a plane parallel to the flat surfaces of the product.

11. Other Requirements

11.1 *Purchases for U.S. Government Agencies*—When identified in the contract or purchase order, product purchased for agencies of the U.S. Government shall conform to the special government requirements stipulated in the supplemental requirements given in Specification B248 or B248M.

12. Dimensions, Mass, and Permissible Variations

12.1 The inch-pound dimensions and tolerances for products covered by this specification shall be as prescribed in the

current edition of Specification B248, and the SI dimensions and tolerances covered by this specification shall be as prescribed in the current edition of Specification B248M, with particular reference to Section 5 and the following tables of those specifications:

12.1.1 *Thickness*

12.1.2 *Width:*

12.1.2.1 *Slit Metal and Slit Metal with Rolled Edges*

12.1.2.2 *Square-Sheared Metal*

12.1.2.3 *Sawed Metal*

12.1.3 *Length:*

12.1.3.1 *Specific and Stock Lengths With and Without Ends*

12.1.3.2 *Schedule of Lengths (Specific and Stock) with Ends*

12.1.3.3 *Length Tolerances for Square-Sheared Metal*

12.1.3.4 *Length Tolerances for Sawed Metal*

12.1.4 *Straightness:*

12.1.4.1 *Slit Metal or Slit Metal Either Straightened or Edge-Rolled*

12.1.4.2 *Square-Sheared Metal*

12.1.4.3 *Sawed Metal*

12.1.5 *Edges:*

12.1.5.1 *Square Edges*

12.1.5.2 *Rounded Corners*

12.1.5.3 *Rounded Edges*

12.1.5.4 *Full-Rounded Edges*

13. Workmanship, Finish, and Appearance

13.1 The product shall be free of defects, but blemishes of a nature that do not interfere with the intended application are acceptable.

14. Sampling

14.1 *Chemical Analysis:*

14.1.1 The sample for chemical analysis shall be taken from the pieces selected and combined into one composite sample in accordance with Practice E255 for product in its final form. The minimum weight of the composite sample shall be 150 g.

14.1.2 Instead of sampling in accordance with Practice E255, the manufacturer shall have the option of taking samples



at the time the castings are poured or by taking samples from the semi-finished product.

14.1.2.1 When composition of the material has been determined during the course of manufacture, sampling of the finished product by the manufacturer is not required.

14.1.3 The number of samples to be taken for determination of chemical composition shall be as follows:

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

14.1.3.2 When sampled from the semi-finished product, at least one sample shall be taken to represent each 10 000 lb, or fraction thereof, except that not more than one sample shall be required per piece.

14.1.3.3 Only one sample need be taken from the semi-finished product of one cast bar from a single furnace melt charge continuously processed.

14.1.3.4 When the material is cast in the horizontal continuous casting mode, at least one sample will be taken to represent the composition of the holder per cast coil.

15. Test Methods

15.1 Chemical Analysis:

15.1.1 Chemical composition shall be determined, in case of disagreement, by the following appropriate method:

Element	Test Method
Copper	E478
Iron	E478 (Photometric)
Lead	E478 (AA)
Zinc	E478 (Titrimetric)

15.1.2 Test method(s) used for the determination of element(s) required by contractual or purchase order agreement shall be as agreed upon between the manufacturer and the purchaser.

16. Keywords

16.1 leaded brass plate; leaded brass rolled bar; leaded brass sheet; leaded brass strip; UNS No. C33500 ; UNS No. C34000; UNS No. C34200; UNS No. C35000; UNS No. C35300; UNS No. C35600

APPENDIX

(Nonmandatory Information)

X1. METRIC EQUIVALENTS

X1.1 The SI unit for strength properties now shown is in accordance with the International System of Units (SI). The derived SI unit for force is the newton (N), which is defined as that force which when applied to a body having a mass of one kilogram gives it an acceleration of one metre per second squared ($N = \text{kg} \cdot \text{m/s}^2$). The derived SI unit for pressure or

stress is the newton per square metre (N/m^2), which has been named the pascal (Pa) by the General Conference on Weights and Measures. Since $1 \text{ ksi} = 6\,894\,757 \text{ Pa}$ the metric equivalents are expressed as megapascal (MPa), which is the same as MN/m^2 and N/mm^2 .

SUMMARY OF CHANGES

Committee B05 has identified the location of selected changes to this standard since the last issue, B121/B121M – 01 (2006), that may impact the use of this standard.

- (1) Changed C35500 to C33500 in Section 6.1.1.
- (2) Changed Test Method for Iron from E76 (AA) to E478 (Photometric).
- (3) Changed Test Method for Zinc from E478 (AA) to E478 (Titrimetric).
- (4) Added all UNS Nos. from this standard to Section 16.1.

- (5) Removed C35340 from Table 2.
- (6) Corrected Extra Spring Temper Min Tensile Strength to 90 ksi from 909 ksi.
- (7) Removed C34300 and C34340 from Table 3 and added C35300 to Table 3.



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