



Designation: B105 – 05 (Reapproved 2012)

# Standard Specification for Hard-Drawn Copper Alloy Wires for Electric Conductors<sup>1</sup>

This standard is issued under the fixed designation B105; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the U.S. Department of Defense.*

## 1. Scope

1.1 This specification covers hard-drawn round copper alloy wires for electric conductors.

1.2 The copper alloy wires shall be made in any one of ten distinct alloys designated 8.5 to 85 in accordance with their increasing conductivities or designated by assigned UNS numbers (see Explanatory **Note 1**) as follows:

Copper Alloy UNS No.		Copper Alloy UNS No.	
Alloy 8.5	C65100	Alloy 40	
Alloy 13	C51000	Alloy 55	C16500
Alloy 15		Alloy 74	C19600
Alloy 20		Alloy 80	C16200
Alloy 30	C50700	Alloy 85	C16200

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3.1 *Exception*—The SI values of density and resistivity are to be regarded as standard.

## 2. Referenced Documents

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

2.2 *ASTM Standards*:<sup>2</sup>

**B193 Test Method for Resistivity of Electrical Conductor Materials**

**B258 Specification for Nominal Diameters and Cross-Sectional Areas of AWG Sizes of Solid Round Wires Used as Electrical Conductors**

<sup>1</sup> This specification is under the jurisdiction of the 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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<sup>2</sup> 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.

**E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)**

2.3 *Other Document*:

**NBS Handbook 100—Copper Wire Tables**<sup>3</sup>

## 3. Ordering Information

3.1 Orders for material under this specification should include the following information:

3.1.1 Quantity of each size and grade,

3.1.2 Wire size: diameter in inches or millimetres (see **9.1** and **Table 1**),

3.1.3 Alloy (see **1.2** and **Table 1**),

3.1.4 Special composition limits, if required (see **5.2**),

3.1.5 Package size (see **14.1**),

3.1.6 Special package marking, if required, and

3.1.7 Place of inspection (see **13.1**).

## 4. Materials and Manufacture

4.1 The material used shall be copper alloys of such nature and composition as to secure by proper treatment the properties prescribed in this specification for the finished wire.

## 5. Chemical Composition

5.1 The chemical composition of copper alloy wires shall conform to the requirements of **Table 2**. The values prescribed in **Table 2** cover limits of composition of the different alloys which may be supplied (see **Note 2**).

5.2 The maximum percentage of the various alloying elements to be found in any one of the alloys is prescribed in **Table 2**. If the purchaser elects to check the composition of any material supplied to conform to the performance requirements of any one of the alloys, the composition limits should be made the subject of a definite agreement between the manufacturer and the purchaser in the placing of individual orders.

## 6. Chemical Analysis

6.1 An analysis may be made on each lot of 5000 lb (2300 kg) or fraction thereof. Millings or clippings shall be made from at least ten separate coils. Equal quantities shall be taken

<sup>3</sup> Available from National Technical Information Service (NTIS), 5301 Shawnee Rd., Alexandria, VA 22312, http://www.ntis.gov.



TABLE 1 Tensile Requirements<sup>A</sup>

NOTE 1—Conversion factors are presented for ready adaptation to computer readout and electronic data transmission. The factors are written as a number greater than one and less than ten with six or less decimal places. This number is followed by the letter E (for exponent), a plus or minus symbol, and two digits which indicate the power of 10 by which the number must be multiplied to obtain the correct value. For example: 2.54 E + 01 = 2.54 × 10<sup>1</sup> = 25.4.

Table with columns: Diameter (in, mm), Area (cmil, in.², mm²), Elongation, min, % in 10 in. (250 mm), Alloy 8.5 (ksi, Mpa), Alloy 13 (ksi, Mpa), Alloy 15 and 20 (ksi, Mpa), Alloy 30 (ksi, Mpa), Alloy 40 (ksi, Mpa), Alloy 55 (ksi, Mpa), Alloy 74 (ksi, Mpa), Alloy 80 (ksi, Mpa), Alloy 85 (ksi, Mpa). Rows list various alloy grades and their mechanical properties.

<sup>A</sup> Conversion factors: 1 in. = 2.54 E + 01 mm, 1 kcmil = 5.067 E - 01 mm², 1 in.² = 6.452 E + 02 mm², 1 ksi = 6.895 E + 00 MPa.