



Standard Specification for Seamless Copper-Alloy Tubes for Pressure Applications¹

This standard is issued under the fixed designation B 469; 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 the requirements for seamless tubes produced from Copper Alloy UNS² Nos. C19200 and C70600 for general engineering applications.

NOTE 1—This tube is particularly suitable for automobile hydraulic brake lines exposed to a corrosive salt environment.

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

1.3 The following hazard statement pertains only to the test method described in Sections 15.3.3, 15.3.4, and 15.3.5 of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

- B 153 Test Method for Expansion (Pin Test) of Copper and Copper-Alloy Pipe and Tubing³
- B 251 Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tubes³
- B 601 Practice for Temper Designations for Copper and Copper Alloys—Wrought and Cast³
- E 8 Test Methods for Tension Testing of Metallic Material⁴
- E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications⁵
- E 62 Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods)⁶
- E 255 Practice for Sampling Copper and Copper Alloys for the Determination of Chemical Composition⁶
- E 478 Test Methods for Chemical Analysis of Copper Alloys⁶
- E 527 Practice for Numbering Metals and Alloys (UNS)⁷

¹ This specification is under the jurisdiction of ASTM Committee B-5 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.04 on Pipe and Tube.

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² Refer to Practice E 527 for an explanation of the unified numbering system (UNS).

³ *Annual Book of ASTM Standards*, Vol 02.01.

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 03.05.

⁷ *Annual Book of ASTM Standards*, Vol 01.01.

2.2 SAE Handbook Vol. 2 Standard J 533 Flares for Tubing [6-92]

3. Terminology

3.1 Description of terms specific to this specification:

3.2 *flattening*—a condition resulting from a test procedure in which different elements of a tube specimen are compressed slowly by one stroke of a press whereby a micrometer caliper set at three times the wall thickness shall pass freely over the tube throughout the flattened part except at the points where the change in the element of compression takes place.

3.3 *unaided eye*—without visual enhancement. However corrective spectacles necessary for normal vision shall be allowed.

4. Ordering Information

4.1 The contract or purchase order for product under this specification should include the following information:

4.1.1 ASTM designation and year of issue (for example, B469 – XX),

4.1.2 Copper Alloy UNS No. (Section 1 and Table 1),

4.1.3 Temper (Section 8),

4.1.4 Size (Section 11 and Table 2),

4.1.5 How furnished; straight lengths or coiled lengths (Section 11),

4.1.5.1 Length; when straight,

4.1.6 Total length; each size and alloy,

4.1.7 Total weight, and

4.1.8 When product is to be subsequently welded (Note B Table 1).

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

4.2.1 Heat identification or traceability details,

4.2.2 Flaring test (Section 10.1.1),

4.2.3 Expansion test (Section 15.3 & 15.3.2),

4.2.4 Flattening test (Section 15.3 & 15.3.3),

4.2.5 Bend test (Section 15.3 & 15.3.4),

4.2.6 Hydrostatic test (Section 15.3 & 15.3.4),

4.2.7 Certification (Specification B 251), and

4.2.8 Test report (Specification B 251).

5. General Requirements

5.1 The following sections of Specification B 251 are a part of this specification:

5.1.1 Terminology,

TABLE 1 Chemical Requirements

Element	Composition, %	
	Copper Alloy UNS No. C19200	Copper Alloy UNS No. C70600
Copper ^A	98.7 min	remainder
Iron	0.8 to 1.2	1.0 to 1.8
Phosphorus	0.01 to 0.04	^B
Lead		.05 max ^B
Zinc		1.0 max ^B
Nickel		9.0 to 11.0
Manganese		1.0 max ^B
Other named elements		^B

^A Silver counting as copper.

^B 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 %, sulfur 0.02 % max, and carbon 0.05 % max.

TABLE 3 Mechanical Requirements

Alloy	Temper	Tensile, ksi ^A (MPa) ^B	Yield, ^C ksi (MPa)	Elongation, %
C19200	H55	40 (275)	35 (240)	10
	O61	38 (260)	12 (85)	40
C70600	H55	45 (310)	35 (240)	10
	O61	40 (275)	15 (110)	40

^A ksi = 1000 psi.

^B See Appendix.

^C At 0.5 % under load.

7.1.1 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

TABLE 2 Standard Dimensions, Weights, and Tolerances

Standard Size, in.	Outside Diameter, in. (mm)	Wall Thickness, in. (mm)	Weight, lb/ft (kg/m)	Tolerances, plus and minus	
				Average Outside Diameter, in. (mm)	Wall Thickness, in. (mm)
1/8	0.125	0.030	0.0347	0.002	0.003
	(3.18)	(0.762)	(0.0516)	(0.051)	(0.076)
3/16	0.188	0.030	0.0575	0.002	0.0025
	(4.78)	(0.762)	(0.0856)	(0.051)	(0.064)
1/4	0.250	0.030	0.0804	0.002	0.0025
	(6.35)	(0.762)	(0.120)	(0.051)	(0.064)
5/16	0.312	0.030	0.103	0.002	0.0025
	(7.91)	(0.762)	(0.153)	(0.051)	(0.064)
3/8	0.375	0.030	0.126	0.002	0.0025
	(9.53)	(0.762)	(0.187)	(0.051)	(0.064)
7/16	0.437	0.032	0.158	0.002	0.0025
	(11.1)	(0.812)	(0.235)	(0.051)	(0.064)
1/2	0.500	0.032	0.182	0.002	0.0025
	(12.7)	(0.812)	(0.271)	(0.051)	(0.064)
5/8	0.625	0.035	0.251	0.002	0.003
	(15.9)	(0.889)	(0.373)	(0.051)	(0.076)

5.1.2 Workmanship, Finish, and Appearance,

5.1.3 Significance of Numerical Limits,

5.1.4 Certification,

5.1.5 Test Report, and

5.1.6 Packaging and Package Marking.

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

6. Material and Manufacture

6.1 Material:

6.1.1 The product material shall conform to the published compositional requirements for the UNS No. designation specified in the contract or purchase order.

6.1.2 In the event heat identification or traceability is required, the purchaser shall specify the details desired.

NOTE 2—Due to the discontinuous nature of the processing of castings into wrought products, it is not always practical to identify a specific casting analysis with a specific quantity of finished material.

6.2 Manufacture:

6.2.1 The tube shall be produced with a continuous periphery in all stages of the operation and finished by cold drawing, annealing, cleaning, and redrawing necessary to meet the specified dimensions and temper.

7. Chemical Composition

7.1 The material shall conform to the requirements specified in Table 1.

manufacturer and the purchaser.

7.2 The sum of results for Copper UNS No. C19200 shall be 99.8 % minimum when all elements specified in Table 1 are determined.

7.3 The sum of results for all elements specified in Table 1 for Copper Alloy UNS No. C70600 shall be 99.5 % minimum.

7.3.1 When specified as the “Remainder,” copper may be taken as the difference between sum of results of all elements analyzed and 100 %.

8. Temper

8.1 The tube shall be produced in the H55⁸ and O61 tempers for both alloys (C19200 and C70600) and shall be furnished as specified in the ordering information.

9. Mechanical Property Requirements

9.1 The tubes shall conform to the tensile strength, yield strength, and elongation requirements prescribed in Table 3.

10. Performance Requirements

10.1 Flaring Test:

10.1.1 The tubes furnished shall withstand either 37° or 45° double flares as described in SAE⁹ Standard J 533 [6–92].

⁸ Refer to Practice B 601 for a definition of temper designations.

⁹ 1993 SAE Handbook, available from Society of Automotive Engineers, Inc., Commonwealth Dr., Warrendale, PA 15096.