Designation: B 768 – 99 (Reapproved 2004)

Standard Specification for Copper-Cobalt-Beryllium Alloy and Copper-Nickel-Beryllium Alloy Strip and Sheet[1]

This standard is issued under the fixed designation B 768; 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-cobalt-beryllium and copper-nickel-beryllium strip and sheet. The following alloys are covered:

Copper Alloy UNS No.[2]	Nominal Composition, %		
	Beryllium	Cobalt	Nickel
C17410	0.3	0.5	. . .
C17450	0.3	. . .	0.8
C17460	0.3	. . .	1.2

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 The following safety hazard caveat pertains only to the test methods 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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 The following documents of the issue in effect on date of material purchase form a part of this specification to the extent referenced herein:

2.2 *ASTM Standards:* [3]

B 194 Specification for Copper-Beryllium Alloy Plate, Sheet, Strip and Rolled Bar

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

B 601 Classification for Temper Designations for Copper and Copper Alloys—Wrought and Cast

B 846 Terminology for Copper and Copper Alloys

E 8 Test Methods for Tension Testing of Metallic Materials

E 255 Practice for Sampling Copper and Copper Alloys for Determination of Chemical Composition

E 527 Practice for Numbering Metals and Alloys (UNS)

3. Terminology

3.1 For terms related to copper and copper alloys, refer to Terminology B 846.

4. General Requirements

4.1 The following sections of Specification B 248 constitutes a part of this specification

4.1.1 Terminology.
4.1.2 Materials and Manufacture.
4.1.3 Workmanship, Finish, and Appearance.
4.1.4 Sampling.
4.1.5 Number of Tests and Retests.
4.1.6 Specimen Preparation.
4.1.7 Test Methods.
4.1.8 Significance of Numerical Limits.
4.1.9 Inspection.
4.1.10 Rejection and Rehearing.
4.1.11 Certification.
4.1.12 Test Report.
4.1.13 Packaging and Marking.
4.1.14 Supplementary Requirements.

4.2 In addition, when a section with a title identical to that referenced in 5.1 appears in this specification, it contains additional requirements which supplement those appearing in Specification B 248.

5. Ordering Information

5.1 Orders for material under this specification should include the following information:

5.1.1 Quantity,
5.1.2 Copper alloy UNS numbers (1.1),
5.1.3 Form of material: strip or sheet,
5.1.4 Temper (Section 8),
5.1.5 Tension test, if required (Section 9),

[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.

Current edition approved May 1, 2004. Published May 2004. Originally approved in 1987. Last previous edition approved in 1999 as B 768 – 99.

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

[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.**

5.1.6 Dimensions: thickness and width, and length as applicable (Section 11),

5.1.7 How furnished: rolls, stock lengths with or without ends, specific lengths with or without ends (Section 11),

5.1.8 Type of edge, if required: slit, sheared, sawed, square corners, rounded corners, rounded edges, or full rounded edges (see 11.6),

5.1.9 Special thickness tolerances, if required (Section 11),

5.1.10 Specification number and year of issue,

5.1.11 Hardness test, if required,

5.1.12 Special marking or packaging, if required,

5.1.13 Mill test report, if required,

5.1.14 Special tests or exceptions, if any, and

5.1.15 Certification, if required.

5.2 When material is purchased for agencies of the U.S. Government, this shall be specified in the contract or purchase order, and the material shall conform to the Supplementary Requirements as defined in the current issue of Specification B 248.

6. Materials and Manufacture

6.1 *Materials*—The material of manufacture shall be cast billets or slabs of one of the alloys cited in Section 1 of this specification. The cast material shall be of such soundness and purity as to be suitable to product the product as described in 6.2.

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 rolled to finish size and heat treated when required to meet the temper properties.

7. Chemical Composition

7.1 The material shall conform to the requirements specified in Table 1.

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

7.3 For copper alloys in which copper is given as remainder, copper may be taken as the difference between the sum of all the elements analyzed and 100 %. When all the elements in the table are analyzed, their sum shall be 99.5 % minimum.

TABLE 1 Chemical Requirements

Element	Composition, %		
	Copper Alloy UNS Number		
	C17410	C17450	C17460
Beryllium	0.15–0.50	0.15–0.50	0.15–0.50
Cobalt	0.35–0.6		
Nickel		0.50–1.0	1.0–1.4
Iron, max	0.20	0.20	0.20
Zirconium, max		0.50	0.50
Tin, max		0.25	0.25
Silicon, max	0.20	0.20	0.20
Aluminum, max	0.20	0.20	0.20
Copper + sum of named elements	99.5 % min	99.5 % min	99.5 % min

8. Temper

8.1 The product is offered in the following tempers in accordance with Classification B 601.

8.1.1 Copper Alloy UNS No. C17410 Strip and Sheet is offered in the TH02 (½ HT) and TH04 (HT) tempers.

8.1.2 Copper Alloy UNS No. C17450 Strip and Sheet is offered in TH02 (½ HT) Temper.

8.1.3 Copper Alloy UNS No. C17460 Strip and Sheet is offered in the TH03 (¾ HT) and TH04 (HT) tempers.

9. Physical Properties

9.1 *Electrical Conductivity*—The electrical conductivity of the product shall conform to the applicable requirement given in Table 2.

10. Mechanical Properties

10.1 *Tensile Requirements*:

10.1.1 Tension tests are required for material under 0.075 in. (1.905 mm) in thickness and shall conform to the mechanical properties in Table 3.

10.1.2 Tension test specimens shall be taken so that their longitudinal axis is parallel to the direction of rolling.

10.2 *Rockwell Hardness*—Rockwell hardness measurements are required for material 0.075 in. (1.905 mm) and over and shall conform to the Rockwell Hardness number in Table 3.

11. Dimensions and Permissible Variations

11.1 The dimensions and tolerances for material covered by this specification shall be in accordance with the current edition of Specification B 248, with particular reference to Section 5 and the following tables of that specification:

11.2 *Thickness*—See 5.2.2, Table 2, and for special tolerances, Table 3.

11.3 *Width*:

11.3.1 *Slit Metal and Slit Metal With Rolled Edges*—See 5.3.1 and Table 4.

11.4 *Length*:

11.4.1 *Specific and Stock Lengths With and Without Ends*—See 5.4.1.

11.4.2 *Schedule of Lengths (Specific and Stock) With Ends*—See 5.4.2 and Table 8.

11.5 *Straightness*:

11.5.1 *Slit Metal or Edge-Rolled Metal*—See 5.5.1 and Table 11.

11.6 *Edges*—See 5.6.

11.6.1 *Square Edges*—See 5.6.1 and Table 15.

11.6.2 *Rounded Corners*—See 5.6.2 and Table 16.

11.6.3 *Rounded Edges*—See 5.6.3 and Table 17.

11.6.4 *Full-Rounded Edges*—See 5.6.4 and Table 18.

TABLE 2 Electrical Conductivity

Copper Alloy UNS No.	Temper	Percent IACS, min
C17410	TH02, TH04	45
C17450	TH02	50
C17460	TH03, TH04	50

TABLE 3 Mechanical Property Requirements for Strip and Sheet Precipitation Heat Treated

Copper Alloy UNS No.	Temper Designation		Tensile Strength, ksi (MPA)	Yield Strength, ksi (MPA), 0.2 % offset	Elongation, 2 in. (50 mm), %	Rockwell Hardness	
	Standard	Former				B	30T
C17410	TH02	½ HT	95-115 (655-790)	80-100 (550-690)	10-20	89-98	76-81
	TH04	HT	110-130 (760-895)	100-120 (690-830)	7-17	95-100	79-86
C17450	TH02	½ HT	95-115 (655-790)	80-100 (550-690)	12 min	88-99	75-82
C17460	TH03	¾ HT	115-135 (790-930)	95-115 (655-790)	11 min	98-105	81-88
	TH04	HT	120-140 (825-965)	105-125 (720-860)	10 min	99-106	82-89

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 *Sampling*—The heat, lot, portion size, and selection of samples should be as follows:

13.1.1 *Heat*—A heat shall be the result of castings poured simultaneously from the same source of molten metal.

13.1.2 *Lot Size*—The lot size shall be a heat or fraction thereof.

13.1.3 *Portion Size*—Sample pieces for physical and mechanical testing shall be taken from each lot. Sample pieces for chemistry shall be in accordance with A7.1.2.1 of Specification B 248.

14. Number of Tests and Retests

14.1 The number of tests and retests shall be in accordance with Section 8 of Specification B 248.

15. Specimen Preparation

15.1 *Chemical Analysis*—Sample preparation shall be in accordance with Practice E 255.

15.2 *Tension Tests*—Sample preparation shall be in accordance with Test Methods E 8.

15.3 *Rockwell Hardness*—The test specimens shall be of a size and shape to permit testing by the available test equipment and shall be taken to permit testing in a plane parallel to the direction of deformation given to the product.

15.3.1 The surface of the test specimens shall be sufficiently smooth and even to permit the accurate determination of hardness.

15.3.2 The specimen shall be free of scale and foreign matter and care shall be taken to avoid any change in condition, that is, heating or cold working.

16. Test Methods

16.1 The test methods for determining the mechanical and physical properties are detailed in Specification B 248.

16.2 The test method for determining chemical analysis for compliance and preparation to certifications and test reports shall be at the discretion of the reporting laboratory.

16.2.1 In case of dispute, the test method in the Annex of Specification B 194 shall be used for determining chemical requirements in Table 1.

16.3 When analysis for unnamed or residual elements is required in the purchase order, the method of analysis shall be mutually agreed upon between the manufacturer or supplier and the purchaser.

17. Keywords

17.1 beryllium copper strip; copper UNS number C17410; copper UNS number C17450; copper UNS number C17460

SUMMARY OF CHANGES

Committee B05 has identified the location of selected changes to this specification since the last issue (B 768 – 94).

(*1*) This specification received an editorial five-year update. Rewording and additions were made in accordance with the new “Outline of Form.”

(*2*) Alloys C17450 and C17460 were added.

(*3*) Title was changed to incorporate C17450 and C17460.