Designation: B 21 – 83b

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Standard Specification for NAVAL BRASS ROD, BAR, AND SHAPES[1]

This standard is issued under the fixed designation B 21; 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 specification has been approved for use by agencies of the Department of Defense and for listing in the DoD Index of Specifications and Standards.

1. Scope

1.1 This specification covers naval brass rod, bar, and shapes. The following five alloys are covered:

Copper Alloy UNS No.[A]	Previously Used Designation
C46200	Alloy D
C46400	Alloy A
C47940	...
C48200	Alloy B
C48500	Alloy C

[A] 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.

NOTE 1—Material for hot forging is covered by Specification B 124.

NOTE 2—A complete metric companion to Specification B21 has been developed—B 21M; therefore, no metric equivalents are presented in this specification.

2. Applicable 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:

2.1.1 *ASTM Standards:*

B 124 Specification for Copper and Copper Alloy Forging Rod, Bar, and Shapes[2]

B 154 Method of Mercurous Nitrate Test for Copper and Copper Alloys[2]

B 249 Specification for General Requirements for Wrought Copper and Copper Alloy Rod, Bar, and Shapes[2]

B 601 Practice for Temper Designations for Copper and Copper Alloys—Wrought and Cast[2]

E 8 Methods of Tension Testing of Metallic Materials[3]

E 527 Practice for Numbering Metals and Alloys (UNS)[2]

3. Ordering Information

3.1 Orders for material under this specification shall include the following information:

3.1.1 Copper Alloy UNS No. (Section 1.1),

3.1.2 Temper (Section 6),

3.1.3 Form: cross section such as round, hexagonal, square, etc. (9.2 and 9.3)

3.1.4 Diameter or distance between parallel surfaces (9.2),

3.1.5 Length (9.4),

3.1.6 Edge contours (9.6),

3.1.7 Piston finish rod or shafting, if required (Section 11),

3.1.8 Weight: total for each size,

3.1.9 ASTM designation and year of issue,

3.1.10 Certification, if required (see Specification B 249, Section 13), and

3.1.11 Mill test report, if required (see Specification B 249, Section 14).

3.2 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 249.

[1] This specification is under the jurisdiction of the ASTM Committee B-5 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.02 on Rods, Bars, and Shapes.

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

[3] *Annual Book of ASTM Standards*, Vol 03.01.

4. General Requirements

4.1 Material furnished under this specification shall conform to the applicable requirement of the current edition of Specification B 249.

5. Chemical Composition

5.1 The material shall conform to the chemical requirements of Table 1.

5.2 These specification limits do not preclude the possible presence of other unnamed elements. However, analysis shall regularly be made only for the minor elements listed in the table, plus all major elements except one. The major element that is not analyzed shall be determined by difference between the sum of those elements analyzed and 100%. By agreement between manufacturer and purchaser, analysis may be required and limits established for elements not specified.

6. Temper

6.1 Tempers available under this specification and as prescribed in Practice B 601 are as follows:

Temper Designation	
Standard	Former
M30	as-hot extruded
O50	light anneal
O60	soft anneal
H50	extruded and drawn
H60	cold heading, forming
H02	half hard
H04	hard
H50	extruded and drawn

7. Tensile Requirements

7.1 The material shall conform to the requirements as to tensile properties prescribed in Table 2.

8. Mercurous Nitrate Test

NOTE 3: **Caution**—Mercury is a definite health hazard, and therefore equipment for the detection and removal of mercury vapor produced in volatilization is recommended. The use of rubber gloves in testing is advisable.

8.1 The test specimens, cut at least 6 in. in length, shall be totally immersed for 30 min in the standard mercurous nitrate solution prescribed in Method B 154. There shall be no cracks in the specimen when examined immediately after it is removed from the solution, rinsed and wiped.

NOTE 4—Bars that have been properly straightened or sprung will have internal stresses so broken up as not to be in danger of splitting or cracking. The mercurous nitrate test is designed to determine whether the internal stresses have been properly broken up and rendered safe.

9. Dimensions and Permissible Variations

9.1 The dimensions and tolerances for material covered by this specification shall be as prescribed in the current edition of Specification B 249, with particular reference to Section 5 and the following tables of that specification:

9.2 *Diameter or Distance Between Parallel Surfaces:*

9.2.1 *Rod: Round, Hexagonal, Octagonal*—See 5.2, Table 1.

9.2.2 *Rod, M30 (As-Hot Extruded)*—See 5.2, Table 4.

9.2.3 *Piston-Finish Rod*—See 5.2, Table 3.

9.2.4 *Bar: Rectangular and Square*—See 5.2, Tables 8 and 10.

9.2.5 *Bar, M30 (As-Hot Extruded)*—See 5.2, Table 4.

9.3 *Shapes*—The dimensional tolerances for shapes shall be as agreed upon by the supplier and the purchaser, and shall be specified in the order.

9.4 *Length of Rod, Bar, and Shapes*—See 5.3, Tables 12 and 13.

9.5 *Straightness:*

9.5.1 *Rod and Bar*—See 5.4.1, Table 15.

9.5.2 *Shafting Rod*—See 5.4.2, Table 16.

9.5.3 M30 (as-hot extruded) rod, bar, and shapes shall be commercially straight.

9.6 *Edge Contours*—See 5.5.

10. Test Specimens

10.1 In the tension test all material shall be pulled in full size when practicable. Full-size or machined test specimens shall be as specified in Methods E 8. Whenever tension test results are obtained from both full-size and from machined test specimens and they differ, the results obtained from full-size test specimens shall be used to determine conformance to the specification requirements.

NOTE 5—The tension test specimens shall conform to the dimensions prescribed in Section 4 of Methods E 8.

10.2 Mercurous nitrate test specimens shall be of the full size of the material, and without bending, springing, polishing, or any other preparation.