



**Designation: B151/B151M-05** ~~Designation: B151/B151M – 05 (Reapproved 2011)~~

## Standard Specification for Copper-Nickel-Zinc Alloy (Nickel Silver) and Copper-Nickel Rod and Bar<sup>1</sup>

This standard is issued under the fixed designation B151/B151M; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope\*

1.1 This specification establishes the requirements for copper-nickel-zinc and copper-nickel rod and bar for general application produced from Copper Alloy UNS Nos. C70600, C70620, C71500, C71520, C74500, C75200, C75700, C76400, C77000, and C79200.

1.1.1 Copper Alloys UNS Nos. C70620 and C71520 are for product intended for welding applications.

1.1.2 The values stated in either 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.

NOTE 1—Requirements for copper-nickel-zinc alloy wire appear in Specification B206/B206M.

### 2. Referenced Documents

2.1 *ASTM Standards*:<sup>2</sup>

B206/B206M [Specification for Copper-Nickel-Zinc \(Nickel Silver\) Wire and Copper-Nickel Alloy Wire](#)

B249/B249M [Specification for General Requirements for Wrought Copper and Copper-Alloy Rod, Bar, Shapes and Forgings](#)

B601 [Classification for Temper Designations for Copper and Copper Alloys Wrought and Cast](#)

B846 [Terminology for Copper and Copper Alloys](#)

E75 [Test Methods for Chemical Analysis of Copper-Nickel and Copper-Nickel-Zinc Alloys](#)

E76 [Test Methods for Chemical Analysis of Nickel-Copper Alloys](#)

E478 [Test Methods for Chemical Analysis of Copper Alloys](#)

### 3. General Requirements

3.1 The following sections of Specifications B249/B249M are a part of this specification:

3.1.1 Terminology,

3.1.2 Material and Manufacture, <http://www.astm.org/standards/sist/15227af8-018d-459e-9e01-436cc6fb3a61/astm-b151-b151m-052011>

3.1.3 Workmanship, Finish, and Appearance,

3.1.4 Sampling,

3.1.5 Specimen Preparation,

3.1.6 Test Methods,

3.1.7 Inspection,

3.1.8 Certification,

3.1.9 Report,

3.1.10 Packaging and Package Marking, and

3.1.11 Supplementary Requirements.

3.2 In addition, when a section with a title identical to that referenced in 3.1 appears in this specification, it contains additional requirements which supplement those appearing in Specifications B249/B249M.

### 4. Terminology

4.1 For definitions of terms related to copper and copper alloys, refer to Terminology B846.

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.02 on Rod, Bar, Wire, Shapes and Forgings.

Current edition approved Oct. 1, 2005-2011. Published November 2005-February 2012. Originally approved in 1941. Last previous edition approved in 2000-2005 as B151/B151M – 005. DOI: 10.1520/B0151\_B0151M-05(2011).

<sup>2</sup> 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. Ordering Information

- 5.1 Include the following information in the contract or purchase order:
- 5.1.1 ASTM designation and year of issue (for example, B151/B151M – XX),
  - 5.1.2 Copper Alloy UNS No. designation (Section 1),
  - 5.1.3 Temper (Section 8 and Tables 2-5),
  - 5.1.4 Form: cross section such as round, hexagonal, square, and so forth (Section 12),
  - 5.1.5 Diameter or distance between parallel surfaces, length (Section 12),
  - 5.1.6 Weight: total for each form, size, and temper, and
  - 5.1.7 When material is purchased for agencies of the U.S. government (Section 11).
- 5.2 The following options are available and should be specified in the contract or purchase order when required:
- 5.2.1 Heat identification or traceability detail,
  - 5.2.2 Certification, and
  - 5.2.3 Test report.

## 6. Materials and Manufacture

### 6.1 Material:

6.1.1 The material of manufacture as specified in the contract or purchase order, shall be of one of Copper Alloy UNS Nos. C70600, C70620, C71500, C71520, C74500, C75200, C75700, C76400, C77000, or C79200.

## 7. Chemical Composition

7.1 The product shall conform to the chemical compositional requirements prescribed in Table 1 for the Copper Alloy UNS No. designation specified in the contract or purchase order.

7.1.1 These composition 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.

7.2 For copper alloys in which zinc or copper is specified as the remainder, zinc or copper may be taken as the difference between the sum of results for all elements determined and 100 %.

7.3 When all elements listed in Table 1 for a specified alloy are determined, the sum of results shall be 99.5 % minimum.

## 8. Temper

8.1 The standard tempers available under this specification and as defined in Classification B601 are: O60, OS015, OS035, OS070, M30, H01, and H04 are given in Tables 2-5.

NOTE 2—The purchaser should confer with the manufacturer or supplier concerning the availability of a specific form and temper.

8.2 Other tempers, and tempers for other products including shapes, shall be subject to agreement between the manufacturer and the purchaser.

## 9. Grain Size of Annealed Tempers

### 9.1 Grain Size:

9.1.1 Product in the OS temper shall conform to the grain size requirement prescribed in Table 2 for the specified copper alloy and temper.

9.1.2 Grain size shall be the basis for acceptance or rejection for OS temper product produced from Copper Alloy UNS Nos. C74500, C75200, C75700, C76400, C77000, and C79200.

## 10. Mechanical Property Requirements

### 10.1 Tensile Strength Requirement:

**TABLE 1 Chemical Requirements**

Copper Alloy UNS No.	Composition, % max (unless shown as range or min)								
	Copper, Incl Silver	Nickel, Incl Cobalt	Lead	Iron	Manganese	Zinc	Phosphorous	Sulfur	Carbon
C70600	remainder	9.0-11.0	0.05	1.0-1.8	1.0	1.0	0.02	0.02	...
C70620	86.5 min	9.0-11.0	0.02	1.0-1.8	1.0	0.50	0.02	0.02	0.05
C71500	remainder	29.0-33.0	0.05	0.40-1.0	1.0	1.0	...	...	...
C71520	65.0 min	29.0-33.0	0.02	0.40-1.0	1.0	0.50	0.02	0.02	0.05
C74500	63.5-66.5	9.0-11.0	0.05	0.25	0.50	remainder	...	...	...
C75200	63.0-66.5	16.5-19.5	0.05	0.25	0.50	remainder	...	...	...
C75700	63.5-66.5	11.0-13.0	0.05	0.25	0.50	remainder	...	...	...
C76400	58.5-61.5	16.5-19.5	0.05	0.25	0.50	remainder	...	...	...
C77000	53.5-56.5	16.5-19.5	0.05	0.25	0.50	remainder	...	...	...
C79200	59.0-66.5	11.0-13.0	0.8-1.4	0.25	0.50	remainder	...	...	...



TABLE 2 Grain Size Requirements for OS (Annealed) Temper Rod and Bar

Table with 5 columns: Copper Alloy UNS No., Temper Designation, Grain Size (Nominal, Minimum, Maximum) in mm. Rows include All alloys (OS015, OS035, OS070) and specific alloy numbers (C74500, C75200, C75700, C76400, C77000).

TABLE 3 Tensile Requirements for Copper-Nickel-Zinc Alloy Rod and Bar

Table with 6 columns: Temper Designation, Diameter or Distance Between Parallel Surfaces (in. [mm]), and Tensile Strength (ksi [MPa]) with sub-columns for Min and Max for different UNS Nos. Rows include H01 (rod round), H04 (rod round, hexagonal, octagonal), and H04 (bar square, rectangular).

10.1.1 Copper-Nickel-Zinc Alloys UNS Nos. C74500, C75200, C75700, C76400, C77000, and C79200 in Tempers H01 and H04 shall conform to the requirement prescribed in Table 3 for the specified shape and size and the tensile strength shall be the basis of acceptance or rejection for product in these tempers.

10.1.2 Copper-Nickel Alloys UNS Nos. C70600, C70620, C71500, and C71520 in Tempers H01, H04, M30, and O60 shall conform to the requirement prescribed in Tables 4 and 5 for the specified shape and size, and the tensile properties shall be the basis of acceptance or rejection for all tempers.

11. Purchases for U.S. Government Agencies

11.1 When specified in the contract or purchase order, product purchased for agencies of the U.S. Government shall conform to the special government regulations specified in the Supplementary Requirements section of Specifications B249/B249M.

12. Dimensions, Mass, and Permissible Variations

12.1 The following titled sections and tables in Specifications B249/B249M are a part of this specification:

- 12.1.1 Diameter or Distance Between Parallel Surfaces:
12.1.1.1 Rod: round/hexagonal, octagonal—cold-drawn rod, Table 2.
12.1.1.2 Bar: rectangular and square—thickness, width, Tables 9 and 11.
12.1.2 Length—length tolerances, schedule of length, Tables 13 and 15.
12.1.3 Straightness tolerances for rod, bar, and shapes, Table 16.
12.1.4 Edge contours—see identically titled clause.

13. Number of Tests and Retests

13.1 Tests:

13.1.1 Chemical Analysis—Chemical composition shall be determined as the per element mean of results from at least two replicate determinations of the sample(s) and the results of each replication shall conform to compositional requirements.

13.1.2 Other Tests—Grain size and tensile properties shall be determined from specimens prepared from each of two sample pieces selected for tests and each specimen shall conform to test requirement(s).

13.2 Retests:

13.2.1 When requested by the manufacturer or supplier, a retest may be permitted when test results obtained by the purchaser fail to conform with the product specification requirement(s).