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

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 (ε) 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 *Units*—The values stated in either inch-pound or SI units are to be regarded separately as standard. Within the text, SI units are shown in brackets. 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:*[2]

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
B950 Guide for Editorial Procedures and Form of Product Specifications for Copper and Copper Alloys
E75 Test Methods for Chemical Analysis of Copper-Nickel and Copper-Nickel-Zinc Alloys (Withdrawn 2010)[3]
E76 Test Methods for Chemical Analysis of Nickel-Copper Alloys (Withdrawn 2003)[3]
E478 Test Methods for Chemical Analysis of Copper Alloys

3. General Requirements

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

3.1.1 Terminology,
3.1.2 Material and Manufacture,
3.1.3 Workmanship, Finish, and Appearance,
3.1.4 Sampling,
3.1.5 Number of Tests and Retests,
3.1.6 Specimen Preparation,
3.1.7 Test Methods,
3.1.8 Significance of Numerical Limits,
3.1.9 Inspection,
3.1.10 Rejection and Rehearing,
3.1.11 Certification,
3.1.12 Report,
3.1.13 Packaging and Package Marking, and

[1] 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.

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[2] 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.

[3] The last approved version of this historical standard is referenced on www.astm.org.

***A Summary of Changes section appears at the end of this standard**

3.1.14 Supplementary Requirements.

3.2 In addition, when a section with a title identical to that referenced in 3.1, above, 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.

5. Ordering Information

5.1 Include the following ~~information in the contract or purchase order:~~specified choices when placing orders for product under this specification, as applicable:

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~~6),

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~~ Intended application.~~11).~~

5.2 The following options are available ~~and should be specified in the contract or purchase~~ but may not be included unless specified at the time of placing of the order when required:

5.2.1 Heat identification or traceability ~~detail,~~details (Section 4.1 of Specification B249/B249M),

5.2.2 Certification (Section 15 of Specification B249/B249M),

5.2.3 ~~Certification,~~ Test report (Section 16 of Specification B249/B249M), and

5.2.4 ~~Test report.~~ When material is purchased for agencies of the U.S. Government (Section 11).

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~~composition requirements ~~prescribed~~ in Table 1 for the Copper Alloy UNS No. designation specified in the ~~contract or purchase order.~~ordering information.

7.1.1 These composition limits do not preclude the presence of other elements. ~~Limits~~ By agreement between the manufacturer and the purchaser, limits may be established and analysis required for unnamed ~~elements by agreement between the manufacturer and the purchaser.~~ elements.

7.2 For alloys in which copper is listed as "remainder," copper is the difference between the sum of results for all elements determined and 100 %.

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

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

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~~	~~...~~
C70600	remainder	9.0-11.0	0.05	1.0-1.8	1.0	1.0	...	...	...
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

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 (Inch-Pound Units)

NOTE 1—SI values are stated in Table 4.

Temper Designation	Diameter or Distance Between Parallel Surfaces, in. ~~[mm]~~	Tensile Strength, ksi ~~[MPa][A]~~			
		Copper Alloy UNS Nos. C75200 and C79200		Copper Alloy UNS Nos. C74500, C75700, C76400, and C77000	
		Min	Max	Min	Max
	Rod: round				
~~H01~~	~~0.02 to 0.50 [0.5 to 10], incl~~	~~60 [415]~~	~~80 [550]~~	~~75 [515]~~	~~95 [655]~~
H01	0.02 to 0.50, incl	60	80	75	95
	Rod: round, hexagonal, octagonal				
~~H04~~	~~0.02 to 0.25 [0.5 to 6.5], incl~~	~~80 [550]~~	~~100 [690]~~	~~90 [620]~~	~~110 [760]~~
H04	0.02 to 0.25, incl	80	100	90	110
	~~Over 0.25 to 0.50 [6.5 to 10], incl~~	~~70 [485]~~	~~90 [620]~~	~~80 [550]~~	~~100 [690]~~
	Over 0.25 to 0.50, incl	70	90	80	100
	~~Over 0.50 to 1.0 [10 to 25], incl~~	~~65 [450]~~	~~85 [590]~~	~~75 [515]~~	~~95 [655]~~
	Over 0.50 to 1.0, incl	65	85	75	95
	~~Over 1.0 [25]~~	~~60 [415]~~	~~80 [550]~~	~~70 [485]~~	~~90 [620]~~
	Over 1.0	60	80	70	90
H04	Bar: square, rectangular				
	~~all sizes~~	~~68 [470]~~	~~88 [605]~~	~~75 [515]~~	~~95 [650]~~
	all sizes	68	88	75	95

8. Temper

8.1 The standard tempers ~~available under~~ for products described in this specification and as defined in Classification B601 are: O60, OS015, OS035, OS070, M30, H01, and H04 ~~are~~as given in Tables 2-~~5~~6.

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:*~~ Grain size shall be the standard requirement for all product in the annealed tempers.

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 :*~~ *Requirement:*

10.1.1 Product of Copper-Nickel-Zinc Alloys UNS Nos. C74500, C75200, C75700, C76400, C77000, and C79200 in Tempers H01 and H04 furnished under this specification shall conform to the ~~requirement~~ tensile requirements prescribed in ~~Table 3~~Tables 3 and 4 for the specified shape and ~~size and the~~ size. The tensile strength shall be the basis of acceptance or rejection for product in these tempers.