Designation: B 66 – 95 (Reapproved 2003)

Standard Specification for Bronze Castings for Steam Locomotive Wearing Parts[1]

This standard is issued under the fixed designation B 66; 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 requirements for bronze castings for steam locomotive wearing parts. Historically, the alloys in this specification have been used in the applications listed in the Appendix. Actual practice may vary according to locomotive type and service.

1.2 The values stated in inch-pound units are the standard.[2]

2. Referenced Documents

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

B 824 Specification for General Requirements for Copper Alloy Castings[3]

B 846 Terminology for Copper and Copper Alloys[3]

E 527 Practice for Numbering Metals and Alloys (UNS)[4]

2.2 *AAR Standards:*

M-503 Bronze Bearings for Locomotives[5]

3. Terminology

3.1 Definitions of terms relating to copper alloys can be found in Terminology B 846.

4. Ordering Information

4.1 Orders for castings under this specification should include the following information:

4.1.1 Specification title, number, and year of issue,

4.1.2 Quantity of castings,

4.1.3 Copper Alloy UNS Number (Table 1),

4.1.4 Pattern or drawing number and condition (as cast, machined, and so forth).

4.2 The following are optional and should be specified in the purchase order when required:

4.2.1 Chemical analysis of residual elements, if specified in the purchase order (Section 5.3),

4.2.2 Pressure test or soundness requirements (Specification B 824),

4.2.3 Certification (Specification B 824),

4.2.4 Foundry test report (Specification B 824),

4.2.5 Witness inspection (Specification B 824), and

4.2.6 Product marking (Section 7).

5. Chemical Composition

5.1 The castings shall conform to the compositional requirements for named elements shown in Table 1 for the Copper Alloy UNS Numbers specified in the purchase order.

5.2 These specification limits do not preclude the presence of other elements. Limits may be established and analysis required for unnamed elements agreed upon between the manufacturer or supplier and the purchaser. Copper or zinc may be given as remainder and may be taken as the difference between the sum of all elements analyzed and 100 %. When all named elements in Table 1 are analyzed, their sum shall be as specified in Table 2.

5.3 It is recognized that residual elements may be present in cast copper base alloys. Analysis shall be made for residual elements only when specified in the purchase order.

6. Casting Repair

6.1 The castings shall not be repaired, plugged, welded, or burned-in.

7. Test Methods

7.1 Analytical chemical methods are given in Specification B 824 (Section 12).

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[1] This practice is under the jurisdiction of ASTM Committee B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.05 on Castings and Ingots for Remelting.

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[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] *Annual Book of ASTM Standards,* Vol 02.01.

[4] *Annual Book of ASTM Standards,* Vol 01.01.

[5] Available from Association of American Railroads, Mechanical Division, 50 F Street NW, Washington, DC 20001.

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

TABLE 1 Chemical Requirements

NOTE 1—Composition % max except as indicated

	Major Elements								Residual Elements					
Copper Alloy No.	Copper	Tin	Lead	Zinc	Nickel (incl Co)	Iron	Aluminum	Manga-nese	Iron	Antimony	Phos-phorus	Sulphur	Aluminum	Silicon
C93200	81.0–85.0	6.3–7.5	6.8–8.0	1.0–4.0	...	...	...	...	0.20	0.35	0.15	0.08	0.005	0.005
C93400	82.0–85.0	7.0–9.0	7.0–9.0	0.8	...	...	...	...	0.20	0.50	0.50	0.08	0.005	0.005
C93600	79.0–83.0	6.0–8.0	11.0–13.0	1.0	...	...	...	...	0.20	0.55	0.15	0.08	0.005	0.005
C93700	78.0–82.0	9.0–11.0	8.0–11.0	0.8	...	...	...	...	0.15	0.50	0.15	0.08	0.005	0.005
C93800	75.0–79.0	6.3–7.5	13.0–16.0	0.8	1.0	...	...	...	0.15	0.8	0.05	0.08	0.005	0.005
C94300	67.0–72.0	4.5–6.0	23.0–27.0	0.8	1.0	...	...	...	0.15	0.8	0.05	0.08	0.005	0.005
C94400	remainder	7.0–9.0	9.0–12.0	0.80	1.0	...	...	...	0.15	0.8	0.05	0.08	0.005	0.005
C94500	remainder	6.0–8.0	16.0–22.0	1.2	1.0	...	...	...	0.15	0.8	0.05	0.08	0.005	0.005
C95400	83.0 min	...	...	...	1.5	3.0–5.0	10.0–11.5	0.50	...	...	...	...	...	...

TABLE 2 Sum of Named Elements Analyzed

Copper Alloy UNS No.	Copper Plus Named Elements,% min
C93200	99.2
C93400	99.2
C93600	99.3
C93700	99.0
C93800	98.9
C94300	99.0
C94400	99.0
C94500	99.0
C95400	99.5

7.1.1 Test methods to be followed for the determination of elements resulting from contractual or purchase order agreement shall be as agreed upon between the manufacturer or supplier and the purchaser.

8. General Requirements

8.1 The following sections of Specification B 824 form a part of this specification. In the event of a conflict between this specification and Specification B 824, the requirements of this specification shall take precedence.

8.1.1 Terminology (Section 3),

8.1.2 Other Requirements (Section 5),

8.1.3 Dimensions, Mass, and Permissible Variations (Section 6),

8.1.4 Workmanship, Finish, and Appearance (Section 7),

8.1.5 Sampling (Section 9),

8.1.6 Number of Tests and Retests (Section 10),

8.1.7 Specimen Preparation (Section 11),

8.1.8 Test Methods (Section 12),

8.1.9 Significance of Numerical Limits (Section 13),

8.1.10 Inspection (Section 14),

8.1.11 Rejection and Rehearing (Section 15),

8.1.12 Certification (Section 16),

8.1.13 Test Report (Section 17), and

8.1.14 Packaging and Package Marking (Section 19).

9. Product Marking

9.1 All castings shall have the manufacturer's initial or trademark, the pattern number, and such other marks as are shown on the drawings cast on them. When serial numbers are specified, each 100 castings, or fraction thereof, shall bear the same serial number, commencing with the numeral one (1) at the beginning of the year and continuing consecutively until the end of the year, at each manufacturer's plant.

10. Keywords

10.1 bronze castings; copper-alloy castings; locomotive wearing parts

APPENDIX

(Nonmandatory Information)

X1. APPLICATIONS FOR ALLOYS IN THIS STANDARD

X1.1 The alloys in this specification have historically been used in the applications listed below. Actual practice may vary according to locomotive type and service. This information is provided for "information only" and should not be considered as recommendations.

X1.2 *Copper Alloy UNS No. C93400*—For side rod bushings and cross-head gibs.

X1.3 *Copper Alloy UNS No. C93600*—For side rod bushings.

X1.4 *Copper Alloy UNS No. C93700*—For shoes and wedges.

X1.5 *Copper Alloy UNS No. C93800 (Formerly Hard Bronze)*—General purpose wearing metal, may be cast in either sand or metal molds, for rod bushings, shoes and wedges, cross-head gibs, engine truck, driving boxes and trailer brasses.

X1.6 *Copper Alloy UNS No. C94300 (Formerly Soft Bronze)*—Generally cast in metal molds for driving boxes and special purposes where a soft metal is desired.

X1.7 *Copper Alloy UNS No. C94400 (Formerly Phosphor Bronze)*—Shoes and wedges, floating rod bushings, or other uses where a hard wearing surface is required.

X1.8 *Copper Alloy UNS No. C94500 (Formerly Medium Bronze)*—May be cast in sand or metal molds for driving-box engine and trailer truck brasses, hub liners, and bearings requiring lining metal for facing or lining.

X1.9 *Copper Alloy UNS No. C95400*—For shoes, wedges and hub liners.

SUMMARY OF CHANGES

Committee B05 has identified the location of selected changes to this standard since the last issue (B 66 – 93a) that may impact the use of this standard.

(*1*) The non-mandatory information in Section 1 was moved to the Appendix.
(*2*) New Section 3 Terminology was added.
(*3*) Old Sections 3 and 8 were rewritten.
(*4*) New Section 7 Test Methods was added.