



Standard Specification for General Requirements for Copper Alloy Castings¹

This standard is issued under the fixed designation B 824; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope *

1.1 This specification establishes a group of general requirements common to ASTM copper alloy casting specifications B 22, B 61, B 62, B 66, B 67, B 148, B 176, B 271, B 369, B 427, B 505, B 584, B 763, B 770, and B 806. These requirements apply to the casting specifications to the extent referenced therein. In the event of conflict between this specification and a casting specification, the requirements of the casting specification shall take precedence.

1.2 The chemical composition and other requirements not included in this specification shall be prescribed in the casting specifications.

1.3 The values stated in inch-pound units are the standard. SI values given in parentheses are for information only.

1.4 No precise quantitative relationship can be stated between the properties of the metal in various locations of the same casting or between the properties of castings and those of a test bar casting from the same metal. (See Appendix X1.)²

2. Referenced Documents

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

2.2 ASTM Standards:

- B 22 Specification for Bronze Castings for Bridges and Turntables³
- B 61 Specification for Steam or Valve Bronze Castings³
- B 62 Specification for Composition Bronze or Ounce Metal Castings³
- B 66 Specification for Bronze Castings for Steam Locomotive Wearing Parts³
- B 67 Specification for Car and Tender Journal Bearings, Lined³
- B 148 Specification for Aluminum-Bronze Sand Castings³
- B 176 Specification for Copper-Alloy Die Castings³
- B 194 Specification for Copper-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar³

¹ This specification is under the jurisdiction of ASTM Committee B-5 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.05 on Castings and Ingots for Remelting.

Current edition approved Sept. 10, 1996. Published November 1996. Originally published as B 824 – 92. Last previous edition B 824 – 95a.

² For ASME Boiler and Pressure Vessel Code application see related specification in Section II of that code.

³ Annual Book of ASTM Standards, Vol 02.01.

- B 208 Practice for Preparing Tension Test Specimens for Copper-Base Alloys for Sand, Permanent Mold, Centrifugal, and Continuous Castings³
- B 271 Specification for Copper-Base Alloy Centrifugal Castings³
- B 369 Specification for Copper-Nickel Alloy Castings³
- B 427 Specification for Gear Bronze Alloy Castings³
- B 505 Specification for Copper-Base Alloy Continuous Castings³
- B 584 Specification for Copper Alloy Sand Castings for General Applications³
- B 763 Specification for Copper Alloy Sand Castings for Valve Application³
- B 770 Specification for Copper-Beryllium Alloy Sand Castings for General Applications³
- B 806 Specification for Copper Alloy Permanent Mold Castings for General Applications³
- E 8 Test Methods for Tension Testing of Metallic Materials⁴
- E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications⁵
- E 44 Definitions of Terms Relating to Heat Treatment of Metals⁶
- E 54 Test Methods for Chemical Analysis of Special Brasses and Bronzes⁷
- E 62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Method)⁷
- E 76 Test Methods for Chemical Analysis of Nickel-Copper Alloys⁷
- E 478 Test Methods for Chemical Analysis of Copper Alloys⁷
- E 581 Test Methods for Chemical Analysis of Manganese-Copper Alloys⁷

3. Terminology

3.1 Definitions:

3.1.1 *casting, n*—a general term for a metal object produced at or near finished shape by pouring or otherwise introducing molten metal into a mold and allowing it to solidify.

3.1.2 *casting, centrifugal, n*—a casting produced in a cylindrical mold rotating on its axis with the major axis of the product coinciding with the axis of rotation. The axis of

⁴ Annual Book of ASTM Standards, Vol 03.01.

⁵ Annual Book of ASTM Standards, Vol 14.02.

⁶ Annual Book of ASTM Standards, Vol 01.02.

⁷ Annual Book of ASTM Standards, Vol 03.05.

rotation may be horizontal, vertical, or any angle in between.

3.1.3 *casting, centrifuged, n*—a casting produced in a mold, a number of which may be mounted around a central sprue. The molds are rotated, in a vertical position, about a central axis concentric with the central sprue.

3.1.4 *casting, continuous, n*—a casting produced by the continuous pouring and solidification of molten metal through a water-cooled mold that determines the cross-sectional shape. The length of the product is not restricted by mold dimensions.

3.1.5 *casting, die, n*—a casting produced in a reusable metal mold (die) characterized by a high degree of fidelity to the mold cavity with the molten metal being introduced under high pressure.

3.1.6 *casting, lost wax, n*—a casting produced in a sacrificial mold made of various layers and grades of refractory powders and washes having been invested about a wax pattern. The casting is characterized by a high degree of fidelity to the original pattern.

3.1.7 *casting, plaster mold, n*—a casting produced in a sacrificial mold made of various grades of fine plaster-like material and having a high degree of fidelity to the original pattern.

3.1.8 *casting, permanent mold, n*—a product produced in a reusable mold constructed of a durable material, usually iron or steel, with the molten metal being introduced by gravity, low pressure, or vacuum.

3.1.9 *casting, sand, n*—a casting produced in a sacrificial sand mold. The sand may be bonded by various mechanical or chemical means.

3.1.10 *casting, semicentrifugal, n*—a casting produced in a manner similar to the centrifugal casting except that a central core is used to allow the formation of other than a cylindrical inside surface. The axis of rotation is always vertical.

4. Materials and Manufacture

4.1 Manufacture:

4.1.1 Mechanical properties of Copper Alloy UNS Nos. C94700, C95300, C95400, C95410, C95500, C95520, and C96800 can be changed by heat treatment. Suggested heat treatments are given in the casting specifications containing these alloys.

4.1.2 Definitions of terms relating to heat treating are given in Definitions E 44.

5. Chemical Composition

5.1 The casting material shall conform to the chemical requirements of the casting specification.

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

6. Mechanical Properties

6.1 When tension testing is required by the casting specification, the results shall conform to the requirements of that specification.

7. Other Requirements

7.1 When specified in the purchase order, castings shall be hydrostatically tested. The details of the test and acceptance

criteria shall be agreed upon between the manufacturer and the purchaser.

7.2 When specified in the purchase order, castings shall meet soundness standards furnished or referenced by the purchaser. In the absence of standards for soundness, the requirement shall be as agreed upon between the manufacturer and the purchaser.

8. Dimensions, Mass, and Permissible Variations

8.1 The manufacturer shall be responsible for the dimensional accuracy of the castings as related to the drawing when the pattern equipment is produced by the manufacturer.

8.2 When the pattern equipment is provided by the purchaser, the manufacturer shall be responsible for the dimensional accuracy of the casting as related to the provided pattern equipment.

8.3 Where thick and thin sections of the casting join, the manufacturer shall be permitted to add fillets of adequate size, where not previously provided, subject to approval of the purchaser.

9. Workmanship, Finish, and Appearance

9.1 The surface of the casting shall be free of adhering sand, cracks, and hot tears. Other surface discontinuities shall meet visual acceptance standards agreed upon between the manufacturer and the purchaser.

10. Sampling

10.1 Lot:

10.1.1 A lot shall consist of: (1) all of the metal poured from a single furnace or crucible melt, or (2) all the metal poured from two or more furnaces into a single ladle, or (3) all of the metal poured from a continuous melting furnace between charges, or (4) all of the metal poured from an individual melting furnace or group of melting furnaces having a uniform melting stock, operating during the course of one-half shift, not to exceed 5 h.

10.1.2 The sample for chemical analysis shall be obtained during the pouring of the lot in such a manner as to be representative of the lot.

10.1.3 Tension test bars used in meeting the requirements of 6.1 may be either separately cast or removed from the casting. When tension test bars are separately cast, they shall be poured from the same lot as the castings represented to the form and dimensions specified in the casting specification and Practice B 208.

10.1.3.1 When the requirements of 6.1 have been complied with using separately cast test bars, additional tests may be performed using test bars removed from the casting with test bar location and mechanical properties agreed upon between the manufacturer and the purchaser.

11. Number of Tests and Retests

11.1 Tests:

11.1.1 A chemical analysis of each element with a specified limiting value shall be made on each lot. Chemical analysis for residual elements is not required unless specified in the purchase order.

11.1.2 One tension test shall be performed on each lot.