



Designation: B 121/B 121M – 9501

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

This standard is issued under the fixed designation B 121/B 121M; 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~~ 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, %				Iron
		Copper	Zinc	Lead		
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	...	
C35340	...	61.2	36.8	1.8	0.2	
C35600	6	61.2	36.3	2.5	...	

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

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 ~~of in the current issue in effect on date of material purchase~~ Book of Standards form a part of this specification to the extent referenced herein:

2.2 *ASTM Standards*:

B 248 Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar²

B 248M Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar [Metric]²

~~B 601 Practice~~ 601 Classification for Temper Designations for Copper and Copper Alloys—Wrought and Cast²

B 846 Terminology for Copper and Copper Alloys³

E 8 Test Methods for Tension Testing of Metallic Materials³

E 8M Test Methods for Tension Testing of Metallic Materials [Metric]³

E 76 Test Methods for Chemical Analysis of Nickel Copper Alloys⁴

~~E 478M Test Methods for Tension Testing~~ Chemical Analysis of Metallic Materials [Metric] Copper Alloys⁴

E 527 Practice for Numbering Metals and Alloys (UNS)⁵

3. Ordering Information

~~3.1 Orders for material under the specification should include the~~ General Requirements

~~3.1 The following information:~~

~~3.1.1 Copper Alloy UNS number (Section 1);~~

~~3.1.2 Temper (Section 5);~~

~~3.1.3 Dimensions: thickness~~ sections of Specification B 248 constitute part of this specification:

~~3.1.1 Terminology—Definitions,~~

~~3.1.2 Materials and width (see 9.1.1 Manufacturing,~~

~~3.1.3 Workmanship, Finish, and 9.1.2);~~

~~3.1.4 Type of edge, if required: slit, sheared, sawed, square corners, rounded corners, rounded edges, or full-rounded edges (see 9.1.5);~~

~~3.1.5 How furnished (straight lengths or coils);~~

~~3.1.6 Lengths (see 9.1.3);~~

~~3.1.7 Weight: total Appearance,~~

~~3.1.4 Sampling—except for each size, and~~

~~3.1.8 ASTM Specification B 121/B 121M, year 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 whether inch-pound or SI units are applicable (see 1.2). 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 material is purchased for agencies of the U. S. Government, it shall conform a section with a title identical to the Supplementary Requirements as defined that referenced in Specification B 248 or B 248M when specified 4.1 appears in the contract or purchase order.~~

this specification, it contains additional requirements, which supplement those appearing in Specification B 248.

4. Terminology

4.1 Definitions—For standard terms related to copper and copper alloys, refer to Terminology B 846.

² The UNS system for copper and copper alloys (see Practice E 527) is a simple expansion

² *Annual Book 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.* ASTM Standards, Vol 02.01.

³ Annual Book of ASTM Standards, Vol 02.01.

⁴ Annual Book of ASTM Standards, Vol 03.04+5.

⁵ Annual Book of ASTM Standards, Vol 01.01+ 03.06.

5. Ordering Information

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

5.1.1 ASTM designation and year of issue (B 121/B 121M-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 B 248 or B 248M 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, etc. of copper alloy UNS No. C35500, 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.

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
C35340	99.5
C35600	99.5

8. Temper

8.1 Rolled Material—The standard tempers of rolled material 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 (see 3.1.2).

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
C35340	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 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	Min	Max			
Copper Alloy UNS Nos. C33500, C34000, C34200, C35000, C35300, C35340, and C35600						
H04	quarter-hard	49	59	340	405	40–6543–60
H01	quarter-hard	49	59 [405]	340	405	40–6543–60
H02	half-hard	55	65	380	450	57–7454–66
H02	half-hard	55	65 [450]	380	450	57–7454–66
H04	hard	68	78	470	540	76–8468–73
H04	hard	68	78 [540]	470	540	76–8468–73
H06	extra-hard	79	89	545	615	83–8973–76
H06	extra-hard	79	89 [615]	545	615	83–8973–76
H08	spring ^E	86	95	595	655	87–9275–78
H08	spring ^E	86	95 [655]	595	655	87–9275–78
H10	extra-spring ^E	909	99620	685	88–93	76–79
H10	extra-spring ^E	909 [620]	99 [620]	685]	88–93	76–79

^A Standard designations defined in Practice B 601.

^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.

5.2 purchaser.

8.2 Annealed Material—The standard tempers of annealed material 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 (see 3.1.2).

6. purchaser.

9. Mechanical Property Requirements

69.1 Tensile Strength:

69.1.1 Products ordered to this specification in inch-pound units shall be tested in accordance with Test Methods E 8, and shall conform to tensile strength requirements prescribed in ksi units in Table 2.

69.1.2 Products ordered to this specification in SI units shall be tested in accordance with Test Methods E 8M, and shall conform to tensile strength requirements prescribed in MPa units in Table 2.

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

7. Grain Size Requirements of Annealed Tempers

7.1 Grain size shall be the standard test for material of all thicknesses in annealed tempers, and acceptance or rejection shall depend only on the grain size. The average grain size of each of two samples of annealed material as determined on a plane parallel to the surface of the material shall be within the limits prescribed in Table 3.

8. Rockwell Hardness

8.1 Rockwell

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

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, C34300, C34340, and 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

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 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 E 112.

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 B 248.

12. Dimensions, Mass, and Permissible Variations

912.1 The inch-pound dimensions and tolerances for products covered by this specification shall be as prescribed in the current edition of Specification B 248, and the SI dimensions and tolerances covered by this specification shall be as prescribed in the current edition of Specification of B 248M, with particular reference to Section 4.5 and the following tables of those specifications:

912.1.1 Thickness—See 4.2, Table 1.

9.1.2 —

12.1.2 Width:

912.1.2.1 Slit Metal and Slit Metal with Rolled Edges—See 5.3, Table 4.

9.1.2.2 —

12.1.2.2 Square-Sheared Metal—See 5.3, Table 5.

9.1.2.3 —

12.1.2.3 Sawed Metal—See 5.3, Table 6.

9.1.3 —

12.1.3 Length:

912.1.3.1 Specific and Stock Lengths With and Without Ends—See 5.4, Table 7.

9.1.3.2 —

12.1.3.2 Schedule of Lengths (Specific and Stock) with Ends—See 5.4, Table 8.

9.1.3.3 —

12.1.3.3 Length Tolerances for Square-Sheared Metal—See 5.4, Table 9.

9.1.3.4 —

12.1.3.4 Length Tolerances for Sawed Metal—5.4, Table 10.

9.1.4 —

12.1.4 Straightness:

912.1.4.1 Slit Metal or Slit Metal Either Straightened or Edge-Rolled—See 5.5, Table 11.

9.1.4.2 —

12.1.4.2 Square-Sheared Metal—See 5.5, Table 12.

9.1.4.3 —

12.1.4.3 Sawed Metal—See 5.5, Table 13.

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, C35340, and C35600		
	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.

- 9.1.5—
- 12.1.5 *Edges*—See 5.6.
- 9.1.5.1—
- 12.1.5.1 *Square Edges*—See 5.6.1, Table 14.
- 9.1.5.2—
- 12.1.5.2 *Rounded Corners*—See 5.6.2, Table 15.
- 9.1.5.3—
- 12.1.5.3 *Rounded Edges*—See 5.6.3, Table 16.
- 9.1.5.4—
- 12.1.5.4 *Full-Rounded Edges*—See 5.6.4, Table 17.

10. General Requirements

10.1 Products furnished under this specification—

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 ~~inch-pound units~~ accordance with Practice E 255 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 E 255, 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 ~~applicable requirements~~ time the castings are poured, at least one sample shall be taken for each group of castings poured from the ~~current edition~~ same source of ~~Specification B 248~~.

10.2 Products furnished under this specification in SI units molten metal.

14.1.3.2 When sampled from the semi-finished product, at least one sample shall ~~conform~~ 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 ~~applicable requirements~~ 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 ~~S~~ the holder per cast coil.

15. Test Methods

15.1 *Chemical Analysis:*

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

<u>Element</u>	<u>Test Method</u>
Copper	E 248M
Copper	E 478
Iron	E 76 (AA)
Lead	E 478 (AA)
Zinc	E 478 (AA)

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

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 ($N = \text{kg}\cdot\text{m}/\text{s}^2$). 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, B 121/B 121M – 95, that may impact the use of this standard.

- (1) Added Terminology, Section 4.
- (2) Revised Ordering Information.
- (3) Added Section 6, Materials and Manufacture.
- (4) Added Rockwell hardness to Mechanical Properties section.
- (5) Revised grain size in Section 10.
- (6) Added Section 11, Other Requirements.
- (7) Added Section 14, Sampling.
- (8) Added Section 15, Test Methods.
- (9) Removed alloy C35340 from standard.

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