



Standard Specification for Copper Sheet, Strip, Plate, and Rolled Bar¹

This standard is issued under the fixed designation B152/B152M; 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 specification² establishes the requirements for copper sheet, strip, plate, and rolled bar produced from the following coppers.

Copper UNS No. ⁴	Previous Designation	Type of Copper
C10100 ^B	OFE	Oxygen-free electronic
C10200 ^B	OF	Oxygen-free without residual deoxidants
C10300	OFXLP	Oxygen-free extra low phosphorus
C10400, C10500, C10700	OFS	Oxygen-free, silver bearing
C10800	OFLP	Oxygen-free low phosphorus
C10910	...	Low oxygen
C11000 ^{B, C}	ETP, TP ^C	Electrolytic tough pitch, ^C Tough pitch ^C
C11300, C11400, C11600 ^B	STP	Silver bearing tough pitch
C12000	DLP	Phosphorized, low residual phosphorus
C12200 ^B	DHP	Phosphorized, high residual phosphorus
C12300	DHPS	Phosphorized, silver bearing
C14200	DPA	Phosphorus deoxidized, arsenical
C14420	...	Tin bearing tellurium copper
C14530	...	Tin tellurium bearing copper

⁴ Except Copper UNS Nos. C10910 (low oxygen), C14200 (phosphorus deoxidized, arsenical), C14420 (tin bearing tellurium), and C14530 (tin tellurium bearing) these types of copper are classified in Classification B224.

^B SAE Specification CA101 conforms to Copper UNS No. C10100; SAE Specification CA102 conforms to the requirements for Copper UNS No. C10200; SAE Specification CA110 conforms to the requirements for Copper UNS No. C11000; SAE Specifications CA113, CA114, and CA116 conform to the requirements for Copper UNS Nos. C11300, C11400, and C11600; SAE Specification CA120 conforms to Copper UNS No. C12000; and SAE Specification CA122 conforms to the requirements for Copper UNS No. C12200.

^C Unless specified in the contract or purchase order the supplier is permitted to provide ETP copper or TP copper.

NOTE 1—Each of the coppers listed has unique properties that can make it suitable for specific applications. The purchaser should consult with the supplier to determine which copper would be best suited for the intended application.

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 ASME Boiler and Pressure Vessel Code applications see related Specification SB-152 in Section II of that Code.

NOTE 2—This specification is not intended to establish requirements for material rolled to ounce-weight thicknesses. Such material is defined in Specification B370.

Flat copper products with finished (rolled or drawn) edges (flat wire and strip) are defined in Specification B272.

1.1.1 When a specific copper is not identified in the contract or purchase order, the supplier may furnish product from any of the listed coppers.

1.2 Units—The values stated in either inch-pound units or SI units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other and values from the two systems shall not be combined.

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

1.3.1 *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 determine the applicability of regulatory limitations prior to use.*

1.4 *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:³

- B170 Specification for Oxygen-Free Electrolytic Copper—Refinery Shapes
- B193 Test Method for Resistivity of Electrical Conductor Materials
- B216 Specification for Tough-Pitch Fire-Refined Copper—Refinery Shapes
- B224 Classification of Coppers

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

- [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)
- [B272](#) Specification for Copper Flat Products with Finished (Rolled or Drawn) Edges (Flat Wire and Strip)
- [B370](#) Specification for Copper Sheet and Strip for Building Construction
- [B577](#) Test Methods for Detection of Cuprous Oxide (Hydrogen Embrittlement Susceptibility) in Copper
- [B846](#) Terminology for Copper and Copper Alloys
- [E3](#) Guide for Preparation of Metallographic Specimens
- [E8/E8M](#) Test Methods for Tension Testing of Metallic Materials
- [E53](#) Test Method for Determination of Copper in Unalloyed Copper by Gravimetry
- [E62](#) Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods) (Withdrawn 2010)⁴
- [E112](#) Test Methods for Determining Average Grain Size
- [E478](#) Test Methods for Chemical Analysis of Copper Alloys
- 2.2 *ASME Standard*:
[ASME Boiler and Pressure Vessel Code](#)⁵

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 Sampling
 - 3.1.4 Number of Tests and Retests
 - 3.1.5 Specimen Preparation
 - 3.1.6 Test Methods
 - 3.1.7 Packaging and Package Marking
 - 3.1.8 Workmanship, Finish, and Appearance
 - 3.1.9 Significance of Numerical Limits
 - 3.1.10 Rejection and Reheating

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 Specification [B248](#) or [B248M](#).

4. Terminology

4.1 *Definitions*—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:

⁴ The last approved version of this historical standard is referenced on www.astm.org.

⁵ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

- 5.1.1 ASTM designation and year of issue;
 - 5.1.2 Copper [Alloy] UNS No. (or other internationally recognized copper [alloy]). With Alloys C10400, C10500, C10700, C11300, C11400, C11600, or C12300, the amount of silver in ounces per ton;
 - 5.1.3 Temper (Section [7](#));
 - 5.1.4 Dimensions: thickness, width, and edges (Section [12](#));
 - 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 Length (Section [12](#)); and
 - 5.1.8 Weight of coils: coil weights or coil size limitations, if required.
- 5.2 The following options are available but may not be included unless specified at the time of placing of the order when required:
- 5.2.1 Embrittlement test for the alloys listed in [11.2](#).
 - 5.2.2 Certification (Section [15](#));
 - 5.2.3 Test Report (Section [16](#));
 - 5.2.4 Resistivity test for alloys listed in [Table 5](#) (see Section [9](#));
 - 5.2.5 If product is purchased for agencies of the U.S. Government (see the Supplemental Requirements section of Specifications [B248](#) and [B248M](#)).

6. Chemical Composition

6.1 The materials shall conform to the chemical requirements in [Table 1](#) for the copper [alloy] UNS No. specified in the ordering information.

6.2 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. Temper

7.1 The standard tempers for product described in this specification are given in [Tables 2](#) and [3](#).

- 7.1.1 *As Hot Rolled Temper M20*:
 - 7.1.1.1 Plate not specified for ASME Boiler and Pressure Vessel Code applications are generally available in the M20 temper.
 - 7.1.2 *Cold Rolled Tempers H00 to H10*.
 - 7.1.3 *Annealed Tempers O25, O60, or O68*:
 - 7.1.3.1 Plates specified for ASME Boiler and Pressure Vessel Code applications shall be furnished in the O25 temper.

NOTE 3—Any product produced in a temper other than those listed in [Table 2](#), [Table 3](#), or [Table 4](#) will be produced and sold by contract and cannot be said to be produced under this specification.

NOTE 4—Soft-anneal temper is suitable for most industrial users of copper such as forming, spinning, and simple drawing operations in which close control of temper is not essential. Deep drawing anneal temper is especially suited for very severe drawing and forming operations in which maximum ductility and close control of temper is required.

8. Grain Size for Cold Rolled Annealed Tempers

8.1 Grain size shall be standard requirement for all product of the annealed (O60 and O68) tempers.



TABLE 1 Chemical Requirements

Element	Composition, %																	
	Copper UNS No.																	
	C10100 ^A	C10200	C10300	C10400 ^B	C10500 ^B	C10700 ^B	C10800	C10910	C11000	C11300 ^C	C11400 ^C	C11600 ^C	C12000	C12200	C12300 ^D	C14200	C14420	C14530
Copper, min	99.99 ^E	99.95 ^E incl silver	99.95 ^F incl silver	99.95 ^E incl silver	99.95 ^E incl silver	99.95 ^E incl silver	99.95 ^F incl silver	99.95 incl silver	99.90 incl silver	99.90 incl silver	99.90 incl silver	99.90 incl silver	99.9 incl silver	99.9 incl silver	99.4 incl silver	99.90 ^G incl silver	99.90 ^H incl silver	
Phosphorus	A	...	0.001– 0.005	...	...	...	0.005– 0.012	...	...	...	...	0.004– 0.012	0.015– 0.040	0.015– 0.040	0.015– 0.040	...	...	0.001– 0.010
Arsenic	A	...	...	...	...	...	...	...	...	...	...	...	...	...	0.15– 0.50	...	...	...
Oxygen, max	0.0005	0.0010	...	0.0010	0.001	0.001	...	0.005	...	...	...	...	...	...	...	...	...	...
Silver	A	...	...	8/ 25'	10/ 25'	...	...	...	8/ 25'	10/ 25'	25/ 25'	...	...	4/ 4'	...	...	...	...
Selenium + tellurium, max	A	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.023
Tellurium	A	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.005– 0.05	0.003– 0.023 ^I	...
Tin	A	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.04– 0.15	0.003– 0.023	0.023

^A Impurity maximums in ppm of C10100 shall be: antimony 4, arsenic 5, bismuth 1, cadmium 1, iron 10, lead 5, manganese 0.5, nickel 10, phosphorus 3, selenium 3, silver 25, sulfur 15, tellurium 2, tin 2, and zinc 1.
^B C10400, C10500, and C10700 are oxygen-free coppers with the addition of a specified amount of silver. The compositions of these alloys are equivalent to C10200 plus the intentional addition of silver.
^C C11300, C11400, and C11600 are electrolytic tough-pitch copper with silver additions. The compositions of these alloys are equivalent to C11000 plus the intentional addition of silver.
^D Copper UNS No. C12300 is produced by the addition of silver to phosphorus-deoxidized copper.
^E Copper shall be determined by difference between impurity total and 100 %.
^F Includes phosphorus.
^G Includes tellurium + tin.
^H Includes tin + tellurium + selenium.
^I Values are minimum silver Troy oz/Avoirdupois ton (1 oz/ton is equivalent to 0.0034 %).
^J Tellurium or selenium, or both.