



Designation: **B227—10 B227 – 15**

Standard Specification for Hard-Drawn Copper-Clad Steel Wire¹

This standard is issued under the fixed designation B227; 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 (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers bare hard-drawn round copper-clad steel wire for electrical purposes (**Note 1**).

NOTE 1—Wire ordered to this specification is not intended for redrawing. If wire is desired for this purpose, consult the manufacturer.

1.2 Four grades of wire are specified, designated as follows (**Note 2**): Grade 40 HS, Grade 40 EHS, Grade 30 HS, and Grade 30 EHS.

NOTE 2—The grades covered by this specification correspond to the following commercial designations:

Grade 40 HS, High Strength, 40 % Conductivity.

Grade 40 EHS, Extra High Strength, 40 % Conductivity

Grade 30 HS, High Strength, 30 % Conductivity.

Grade 30 EHS, Extra High Strength, 30 % Conductivity.

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.

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.

2.2 *ASTM Standards*:²

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

2.3 *National Institute of Standards and Technology*:

NBS Handbook 100—Copper Wire Tables³

3. Ordering Information

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

3.1.1 Quantity of each size and grade,

3.1.2 Wire size: diameter in inches (see **5.1** and **Table 1**),

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

3.1.4 Method of measuring elongation (see **7.3** and **7.4**),

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

3.1.6 Special package marking, if required (**Section 13**), and

3.1.7 Place of inspection (**Section 15**).

4. Material

4.1 The wire shall be composed of a steel core with a substantially uniform and continuous copper cladding thoroughly bonded to it throughout.

¹ This specification is under the jurisdiction of the ASTM Committee B01 on Electrical Conductors and is the direct responsibility of Subcommittee B01.06 on Composite Conductors.

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² 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.

³ Available from National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 1070, Gaithersburg, MD 20899-1070, http://www.nist.gov.

TABLE 1 Tensile Requirements

Nominal Diameter, in. Diameter	Area at 20°C		Tensile Strength, min, psi (MPa) ^A			
	in. (mm) cmil	in. ² (mm ²) ^A	Grade 40 HS	Grade 40 EHS	Grade 30 HS	Grade 30 EHS
0.2043	41 740	0.03278	108 000	...	120 000	142 500
0.2043 (5.189)	41 740	0.03278 (21.15)	108 000 (745)	...	120 000 (828)	142 500 (983)
0.1819	33 090	0.02599	113 000	...	125 000	150 500
0.1819 (4.620)	33 090	0.02599 (16.77)	113 000 (780)	...	125 000 (863)	150 500 (1038)
0.1650 ^B	27 230	0.02138	118 000	...	130 000	157 500
0.1650 (4.191) ^B	27 230	0.02138 (13.79)	118 000 (814)	...	130 000 (897)	157 500 (1087)
0.1620	26 240	0.02061	118 000	...	130 000	157 500
0.1620 (4.115)	26 240	0.02061 (13.30)	118 000 (814)	...	130 000 (897)	157 500 (1087)
0.1443	20 820	0.01635	123 000	...	135 000	164 000
0.1443 (3.665)	20 820	0.01635 (10.55)	123 000 (849)	...	135 000 (932)	164 000 (1132)
0.1285	16 510	0.01297	128 000	...	140 000	170 000
0.1285 (3.264)	16 510	0.01297 (8.368)	128 000 (883)	...	140 000 (966)	170 000 (1173)
0.1280 ^B	16 380	0.01287	128 000	...	140 000	170 000
0.1280 (3.251) ^B	16 380	0.01287 (8.303)	128 000 (883)	...	140 000 (966)	170 000 (1173)
0.1144	13 090	0.01028	133 000	...	145 000	174 100
0.1144 (2.906)	13 090	0.01028 (6.632)	133 000 (918)	...	145 000 (1001)	174 100 (1201)
0.1040 ^B	10 820	0.008495	138 600	156 000	151 000	175 000
0.1040 (2.642) ^B	10 820	0.008495 (5.481)	138 600 (956)	156 000 (1076)	151 000 (1042)	175 000 (1208)
0.1019	10 380	0.008155	138 600	...	151 000	179 000
0.1019 (2.588)	10 380	0.008155 (5.261)	138 600 (956)	...	151 000 (1042)	179 000 (1235)
0.0808	6 530	0.005129	115 000	...	120 000	179 000
0.0808 (2.052)	6 530	0.005129 (3.309)	115 000 (794)	...	120 000 (828)	179 000 (1235)
0.0800 ^B	6 400	0.005027	115 000	...	120 000	179 000
0.0800 (2.032) ^B	6 400	0.005027 (3.243)	115 000 (794)	...	120 000 (828)	179 000 (1235)
0.0640 ^B	4 096	0.003217	125 000	...	130 000	179 000
0.0640 (1.626) ^B	4 096	0.003217 (2.076)	125 000 (863)	...	130 000 (897)	179 000 (1235)
0.0403	1 624	0.001276	130 000	...	135 000	179 000
0.0403 (1.024)	1 624	0.001276 (0.8232)	130 000 (897)	...	135 000 (932)	179 000 (1235)
0.0390 ^B	1 521	0.001195	130 000	...	135 000	179 000
0.0390 (0.9906) ^B	1 521	0.001195 (0.7710)	130 000 (897)	...	135 000 (932)	179 000 (1235)
0.0320	1 024	0.000804	135 000	161 000	145 000	179 000
0.0320 (0.8128)	1 024	0.000804 (0.5187)	135 000 (932)	161 000 (1111)	145 000 (1001)	179 000 (1235)

^A Metric equivalents: 1 in. = 25.4 mm (round to four significant figures); 1 in.² = 645.16 mm² (round to four significant figures); 1 psi = 6.9 kPa (round to significant figure of U.S. customary units).

^B These diameters are often employed by purchasers for communication lines but are not in the American Wire Gage (B & S Wire Gage) series, as are the other diameters listed (Note 3).

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<https://standards.iteh.ai/catalog/standards/sist/1b2f0194-2e41-4e66-8a35-b2337bb17258/astm-b227-15>

4.2 The finished copper-clad steel wire shall conform to the requirements prescribed in this specification.

5. Dimensions and Permissible Variations

5.1 The size shall be expressed as the diameter of the wire in decimal fractions of an inch using four places of decimals, that is, in tenths of mils (Note 3).

NOTE 3—The values of wire diameters in Table 1 are given to the nearest 0.0001 in. and correspond to the standard sizes given in Specification B258. In specifying diameters of wire or in inspecting wire, express the diameter to the fourth decimal place. The diameters preceded by asterisks are not in the American Wire Gage series and are also given to four places of decimals. They correspond to certain numbers of the Birmingham Wire Gage of the British Standard Wire Gage and are used for communication lines. The use of gage numbers in specifying wire sizes is not recognized in these specifications because of the possibility of confusion. An excellent discussion of wire gages and related subjects is contained in *NBS Handbook 100* of the National Institute of Standards and Technology.³

5.2 Within the range of diameters included in Table 1, the wire shall not vary from the specified diameter by more than the following amounts rounded off to the nearest 0.1 mil (0.0001 in.):

Specified Diameter, in. (mm)	Permissible Variations in Specified Diameter
0.2043 (5.189) to 0.1000 (2.540), incl	±1.5 %
0.0999 (2.537) and under	±1.0 %

5.3 Ten percent, but not less than five coils or spools (or all if the lot is less than five) from any lot of wire, 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 for diameter as prescribed in 5.2, all coils or spools shall be gaged in the manner specified.

6. Workmanship, Finish, and Appearance

6.1 The surface of the wire shall be smooth and free from imperfections not consistent with good commercial practice.