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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Specification for Seamless Copper Tube for Natural Gas and Liquified Petroleum (LP) Gas Fuel Distribution Systems¹

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1. Scope

1.1 This specification establishes the requirements for Type GAS seamless Copper UNS No. C12200² tube suitable for use in above ground natural gas and liquified petroleum (LP) gas fuel distribution systems installed in conformance with the requirements of American National Standard (ANSI) Z223.1, National Fire Protection Association Standard (NFPA) 54, Canadian Gas Association Standards (CGA) B149.1 and B149.2 which are commonly assembled with flared fittings or brazed joints.

1.2 O60 (soft annealed) temper gas tube is produced in the range of standard sizes 0.375–0.875 in. outside diameter; H58 (drawn general purpose) temper gas tube is produced in the range of standard sizes 0.375–1.125 in. outside diameter.

1.3 O60 (soft annealed) temper gas tube systems are normally assembled with single SAE J512 or J513 45° flared fittings (2.3) although brazed connections using wrought (ASME/ANSI B16.22) or cast (ASME/ANSI B16.18) fittings (2.4) may be permitted by local or code requirements. H58 (drawn general purpose) temper gas tube systems must be assembled with brazed connections.

NOTE 1—Tube temper and applicable size are determined by installation code requirements.

1.4 Flared fittings (SAE J512 or J513—Section 2.3) used with seamless copper tube for natural gas and liquified petroleum (LP) gas fuel distribution systems shall be free of residual stresses.

1.5 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

2. Referenced Documents

2.1 The following documents of the issue in effect on the date of material purchase form a part of this standard specification to the extent referenced herein:

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 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.

2.2 ASTM Standards:

B 153 Test Method for Expansion (Pin Test) of Copper and Copper-Alloy Pipe and Tubing³

B 601 Practice for Temper Designations for Copper and Copper Alloys—Wrought and Cast³

E 3 Methods of Preparation of Metallographic Specimens⁴

E 8 Test Methods for Tension Testing of Metallic Materials⁴

E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials⁴

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications⁵

E 53 Test Methods for Chemical Analysis of Copper⁶

E 62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Method)⁶

E 112 Test Methods for Determining Average Grain Size⁴

E 243 Practice for Electromagnetic (Eddy-Current) Examination of Copper and Copper-Alloy Tubes⁷

E 255 Practice for Sampling Copper and Copper Alloys for Determination of Chemical Composition⁶

E 527 Practice for Numbering Metals and Alloys (UNS)⁸

2.3 SAE Standards:

SAE J512 Automotive Tube Fittings⁹

SAE J513 Refrigeration Tube Fittings⁹

2.4 ASME/ANSI Standards:

B16.18 Cast Copper Alloy Solder Joint Pressure Fittings¹⁰

B16.22 Wrought Copper and Copper Alloy Solder Joint Pressure Fittings¹⁰

2.5 Other Codes:

ANSI Z223.1/NFPA 54 National Fuel Gas Code¹¹

CGA B149.1 Installation Code for Natural Gas Burning Equipment¹²

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 03.03.

⁸ Annual Book of ASTM Standards, Vol 01.01.

⁹ Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096-0001.

¹⁰ Available from American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017.

¹¹ Available from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269-9101.

¹² Available from Canadian Gas Association, 55 Scarsdale Road, Don Mills, Ontario, Canada, M3B 2R3.

CGA B149.2 Installation Code for Propane Fuel Burning Equipment¹²

3. Terminology

3.1 Definitions:

3.1.1 *coil*—a length of tube formed into a series of connected turns. The unqualified term “coil” as applied to tube usually refers to a bunch coil.

3.1.1.1 *bunched coil*—a coil in which turns are bunched and held together such that a cross section of the bunched turns is approximately circular.

3.1.1.2 *double layer flat*—a coil in which the product is spirally wound into two connected disc-like layers such that one layer is on top of the other (a double layer pancake coil or a double layer spirally wound coil).

3.1.1.3 *level or traverse wound*—a coil in which the turns are wound into layers parallel to the axis of the coil such that successive turns in a given layer are adjoining one another (sometimes called a helical coil).

3.1.1.4 *single layer flat*—a coil in which the product is spirally wound into a single disc-like layer (a pancake coil or a single layer spirally wound coil).

3.1.2 *liquefied petroleum (LP) gas*—any of the following hydrocarbons or mixtures of them: propane, propylene, butane (normal butane or isobutane) and butylene.

3.1.3 *standard lengths*—uniform lengths recommended in a simplified practice recommendation or established as a commercial standard.

3.1.4 *tube, gas*—tube specifically intended for use in above ground and natural gas and liquefied petroleum gas fuel distribution systems and conforming to the particular dimensions known as Type GAS.

3.1.5 *tube, seamless*—tube produced with a continuous periphery in all stages of manufacture.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 “*capable of*”—as used in this specification the test need not be performed by the producer of the material to confirm capability. However, should subsequent testing by the purchaser establish that the material did not conform to the requirements of this specification, the material shall be subject to rejection.

4. Ordering Information

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

- 4.1.1 Type GAS tube (Table 1),
- 4.1.2 Standard size (Table 1),
- 4.1.3 Temper (Sections 5 and 7),
- 4.1.4 Whether tension tests, Rockwell Hardness tests, and grain size determinations are required (Section 8),
- 4.1.5 Whether an expansion test is required (Section 9),
- 4.1.6 Length (11.5—Table 2),
- 4.1.7 Whether the tube is to be furnished in straight lengths or coils,
- 4.1.8 Quantity: number of straight lengths or coils required,
- 4.1.9 Certification, if required (Section 20),
- 4.1.10 Mill test report, if required (Section 21).

4.2 In addition, when material is purchased for agencies of the U.S. Government, it shall conform to the Supplementary Requirements as defined herein, when specified in the contract or purchase order.

5. Materials and Manufacture

5.1 The material shall be of such quality and purity that the finished tube shall have the properties and characteristics prescribed in this specification and shall be cold drawn to size.

5.2 The tube shall be finished by such cold-working and annealing operations as are necessary to produce the required temper and surface finish.

5.3 Tubes furnished in coils shall be annealed after coiling.

5.4 Tubes furnished in straight lengths shall normally be in the H58 (Drawn General Purpose) temper but may be furnished in the O60 (Soft Anneal) temper if so specified.

6. Chemical Composition

6.1 The material shall conform to the following chemical requirements of Copper UNS No. C12200:

Copper (incl. Silver)	99.9 % min.
Phosphorus	0.015 to 0.040 %

6.2 These specification limits do not preclude the presence of other elements. Limits for unnamed elements may be established by agreement between the manufacturer or supplier and the purchaser.

7. Temper

7.1 Type GAS copper tube shall be furnished in either of the following tempers as defined in Practice B 601.

Soft Anneal	O60
Drawn General Purpose	H58

TABLE 1 Dimensions, Mass and Tolerances in Diameter and Wall Thickness for Standard Sizes of Type G Seamless Copper Tube for Natural Gas and Propane Fuel Distribution Systems (All tolerances in this table are plus and minus)

Standard Size	Actual Outside Diameter		Average Outside Diameter ^A Tolerances				Wall Thickness and Tolerance In. (mm)				Theoretical Mass	
Inch	in.	(mm)	Inch (mm)				Wall Thickness		Tolerance ^B		lbs/ft	(kg/m)
			Annealed		Drawn							
⅜	0.375	(9.52)	0.002	(0.051)	0.001	0.025	0.030	(0.762)	0.003	(0.076)	0.126	(0.187)
½	0.500	(12.7)	0.0025	(0.064)	0.001	0.025	0.035	(0.889)	0.004	(0.10)	0.198	(0.146)
⅝	0.625	(15.9)	0.0025	(0.064)	0.001	0.025	0.040	(1.02)	0.004	(0.10)	0.285	(0.424)
¾	0.750	(19.1)	0.0025	(0.064)	0.001	0.025	0.042	(1.07)	0.004	(0.10)	0.362	(0.539)
⅞	0.875	(22.3)	0.003	(0.076)	0.001	0.025	0.045	(1.14)	0.004	(0.10)	0.455	(0.677)
1⅜	1.125	(29)	...	...	0.0015	0.038	0.050	(1.27)	0.005	(0.13)	0.655	(0.975)

^A The average outside diameter of a tube is the average of the maximum and minimum outside diameter, as determined at any one cross section of the tube.

^B Maximum permissible deviation at any one point.