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Standard Specification for Aluminum 1350 Wire For Communication Cable[1]

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1. Scope

1.1 This specification covers aluminum 1350-H14 or -H24 (½ hard) round wire primarily for use as conductor in communication cable (Explanatory Notes 1 and 2).

1.2 The values stated in inch-pound units are to be regarded as the standard, with the exception of resistivity. The values given in parentheses are for information only.

NOTE 1—Prior to 1975, aluminum 1350 was designed as EC aluminum.

NOTE 2—The aluminum and temper designations conform to ANSI H35.1. Aluminum 1350 corresponds to Unified Numbering System A91350 in accordance with Practice E 527.

2. Referenced Documents

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

2.1.1 *ASTM Standards:*

B 193 Test Method for Resistivity of Electrical Conductor Materials[2]

B 233 Specification for Aluminum 1350 Drawing Stock for Electrical Purposes[2]

B 354 Definitions of Terms Relating to Uninsulated Metallic Electrical Conductors[2]

B 557 Methods of Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products[3]

E 527 Practice for Numbering Metals and Alloys (UNS)[4]

2.1.2 *American National Standard:*

ANSI H35.1 American National Standard Alloy and Temper Designation Systems for Aluminum[5]

2.1.3 *National Bureau of Standards:*

NBS Handbook 100—Copper Wire Tables[6]

NBS Handbook 109—Aluminum Wire Tables[6]

3. Ordering Information

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

3.1.1 Quantity of each size,

3.1.2 Wire size, diameter in inches (Section 9),

3.1.3 When tension tests on wires containing joints shall be made (see 5.1 and 5.2),

3.1.4 Special jointing procedures if permitted (see 6.2),

3.1.5 Package size and marking (see 13.1), and

3.1.6 Place of inspection (see 13.2).

3.1.7 In addition supplementary requirements shall apply only when specified by the purchaser in the inquiry, contracts or purchase order for direct procurement by agencies of the U.S. Government (S1, S2, S3).

4. Material

4.1 The wire shall be made from drawing stock meeting the requirements of Specification B 233.

5. Tensile Requirements

5.1 Tension tests shall be made of representative samples tested in accordance with Methods B 557. The wire shall have a tensile strength not less than 15 ksi (103 MPa) and an elongation not less than 12 % in 10 in. (250 mm) (Explanatory Note 3). The elongation of the wire shall be determined as the permanent increase in length, due to the breaking of the wire in tension, measured between gage marks placed originally 10 in. apart upon the test specimen, or by measurements made between the jaws of the testing machine. When the latter method is used, the zero length shall be the distance between the jaws at the start of the tension test and be as near 10 in. as practicable, and the final length shall be the distance between the jaws at the time of rupture. The fraction shall be between gage marks in the case of specimens so marked or between the jaws of the testing machine and not closer than 1 in. (25 mm) to either gage mark or either jaw. Either method for determination of elongation may be used, provided that, in case of dispute, the results secured by the method using gage marks shall be the basis for acceptance.

5.2 When requested by the purchaser, tension tests of specimens containing joints made in the finished wire or during the final drawing, as permitted in 6.2, shall be made. Such tests shall show a tensile strength of not less than 12.5 ksi (86 MPa).

6. Joints

6.1 Necessary joints in the wire and drawing stock prior to final drawing shall be made in accordance with good commercial practice. Unless otherwise specified, no joints shall be made during final drawing or in the finished wire.

6.2 If agreed upon between the manufacturer and the purchaser, joints may be made during final drawing or in the finished wire by cold-pressure welding or by electric-butt, cold-upset welding. Not more than 10 % of the reels, coils, or spools shall contain such joints and no such joint shall be

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[1] This specification is under the jurisdiction of ASTM Committee B-1 on Electrical Conductors and is the direct responsibility of Subcommittee B01.07 on Conductors of Light Metals.

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[2] *Annual Book of ASTM Standards*, Vol 02.03.

[3] *Annual Book of ASTM Standards*, Vols 02.02 and 02.03.

[4] *Annual Book of ASTM Standards*, Vols 01.01 and 02.03.

[5] Available from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

[6] Available from the National Technical Information Service, 5285 Port Royal Rd., Springfield, VA 22161.

TABLE 1 Permissible Variations in Diameter

Specified Diameter		Permissible Variations of Mean Diameter from Specified Diameter, plus and minus
in.	mm	
0.0200 or over	0.508 or over	1 %
Under 0.0200	under 0.508	0.002 in. (0.005 mm)

closer than 50 ft (15 m) to another or to either end of the wire, and not more than two such joints shall be present in any reel, coil, or spool of the nominal specified weight. Reels, coils, or spools containing such joints shall be so marked.

7. Density

7.1 For the purpose of calculating linear density, cross section, etc., the density of aluminum 1350 shall be taken as 0.0975 lb/in.^{3} (2705 kg/m^3) at 20°C.

8. Resistivity

8.1 Electrical resistivity, determined on samples selected in accordance with Section 11 and tested in accordance with Test Method B 193, shall not exceed 0.028264 Ω·mm^2/m (17.002 Ω·cmil/ft) at 20°C (68°F) (Explanatory Note 4).

9. Diameter and Permissible Variations

9.1 The diameter of the wire shall be expressed in decimal fractions of an inch using four places of decimals.

9.2 Samples taken in accordance with Section 11 shall be gaged at three places. If accessible, one gaging shall be taken near each end and one near the middle. If any of the selected coils or spools fail to conform to the requirements prescribed in 9.3 all coils or spools shall be gaged in the manner specified.

9.3 The coil, spool, or reel shall be subject to rejection if the average of the measurements so made departs from the specified diameter by more than the amounts prescribed in Table 1.

10. Finish

10.1 The wire shall be free of all imperfections not consistent with good commercial practice.

11. Sampling

11.1 Unless otherwise agreed upon between the manufacturer and the purchaser, one sample shall be taken from each 500 lb (230 kg) or fraction thereof, but not less than five reels, coils, or spools of wire (or all if the lot is less than five) shall be sampled for test, to determine conformance with the requirements of Sections 5, 8, and 9.

12. Retests

12.1 If upon testing a sample from any reel, coil, or spool of wire, the results do not conform to the requirements of Sections 5 and 8, two additional samples shall be tested, and the average of the three tests shall determine the acceptance or rejection of the reel, coil, or spool. The wire in all other respects shall conform to specified requirements.

13. Inspection

13.1 Unless otherwise specified in the contract or purchase order, the manufacturer shall be responsible for the performance of all inspection and test requirements specified.

13.2 All inspections and tests shall be made at the place of manufacture unless otherwise agreed to between the manufacturer and the purchaser at the time of purchase.

13.3 The manufacturer shall afford the inspector representing the purchaser all reasonable manufacturer's facilities to satisfy him that the material is being furnished in accordance with this specification.

14. Packaging, and Package Marking

14.1 Package sizes and marking shall be as agreed between the manufacturer and the purchaser in the placing of individual orders.

14.2 The wire shall be protected against damage in ordinary handling and shipping.

TABLE 2 Equivalent Resistivity Values at 20 °C (68 °F)[A]

Material	Volume Conductivity % IACS	Resistivity Constants, Volume			
		Ω·cmils/ft	Ω·mm^2/m	μΩ·in.	μΩ·cm
Copper	100	10.371	0.017241	0.67879	1.7241
Aluminum	61.0	17.002	0.028265	1.1128	2.8265

[A] The equivalent resistivity values for 100 % IACS (soft copper) were each computed from the fundamental IEC value (1/58 Ω·mm^2/m) using conversion factors each accurate to at least seven significant figures. Corresponding values for other conductivities (aluminum) were derived from these by multiplying by the reciprocal of the conductivity ratios accurate to at least seven significant figures.