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Standard Specification for Copper-Nickel-Zinc Alloy (Nickel Silver) and Copper-Nickel Rod and Bar [Metric][1]

This standard is issued under the fixed designation B 151M; 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. Consult the DoD Index of Specifications and Standards for the specific year of issue which has been adopted by the Department of Defense.

1. Scope*

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

1.2 The values given in SI units are the standard.

1.3 This specification is the companion to inch-pound Specification B 151.

NOTE 1—Requirements for copper-nickel-zinc alloy wire appear in Specification B 206M.

2. Referenced Documents

2.1 *ASTM Standards:*

B 151 Specification for Copper-Nickel-Zinc (Nickel Silver) and Copper-Nickel Rod and Bar[2]

B 206M Specification for Copper-Nickel-Zinc Alloy (Nickel Silver) Wire and Copper-Nickel Alloy Wire [SI][2]

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

E 3 Methods of Preparation of Metallographic Specimens[3]

E 8M Test Methods for Tension Testing of Metallic Materials [SI][3]

E 75 Test Methods for Chemical Analysis of Copper-Nickel and Copper-Nickel-Zinc Alloys[4]

E 76 Test Methods for Chemical Analysis of Nickel-Copper Alloys[4]

E 112 Test Methods for Determining Average Grain Size[3]

E 255 Practice for Sampling Copper and Copper-Alloys for the Determination of Chemical Composition[4]

E 478 Test Methods for Chemical Analysis of Copper Alloys[4]

3. Ordering Information

3.1 The contract or purchase order for product to this specification should include the following information:

3.1.1 ASTM designation and year of issue,

3.1.2 Copper Alloy UNS No. designation (Section 4 and Table 1),

3.1.3 Temper (Section 7 and Tables 2, 3, & 4),

3.1.4 Form: cross section such as round, hexagonal, square, etc. (Section 11),

3.1.5 Diameter or distance between parallel surfaces (Section 11),

3.1.6 *Quantity*—approximate weight or footage for each item,

3.1.7 When product is for subsequent welding application (Table 1, Footnote C),

3.1.8 When material is purchased for agencies of the U.S. Government (Section 10).

3.2 The following options are available and should be specified in the contract or purchase order when they are required:

3.2.1 Heat identification or traceability,

3.2.2 Certification, and

3.2.3 Test Reports.

4. General Requirements

4.1 The following sections of Specification B 249M are a part of this specification.

4.1.1 Terminology,

4.1.2 Material and Manufacture,

4.1.3 Workmanship, Finish and Appearance,

4.1.4 Sampling,

4.1.5 Specimen Preparation,

4.1.6 Test Methods,

4.1.7 Inspection,

4.1.8 Certification,

4.1.9 Test Report,

4.1.10 Packaging and Package Marking.

4.2 An identical section in this specification supplements the referenced section.

5. Material and Manufacture

5.1 *Material:*

5.1.1 As specified in the contract or purchase order, the product shall be made from Copper Alloy No. C70600, C71500, C74500, C75200, C75700, C76400, C77000 or C79200.

6. Chemical Composition

6.1 The material composition shall conform to the re-

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

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

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

[4] *Annual Book of ASTM Standards*, Vol 03.05.

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

TABLE 1 Chemical Requirements

Copper Alloy UNS No.	Composition, % max (unless shown as a range or min)						
	Copper, incl Silver	Nickel, incl Cobalt	Lead	Iron	Manganese, max	Zinc	Other Named Elements
C70600[A]	86.5 min[B]	9.0–11.0	0.05[C]	1.0–1.8	1.0	1.0[C] max	[C]
C71500	65.0 min[B]	29.0–33.0	0.05[C]	0.40–1.0	1.0	1.0[C] max	[C]
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	...

[A] Phosphorus and sulfur content shall each be 0.02 % max.
[B] Copper plus elements with specific limits, 99.5 % min.
[C] When the product is for subsequent welding applications and so specified by the purchaser, zinc shall be 0.50 % max, lead 0.02 % max, phosphorus 0.02 % max, sulfur 0.02 % max, and carbon 0.05 % max.

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

Copper Alloy UNS No.	Temper Designation	Grain Size, mm		
		Nominal	Minimum	Maximum
All alloys	OS015	0.015	...	0.030
All alloys	OS035	0.035	0.025	0.050
C74500, C75200, C75700, C76400, and C77000	OS070	0.070	0.050	0.100

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

Temper Designation	Diameter or Distance Between Parallel Surfaces, mm	Tensile Strength, MPa			
		Copper Alloy UNS Nos. C75200 and C79200		Copper Alloy UNS Nos. C74500, C75700, C76400, and C77000	
		Min	Max	Min	Max
H01	Rod: round, 0.5 to 10	415	550	515	655
H04	round, hexagonal, and octagonal 0.5 to 6.5	550	690	620	760
	over 6.5 to 10, incl	485	620	550	690
	over 10 to 25, incl	450	590	515	655
	over 25	415	550	485	620
	Bar: square, rectangular all sizes	470	605	515	650

quirements prescribed in Table 1 for the Copper Alloy UNS No. designation specified in the contract or purchase order.

6.1.1 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.

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

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

7. Temper

7.1 Tempers available under this specification, and as defined in Practice B 601, are O60, OS035, OS070, H01 and H04.

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

8. Grain Size Requirements

8.1 *Grain Size:*

8.1.1 Product in the OS temper shall conform to the requirements prescribed in Table 4 for the specified copper alloy and temper.

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

9. Mechanical Properties Requirements

9.1 Tensile Requirement.

9.1.1 Copper-Nickel-Zinc Alloy 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 for acceptance or rejection of product in these tempers.

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

10. Purchases for U.S. Government

10.1 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 Supplemental Requirements section.

11. Dimensions, Mass and Permissible Variations

11.1 The following titled sections and tables in Specification B 249M are a part of this specification:

11.1.1 *Diameter or Distance between Parallel Surfaces:*

11.1.1.1 *Rod*: Round, Hexagonal, Octagonal—Table 2.

11.1.1.2 *Bar*: Rectangular and Square—Tables 9 and 11.

11.1.2 *Length*—Tables 12 and 14.

11.1.3 *Straightness*—Table 15.

11.1.4 *Edge Contours*—see section of that name.

12. Number of Tests and Retests

12.1 *Tests:*

12.1.1 *Chemical Analysis:*

12.1.1.1 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.