



Designation: ~~B66/B66M-06~~ Designation: B 66/B 66M – 06^{ε1}

Standard Specification for Bronze Castings for Steam Locomotive Wearing Parts¹

This standard is issued under the fixed designation B 66/B 66M; 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.

^{ε1} NOTE—Paragraphs 1.1 and 6.1.1 editorially updated in January 2009.

1. Scope*

1.1 This specification establishes requirements for bronze castings for steam locomotive wearing parts. The following Copper Alloy UNS Nos. are specified: C93200, C93400, C93600, C93700, C93800, C94300, C94400, C94500, and ~~€94500~~C95400.²

NOTE 1—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 *Units*—The values stated in inch-pound or SI units are to be regarded separately as standard. 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 nonconformance with the standard.

1.3 *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 ASTM Standards:³

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](#)

B 846 [Terminology for Copper and Copper Alloys](#)

E 255 [Practice for Sampling Copper and Copper Alloys for the Determination of Chemical Composition](#)

E 527 [Practice for Numbering Metals and Alloys in the Unified Numbering System \(UNS\)](#)

2.2 AAR Standards:

~~HM-503~~ [Bronze Bearings for Locomotives](#)⁴

3. Terminology

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

4. General Requirements

4.1 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.

4.1.1 Terminology (Section 3),

4.1.2 Other Requirements (Section 7),

4.1.3 Dimensions, Mass, and Permissible Variations (Section 8),

4.1.4 Workmanship, Finish, and Appearance (Section 9),

4.1.5 Sampling (Section 10),

4.1.6 Number of Tests and Retests (Section 11),

¹ This specification 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 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.

⁴ 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.

- 4.1.7 Specimen Preparation (Section 12),
- 4.1.8 Test Methods (Section 13),
- 4.1.9 Significance of Numerical Limits (Section 14),
- 4.1.10 Inspection (Section 15),
- 4.1.11 Rejection and Rehearing (Section 16),
- 4.1.12 Certification (Section 17),
- 4.1.13 Test Report (Section 18), and
- 4.1.14 Packaging and Package Marking (Section 20).

5. Ordering Information

- 5.1 Orders for castings under this specification should include the following information in orders for product:
 - 5.1.1 ASTM designation and year of issue (for example, B 66/B 66M-06),
 - 5.1.2 Number of castings or total weight, for each size and form,
 - 5.1.3 Copper Alloy UNS Number (Table 1),
 - 5.1.4 Pattern or drawing number and condition (as cast, machined, and so forth).
- 5.2 The following are optional and should be specified in the purchase order when required:
 - 5.2.1 Chemical analysis of residual elements, if specified in the purchase order (Section 7.3 and specification B 824),
 - 5.2.2 Pressure test or soundness requirements (Specification B 824),
 - 5.2.3 Certification (Specification B 824),
 - 5.2.4 Foundry test report (Specification B 824),
 - 5.2.5 Witness inspection (Specification B 824), and
 - 5.2.6 Product marking (Section 10).

6. Materials and Manufacture

6.1 Materials:

6.1.1 The material of manufacture shall be a casting of Copper Alloy UNS Nos. C93200, C93400, C93600, C93700, C93800, C94300, C94400, C94500, or C95400 of such purity and soundness as to be suitable for processing into the products prescribed herein.

6.1.2 In the event heat identification or traceability is required, the purchaser shall specify the details desired.

6.2 *Manufacture*—The product shall be manufactured by such casting methods to produce a uniform finished product.

7. Chemical Composition

7.1 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.

7.2 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.

7.3 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.

8. Casting Repair

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

TABLE 1 Chemical Requirements

NOTE 1—Composition % max except as indicated

Copper Alloy UNS No.	Major Elements							Residual Elements						
	Copper	Tin	Lead	Zinc	Nickel (incl Co)	Iron	Aluminum	Manga- nese	Iron	Antimony	Phos- phorus ^A	Sulphur	Aluminum	Silicon
C93200	81.0–85.0 ^B	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 ^B	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 ^C	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	...	...	...	...	...	...

^A For continuous castings, phosphorus shall be 1.5 % max.

^B In determining copper minimum, copper may be calculated as copper plus nickel.

^C For continuous castings, sulfur shall be 0.25 %.