



Designation: B174 – 02 (Reapproved 2007)^{ε1}

Standard Specification for Bunch-Stranded Copper Conductors for Electrical Conductors¹

This standard is issued under the fixed designation B174; 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.

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

^{ε1} NOTE—Table 1 was editorially corrected in March 2007.

1. Scope

1.1 This specification covers bare bunch-stranded conductors made from round copper wires, either uncoated or coated with tin, lead, or lead-alloy for use as electrical conductors (Explanatory Note 1 and Explanatory Note 2).

1.2 Coated wires shall include only those wires with finished diameters and densities substantially equal to the respective diameters and densities of uncoated wires.

1.3 The values stated in inch-pound or SI units are to be regarded separately as standard. Each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the specification. For conductor sizes designated by AWG or kcmil, the requirements in SI units have been numerically converted from corresponding values, stated or derived, in inch-pound units. For conductor sizes designated by SI units only, the requirements are stated or derived in SI units.

2. Referenced Documents

2.1 The following documents of the issue in effect at the time of reference form a part of this specification to the extent referenced herein:

2.2 *ASTM Standards*:²

B3 Specification for Soft or Annealed Copper Wire

B33 Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes

B172 Specification for Rope-Lay-Stranded Copper Conductors Having Bunch-Stranded Members, for Electrical Conductors

¹ This specification is under the jurisdiction of ASTM Committee B01 on Electrical Conductors and is the direct responsibility of Subcommittee B01.04 on Conductors of Copper and Copper Alloys.

Current edition approved March 15, 2007. Published April 2007. Originally approved in 1941. Last previous edition approved in 2002 as B174–02. DOI: 10.1520/B0174-02R07E01.

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.

B189 Specification for Lead-Coated and Lead-Alloy-Coated Soft Copper Wire for Electrical Purposes

B263 Test Method for Determination of Cross-Sectional Area of Stranded Conductors

B354 Terminology Relating to Uninsulated Metallic Electrical Conductors

2.3 *American National Standard*:

ANSI C42.35 Definitions of Electrical Terms³

3. Classification

3.1 For the purpose of this specification bunch-stranded conductors are classified as shown in Table 1.

4. Ordering Information

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

4.1.1 Quantity of each size and class,

4.1.2 Conductor size: circular-mil area or AWG (see 7.1),

4.1.3 Class (Section 3 and Table 2),

4.1.4 Whether coated or uncoated; if coated, designate type of coating (see 11.1),

4.1.5 Maximum length of lay (see 6.3),

4.1.6 Whether separator is required (see 7.2),

4.1.7 Package size (see section 15.1),

4.1.8 Special package marking, if required (Section 14), and

4.1.9 Place of inspection (Section 13).

5. Joints

5.1 Necessary joints in wires shall be made in accordance with accepted commercial practice.

5.2 Joints shall be so constructed and so disposed throughout the conductor that the diameter or configuration of the completed conductor is not substantially affected, and so that the flexibility of the completed conductor is not adversely affected.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

TABLE 1 Classification and Construction Requirements of Bunch-Stranded Conductors^A

Area of Cross Section		Size, AWG	Classification, Size, and Minimum Number of Wires							
			Class I	Class J	Class K	Class L	Class M	Class O	Class P	Class Q
cmil	mm ² †		Wire Diameter	Wire Diameter	Wire Diameter	Wire Diameter	Wire Diameter	Wire Diameter	Wire Diameter	Wire Diameter
			0.0201 in. (0.511 mm) No. 24 AWG	0.0126 in. (0.320 mm) No. 28 AWG	0.0100 in. (0.254 mm) No. 30 AWG	0.0080 in. (0.203 mm) No. 32 AWG	0.0063 in. (0.160 mm) No. 34 AWG	0.0050 in. (0.127 mm) No. 36 AWG	0.0040 in. (0.102 mm) No. 38 AWG	0.0031 in. (0.079 mm) No. 40 AWG
20 820	10.5	7	52	...	...	...	...	...	...	...
16 510	8.37	8	41	...	...	...	...	...	...	...
13 090	6.63	9	33	...	...	...	...	...	...	...
10 380	5.26	10	26	65	104	165	...	...	...	...
6 530	3.31	12	...	41	65	104	...	...	...	...
4 110	2.08	14	...	26	41	65	104	...	...	...
2 580	1.31	16	...	16	26	41	65	104	165	...
1 620	0.821	18	...	10	16	26	41	65	104	165
1 020	0.517	20	...	7	10 ^B	16	26	41	65	104
640	0.324	22	...	...	7	...	19	...	...	...
404	0.205	24	...	...	...	7	...	19	...	...
253	0.128	26	...	...	...	...	7	...	...	...
159	0.0806	28	...	...	...	...	...	...	...	...

†Editorially corrected.

^AThe constructions shown in this table are typical of those used in the industry. It is not intended that this table preclude other constructions which may be desirable for specific applications. The constructions shown provide for a finished, non-covered, stranded conductor approximately of the area indicated. When specified by the purchaser, the number or size of wires may be increased to provide additional area to compensate for draw-down during subsequent processing.

^BAs an alternate to the construction shown for No. 20 AWG, Class K; for hook-up wire construction may consist of 8 wires 0.0100 in. (0.254 mm) diameter around 1 wire of 0.0142 in. (0.361 mm) diameter.

TABLE 2 Maximum Length of Lay for Bunch-Stranded Conductors

Area of Cross Section		Size, AWG	Maximum Length of Lay					
			Nominal Diameter		Column A		Column B	
cmil	mm		in.	mm	in.	mm	in.	mm
20 820	10.5	7	0.167	4.24	3.00	76.20	3.00	76.20
16 510	8.37	8	0.149	3.78	2.75	69.85	2.75	69.85
13 090	6.63	9	0.133	3.38	2.50	63.50	2.50	63.50
10 380	5.26	10	0.118	3.00	2.50	63.50	2.50	63.50
6 530	3.31	12	0.093	2.36	2.00	50.80	2.00	50.80
4 110	2.08	14	0.074	1.88	2.00	50.80	1.75	44.45
2 580	1.31	16	0.059	1.50	2.00	50.80	1.50	38.10
1 620	0.821	18	0.047	1.19	2.00	50.80	1.25	31.75
1 020	0.517	20	0.037	0.94	2.00	50.80	1.00	25.40
640	0.324	22	0.030	0.76	1.30	33.02	0.80	20.32
404	0.205	24	0.024	0.61	1.20	30.48	0.70	17.78
253	0.128	26	0.019	0.48	1.00	25.40	0.60	15.24
159	0.0806	28	0.015	0.38	1.00	25.40	0.50	12.70

6. Lay

6.1 Conductors of the same size and description furnished on one order shall have the same lay.

6.2 The direction of lay shall be at the option of the manufacturer unless otherwise specified.

6.3 Unless otherwise specified by the purchaser, the length of lay of bare or coated bunch-stranded conductors shall conform to the requirements of Column B of **Table 2**.

6.4 When specified, for constructions other than those listed in Footnote A of **Table 2**, the length of lay shall conform to the requirements of Column A of **Table 2**.

6.5 Conductors of an intermediate nominal area in circular mils shall conform to the requirements for length of lay of the next smaller conductor.

7. Construction

7.1 The area of cross section, and the number and diameter of wires for a variety of strand constructions in general use are shown in **Table 1**.

7.2 If a separator is required to be furnished with the conductor, it shall be at the option of the manufacturer unless otherwise specified by the purchaser as to requirements for the kind and thickness of material and its application details.

8. Physical and Electrical Tests

8.1 Tests for the electrical properties of wires composing conductors made from soft or annealed copper wire, bare or coated, shall be made before stranding.

8.2 Tests for the physical properties of soft or annealed copper wire, bare or coated, may be made upon the wires before stranding or upon wires removed from the completed stranded conductors, but need not be made upon both. Care shall be taken to avoid mechanical injury and stretching when removing wires from the conductor for the purpose of testing.

8.3 The physical properties of wire when tested before stranding shall conform to the applicable requirements of **11.1**.

8.4 The physical properties of wires removed from the completed stranded conductor shall be permitted to vary from the applicable requirements of **11.1** by the following amounts (Explanatory **Note 3**):

8.4.1 *Average of Results Obtained on All Wires Tested*—The percent minimum elongation may be reduced by the value of 5 % from the values required for unstranded wires as specified by Specifications **B3**, **B33**, or **B189**, as applicable. For example, where the unstranded wire specification requires minimum elongation of 30 %, wire of that material removed from Specification B174 stranded conductor shall meet a minimum elongation value of 25 %, a value 5 % reduction.