Designation: B121/B121M – 16

Standard Specification for Leaded Brass Plate, Sheet, Strip, and Rolled Bar[1]

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 U.S. Department of Defense.

1. Scope*

1.1 This specification establishes the requirements for 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	63.5	36.0	0.5	...
C34000	3	63.5	35.5	1.0	...
C34200	5	63.5	34.5	2.0	...
C35000	...	61.5	37.4	1.1	...
C35300	4	61.5	36.7	1.8	...
C35600	6	61.5	36.0	2.5	...

1.2 *Units*—Values stated in either inch-pound units or SI units are to be regarded separately as standard. Within the text, SI units are shown in brackets. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

2. Referenced Documents

2.1 *ASTM Standards:*[3]

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

B846 Terminology for Copper and Copper Alloys

E8/E8M Test Methods for Tension Testing of Metallic Materials

E112 Test Methods for Determining Average Grain Size

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)

3. General Requirements

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

3.1.1 Terminology
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
3.1.13 Packaging and Package Marking
3.1.14 Supplementary Requirements

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 which supplement those appearing in Specifications B248 or B248M.

[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.

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

4. Terminology

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

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 Temper (Section 8),

5.1.4 Dimensions: thickness and width (11.1.1 and 11.1.2),

5.1.5 How furnished: straight lengths or coils,

5.1.6 Quantity—total weight or total length or number of pieces of each size,

5.1.7 Type of edge, if required (slit, sheared, sawed, square corners, round corners, rounded edges, or full-rounded edges) (11.1.5),

5.1.8 Length (11.1.3), and

5.1.9 Intended application.

5.2 The following options are available but may not be included unless specified at the time of placing the order when required:

5.2.1 Heat identification or traceability details.

5.2.2 Certification,

5.2.3 Mill Test Report,

5.2.4 If product is purchased for agencies of the U. S. government (see the Supplementary Requirements section of Specifications B248 or B248M for additional requirements, if specified).

6. Materials and Manufacture

6.1 *Materials:*

6.1.1 The material of manufacture shall be a form (cast bar, cake, slab, et cetera) of Copper Alloy UNS No. C33500, C34000, C34200, C35000, C35300, or C35600 of such purity and soundness as to be suitable for processing into the products prescribed herein.

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

NOTE 1—Due to 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.

6.3 *Edges:*

6.3.1 Slit edges shall be furnished unless otherwise specified in the contract or purchase order.

7. Chemical Composition

7.1 The material shall conform to the composition requirements in Table 1 for the copper [alloy] UNS No. designation specified in the ordering information..

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

7.3 For alloys in which zinc is listed as "remainder," either copper or zinc may be taken as the difference between the sum of results of all other elements determined and 100 %. When all elements in Table 1 are determined, the sum of the results shall be as shown in the following table:

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 The standard tempers for products described in this specification are given in Tables 2 and 3.

8.1.1 Cold rolled tempers H01 and H10.

8.1.2 Annealed tempers OS025 to OS070.

9. Grain Size for Annealed Tempers

9.1 Grain size shall be the standard requirement for all product in the annealed tempers.

9.2 Acceptance or rejection based upon grain size shall depend only on the average grain size of a test specimen taken from each of two sample portions, and each specimen shall be within the limits prescribed in Table 3 when determined in accordance with Test Methods E112.

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

10. Mechanical Property Requirements

10.1 *Tensile Strength Requirements:*

10.1.1 Product furnished under this specification shall conform to the tensile requirements prescribed in Table 2 when tested in accordance with Test Methods E8/E8M.

10.1.2 Acceptance or rejection based on mechanical properties shall depend only on tensile strength.

10.2 *Rockwell Hardness:*

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

TABLE 2 Tensile Strength Requirements and Approximate Rockwell Hardness Values for Rolled Temper Product

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]	
Code	Name	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 (OS) Product

Copper Alloy UNS No.	Standard Temper Designation (B601)	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

10.2.1 The approximate Rockwell hardness values given in Table 2 and Table 4 are for general information and assistance in testing, and shall not be used as a basis for product rejection.

NOTE 2—The Rockwell hardness test offers a quick and convenient method of checking for general conformity to the specification requirements for temper, tensile strength, and grain size.

11. Dimensions, Mass, and Permissible Variation

11.1 The dimensions and tolerances for product described by this specification shall be as specified in Specifications B248 or B248M with particular reference to the following tables and related paragraphs:

11.1.1 *Thickness.*
11.1.2 *Width:*
11.1.2.1 *Slit Metal and Slit Metal with Rolled Edges.*

TABLE 4 Approximate Rockwell Hardness of Annealed Material

Nominal Grain Size, mm	Standard Temper Designation	Approximate Rockwell Hardness[A]	
		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.

11.1.2.2 *Square Sheared Metal.*
11.1.2.3 *Sawed Metal.*
11.1.3 *Length:*
11.1.3.1 *Specific and Stock Lengths With and Without Ends.*
11.1.3.2 *Schedule of Lengths (Specific and Stock) with Ends.*
11.1.3.3 *Length Tolerance for Square Sheared Metal.*
11.1.3.4 *Length Tolerance for Sawed Metal.*
11.1.4 *Straightness:*
11.1.4.1 *Slit Metal or Slit Metal Either Straightened or Edge Rolled.*
11.1.4.2 *Square Sheared Metal.*
11.1.4.3 *Sawed Metal.*
11.1.5 *Edges Contours:*
11.1.5.1 *Square Corners.*
11.1.5.2 *Rounded Corners.*
11.1.5.3 *Rounded Edges.*
11.1.5.4 *Full-Rounded Edges.*

12. Workmanship, Finish, and Appearance

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

13. Sampling

13.1 Refer to sampling section in Specifications B248 or B248M.

13.2 *Chemical Analysis:*
13.2.1 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.
13.2.2 Instead of sampling as directed in 13.2.1, the manufacturer shall have the option of sampling at the time castings are poured or from the semi finished product. The number of samples taken for the determination of composition shall be as follows:
13.2.2.1 When samples are taken 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.

13.2.2.2 When samples are taken from semi finished product, a sample shall be taken to represent each 10 000 lb [5 000 kg] or fraction thereof, except that not more than one sample shall be required per piece.

13.2.2.3 Only one sample needs be taken from the semi finished product of one cast bar from a single melt charge continuously processed.

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

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

14. Test Methods

14.1 *Chemical Analyses:*

14.1.1 In cases of disagreement, test methods for chemical analysis shall be subject to agreement between the manufacturer or supplier and the purchaser. The following table is a list of published methods, some of which may no longer be viable, which along with others not listed, may be used subject to agreement:

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

14.1.2 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 the purchaser.

15. Keywords

15.1 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 ($N = kg \cdot m/s^2$). 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 ksi = 6 894 757 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 principal changes to this specification that have been incorporated since the 2011 issue as follows:

(1) Updated the specification to ensure it conforms to proper Form and Style.