ASTM B75

Standard Specification for Seamless Copper Tube

1997 Edition · Technical Summary

Item	Description
Designation	ASTM B75-1997 (fixed designation B 75; 1997 = year of last revision)
Title	Standard Specification for Seamless Copper Tube
Publisher	ASTM International (formerly American Society for Testing and Materials)
Metric companion	ASTM B75M (SI-unit version; the two are companion specifications)
Units	Inch-pound units are the standard, except grain size, which is given in SI units
Legal status	Incorporated by reference into U.S. federal regulations (CFR), giving it binding legal effect
Applications	General engineering: heat exchangers, condensers/evaporators, air-conditioning and refrigeration (ACR), instrumentation and hydraulic lines, etc.

Note: The referenced Scribd page (document/284201218) is only a viewer shell without the standard text. This document is not a verbatim reproduction of the 16-page official standard; it is a technical summary compiled from multiple public sources. For the authoritative full text, purchase the official edition from ASTM International (www.astm.org) or consult the read-only version incorporated in U.S. regulations via eCFR.gov.

1. Scope

This specification establishes the requirements for **seamless round, rectangular, and square copper tube** suitable for **general engineering applications**, covering chemical composition, dimensions and tolerances, mechanical properties, and quality. Tube shall be supplied made from one of the Copper UNS No. designations listed in Section 3, unless otherwise specified in the contract or purchase order. The standard does not purport to address all safety concerns associated with its use; it is the responsibility of the user to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Material and Manufacture

Material — The material of manufacture shall be billets, bars, or tube of Copper UNS No. C10100, C10200, C10300, C10800, C12000, or C12200, and shall be of such soundness as to be suitable for processing into the tubular products described.

Manufacture — The tube shall be manufactured by such hot- and cold-working processes as to produce a homogeneous, uniform wrought structure in the finished product. It shall be cold drawn to the finished size and wall thickness. When a cold-drawn temper is required, the final drawing operation shall be such as to meet the specified temper. When an annealed temper is required, the tube shall be annealed subsequent to the final cold draw.

3. Chemical Composition

The material shall conform to the requirements for the specified Copper UNS No. designation. These specification limits do not preclude the presence of other elements. When included in the contract or purchase order, and agreed upon by the manufacturer or supplier and the purchaser, limits shall be established and analysis required for unnamed elements. Refer to Practice E527 for an explanation of the Unified Numbering System (UNS).

UNS No.	Type of Copper	Cu (incl. Ag), min / %	Phosphorus / %	Remarks
C10100	Oxygen-free electronic (OFE)	99.99	—	Impurity limits: B170 Grade 1
C10200	Oxygen-free without residual deoxidants (OF)	99.95	—	Impurity limits: B170 Grade 2
C10300	Oxygen-free, extra low phosphorus	99.9	0.001–0.005	
C10800	Oxygen-free, low phosphorus	99.9	0.005–0.012	
C12000	Phosphorus deoxidized, low residual P (DLP)	99.9	0.004–0.012	Preferred for brazing/welding
C12200	Phosphorus deoxidized, high residual P (DHP)	99.9	0.015–0.040	Most common grade; no hydrogen embrittlement

Note — Copper includes silver. Impurity limits for C10100 and C10200 are given by Specification B170, Grades 1 and 2 respectively.

4. Temper Designations

Temper designations are defined in Classification B601. Rectangular, including square, tube is normally supplied only in H58 temper; upon agreement between manufacturer and purchaser it may be supplied in H55 or H58 temper. For any combination of diameter and wall thickness not listed under H80 temper, the requirements specified for H58 temper shall apply.

Code	Temper Name	Common Term	Typical Use
O50	Light anneal	light annealed	Fairly soft; balances strength and formability
O60	Soft anneal	soft annealed	Softest, highest ductility; coils and complex forming
H55	Light drawn	light drawn	Light cold work; accurate dimensions
H58	Drawn	drawn (general purpose)	General-purpose cold-drawn temper; most common supply condition
H80	Hard drawn	hard drawn	High strength; round tube only

5. Mechanical Property Requirements

The tube shall conform to the tensile strength, yield strength (determined at 0.5 % extension under load), Rockwell hardness, and average grain size requirements for the specified temper and wall thickness. Rockwell hardness values apply only to tubes of sufficient wall thickness and internal diameter; tests are made on the inside surface of the tube. Where suitable equipment is not available, other Rockwell scales and values may be specified by agreement. A light straightening operation is acceptable for annealed tempers.

Temper	Applicability	Rockwell Hardness	Avg Grain Size / mm	Tensile Strength / ksi	Yield Strength min / ksi
H55 light drawn	All ODs and walls	30T: 30–60	—	36–47	30
H58 drawn	All ODs and walls	30T: 30 min	—	36 min	30
H80 hard drawn	OD up to 4 in., wall 0.020–0.250 in.	30T: 55 min	—	45 min	40

Temper	Applicability	Rockwell Hardness	Avg Grain Size / mm	Tensile Strength / ksi	Yield Strength min / ksi
O60 soft anneal	Wall 0.015–0.035 in.	15T: 60 max	0.040 min	30 min	9
O60 soft anneal	Wall 0.035 in. and over	F: 50 max	0.040 min	30 min	9
O50 light anneal	Wall 0.015–0.035 in.	15T: 65 max	0.040 max	30 min	9
O50 light anneal	Wall 0.035 in. and over	F: 55 max	0.040 max	30 min	9

Approximate SI conversions (ksi → MPa): H80 tensile ≥ 45 ksi ≈ 310 MPa (yield ≥ 275 MPa); H58 tensile ≥ 36 ksi ≈ 250 MPa (yield ≥ 205 MPa); O60/O50 tensile ≥ 30 ksi ≈ 205 MPa. Elongation in 50 mm (2 in.) for annealed tempers is typically required to be ≥ 40 % (as specified in the order / standard text).

6. Physical Property Requirements

Electrical Resistivity — When specified in the contract or purchase order, tube ordered for electrical conductor applications produced from Copper UNS No. C10100, C10200, C10300, or C12000 shall have an electrical mass resistivity (Ω·g/m²) not exceeding the following limits for the specified copper and temper when tested in accordance with Test Method B193. Refer to Appendix X2 of the standard for International Annealed Copper Standard (IACS) conductivity equivalents.

UNS No.	Annealed (O60, O50)	Drawn (H55, H58, H80)
C10100	0.15176	0.15614
C10200	0.15328	0.15737
C10300	0.15614	0.15940
C12000	0.17031	0.17418

Reference physical properties: density ≈ 8.94 g/cm³; melting point ≈ 1083 °C; thermal conductivity ≈ 390 W/(m·K) for C10200 and ≈ 320 W/(m·K) for C12200.

7. Dimensions and Tolerances

Dimensions and tolerances are governed by reference to Specification B251, General Requirements for Wrought Seamless Copper and Copper-Alloy Tube. Common points:

Parameter	Typical Tolerance (based on B251)
Outside diameter (OD)	Varies with OD: approx. +0.000/–0.004 in. to +0.008/–0.004 in.
Wall thickness	+10 % / –0 % of nominal wall
Straightness	≤ 0.01 in./ft for drawn temper
Common size ranges	OD approx. 3/16 in. to 2-1/8 in. (4.76–54 mm); wall 0.25–1.2 mm (typical commercial supply)

Exact limiting dimensions, length tolerances, and test frequencies shall be taken from the standard text and the purchase order.

8. Referenced Documents

Standard	Title	Role in B75
ASTM B75M	Seamless Copper Tube [SI units]	Metric companion specification
ASTM B170	Oxygen-Free Copper Billets	Impurity limits for C10100 / C10200
ASTM B251	General Requirements for Wrought Seamless Copper and Copper-Alloy Tube	Dimensions and general requirements
ASTM B601	Temper Designations for Copper and Copper Alloys	Definition of temper codes
ASTM B193	Resistivity of Electrical Conductor Materials	Resistivity testing
ASTM E527	Numbering Metals and Alloys (UNS)	Alloy numbering system

9. Typical Applications and Selection Guide

Requirement	Recommended Choice	Rationale
Brazed/welded piping, plumbing, HVAC	C12200 (DHP)	Deoxidized copper, no hydrogen embrittlement, excellent brazeability, cost-effective
High-conductivity, vacuum, electronic uses	C10100 / C10200 (OF)	Oxygen-free copper with high conductivity (≥ 101 % / ≥ 100 % IACS)
Coils, complex bending and forming	O60 soft anneal	Highest ductility; easy bending and flaring
Straight lengths requiring higher strength	H58 / H80	Cold-drawn tempers give high strength, stiffness, dimensional accuracy
ACR field service lines	Use with ASTM B280	B280 adds cleanliness and dry, capped delivery requirements

10. Delivery and Inspection Notes (Reference)

· Chemical analysis and mechanical tests are performed according to the sampling and retest procedures of the standard.

· Non-destructive verification of soundness is commonly carried out by eddy-current testing or hydrostatic testing.

· Temper, length, coil or straight form, cleanliness, and end protection shall be specified in the purchase order.

· Material Test Certificates (MTC) are normally supplied to EN 10204 3.1 or an equivalent format.

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