Designation: ~~B496 – 13a~~ B496 – 14

Standard Specification for Compact Round Concentric-Lay-Stranded Copper Conductors[1]

This standard is issued under the fixed designation B496; 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 compact round concentric-lay-stranded conductors made from uncoated round copper wires for general use for electrical purposes. These conductors shall be constructed with a central core surrounded by one or more layers of helically laid compacted wires (Explanatory Note 1 and Note 2).

1.2 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.

1.2.1 For density, resistivity, and temperature, the values stated in SI units are to be regarded as 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]

B3 Specification for Soft or Annealed Copper Wire

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

B354 Terminology Relating to Uninsulated Metallic Electrical Conductors

3. Ordering Information

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

3.1.1 Quantity of each size (Table 1),

3.1.2 Conductor size; circular-mil area or AWG, (Section 6 and Table 1),

3.1.3 Packaging (Section 15), if required,

3.1.4 Special package marking, and

3.1.5 Place of inspection (Section 14).

4. Joints

4.1 Welds and brazes may be made in rods or in wires prior to final drawing.

4.2 Welds and brazes may be made in the individual round drawn wires for compact conductors, but shall not be closer together than 1 ft (300 mm) for conductor of 19 wires or less or closer than 1 ft (300 mm) in a layer for conductor of more than 19 wires.

4.3 No joint nor splice shall be made in a compact-stranded conductor as a whole.

5. Lay

5.1 The lay length of the wires shall not be less than 8 nor more than 16 times the outside diameter of the finished conductor. The maximum length of lay for compact conductors AWG 2 (33.6 mm^2) and smaller shall be 17.5 times the outside diameter of that layer. For conductors of 37 wires or more, this requirement shall apply to the wires of the outer two layers. The lay of the layers other than the outer two layers shall be at the option of the manufacturer, unless otherwise agreed upon.

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[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.

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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.

TABLE 1 Construction Requirements of Compact Round Concentric-Lay-Stranded Copper Conductors

Conductor Size				Number of Wires	Nominal Compact Conductor Diameter		Nominal Mass, lb/1000 ft	Nominal Mass, kg/km	Nominal DC Resistance at 20	
cmil	AWG	~~mm~~mm^2			in.	~~mm~~ mm			Ω/1000 ft	Ω/km
1 500 000	...	760	91[A,B]	1.299	33.0	4631	6892	0.00705	0.0231	
1 250 000	...	633	91[A,B]	1.184	30.1	3859	5743	0.00846	0.0278	
1 100 000	...	557	91[A,B]	1.112	28.2	3396	5054	0.00962	0.0316	
~~1 000 000~~	~~...~~	~~507~~	~~61[A]~~	~~1.060~~	~~26.9~~	~~3086~~	~~4590~~	~~0.0106~~	~~0.0347~~	
1 000 000	...	507	61[C]	1.060	26.9	3086	4590	0.0106	0.0347	
~~900 000~~	~~...~~	~~456~~	~~61[A]~~	~~0.999~~	~~25.4~~	~~2780~~	~~4140~~	~~0.0118~~	~~0.0386~~	
900 000	...	456	61[C]	0.999	25.4	2780	4140	0.0118	0.0386	
~~800 000~~	~~...~~	~~405~~	~~61[A]~~	~~0.938~~	~~23.8~~	~~2469~~	~~3680~~	~~0.0132~~	~~0.0433~~	
800 000	...	405	61[C]	0.938	23.8	2469	3680	0.0132	0.0433	
~~750 000~~	~~...~~	~~380~~	~~61[A]~~	~~0.908~~	~~23.0~~	~~2316~~	~~3450~~	~~0.0141~~	~~0.0462~~	
750 000	...	380	61[C]	0.908	23.0	2316	3450	0.0141	0.0462	
~~700 000~~	~~...~~	~~355~~	~~61[A]~~	~~0.877~~	~~22.3~~	~~2160~~	~~3220~~	~~0.0151~~	~~0.0495~~	
700 000	...	355	61[C]	0.877	22.3	2160	3220	0.0151	0.0495	
~~650 000~~	~~...~~	~~329~~	~~61[A]~~	~~0.845~~	~~21.4~~	~~2006~~	~~2990~~	~~0.0163~~	~~0.0535~~	
650 000	...	329	61[C]	0.845	21.4	2006	2990	0.0163	0.0535	
~~600 000~~	~~...~~	~~304~~	~~61[A]~~	~~0.813~~	~~20.6~~	~~1850~~	~~2760~~	~~0.0176~~	~~0.0577~~	
600 000	...	304	61[C]	0.813	20.6	1850	2760	0.0176	0.0577	
~~550 000~~	~~...~~	~~279~~	~~61[A]~~	~~0.775~~	~~19.7~~	~~1700~~	~~2530~~	~~0.0192~~	~~0.0630~~	
550 000	...	279	61[C]	0.775	19.7	1700	2530	0.0192	0.0630	
~~500 000~~	~~...~~	~~253~~	~~37[B]~~	~~0.736~~	~~18.7~~	~~1542~~	~~2300~~	~~0.0212~~	~~0.0695~~	
500 000	...	253	37[D]	0.736	18.7	1542	2300	0.0212	0.0695	
~~450 000~~	~~...~~	~~228~~	~~37[B]~~	~~0.700~~	~~17.8~~	~~1390~~	~~2070~~	~~0.0235~~	~~0.0770~~	
450 000	...	228	37[D]	0.700	17.8	1390	2070	0.0235	0.0770	
~~400 000~~	~~...~~	~~203~~	~~37[B]~~	~~0.659~~	~~16.7~~	~~1236~~	~~1840~~	~~0.0264~~	~~0.0865~~	
400 000	...	203	37[D]	0.659	16.7	1236	1840	0.0264	0.0865	
~~350 000~~	~~...~~	~~177~~	~~37[B]~~	~~0.616~~	~~15.7~~	~~1080~~	~~1610~~	~~0.0302~~	~~0.0990~~	
350 000	...	177	37[D]	0.616	15.7	1080	1610	0.0302	0.0990	
~~300 000~~	~~...~~	~~152~~	~~37[B]~~	~~0.570~~	~~14.5~~	~~925~~	~~1380~~	~~0.0353~~	~~0.116~~	
300 000	...	152	37[D]	0.570	14.5	925	1380	0.0353	0.116	
~~250 000~~	~~...~~	~~127~~	~~37[B]~~	~~0.520~~	~~13.2~~	~~772~~	~~1150~~	~~0.0423~~	~~0.139~~	
250 000	...	127	37[D]	0.520	13.2	772	1150	0.0423	0.139	
~~211 600~~	~~4/0~~	~~107~~	~~19[C]~~	~~0.475~~	~~12.1~~	~~653~~	~~972~~	~~0.0500~~	~~0.164~~	
211 600	4/0	107	19[E]	0.475	12.1	653	972	0.0500	0.164	
~~167 800~~	~~3/0~~	~~85.0~~	~~19[C]~~	~~0.423~~	~~10.8~~	~~518~~	~~771~~	~~0.0630~~	~~0.206~~	
167 800	3/0	85.0	19[E]	0.423	10.8	518	771	0.0630	0.206	
~~133 100~~	~~2/0~~	~~67.4~~	~~19[C]~~	~~0.376~~	~~9.57~~	~~411~~	~~611~~	~~0.0795~~	~~0.261~~	
133 100	2/0	67.4	19[E]	0.376	9.57	411	611	0.0795	0.261	
~~105 600~~	~~1/0~~	~~53.5~~	~~19[C]~~	~~0.336~~	~~8.55~~	~~326~~	~~485~~	~~0.100~~	~~0.328~~	
105 600	1/0	53.5	19[E]	0.336	8.55	326	485	0.100	0.328	
~~83 690~~	~~1~~	~~42.4~~	~~19[C]~~	~~0.299~~	~~7.60~~	~~259~~	~~385~~	~~0.126~~	~~0.413~~	
83 690	1	42.4	19[E]	0.299	7.60	259	385	0.126	0.413	
66 360	2	33.6	7	0.268	6.81	205	305	0.159	0.521	
41 740	4	21.2	7	0.213	5.41	129	192	0.253	0.830	
26 240	6	13.3	7	0.169	4.29	80.9	121	0.403	1.32	
16 510	8	8.37	7	0.134	3.40	51.0	75.9	0.641	2.10	

[A] 85 wires minimum.
[B] As agreed upon between the manufacturer and the customer, these sizes may be produced with a 61 to 58 wire construction of the appropriate wire size.
[C] 58 wires minimum.
[D] 35 wires minimum.
[E] 18 wires minimum.

5.2 The direction of lay of the outer layer shall be left-hand, and it shall be reversed in successive layers, unidirectional, or unilay.

6. Construction

6.1 The construction of the compact round concentric-lay-stranded conductors shall be as shown in Table 1.

6.2 The starting round copper wires used in the fabrication of the compact round conductor shall be of such diameter as to produce a finished conductor having a nominal cross-sectional area and diameter as prescribed in Table 1.

7. Density

7.1 For the purpose of calculating linear densities, cross sections, and so forth, the density of the copper shall be taken as 8.89 g/cm^3 (0.32117 lb/in.^{3}) at 20°C.

8. Mass and Resistance

8.1 The mass per unit length and dc electrical resistance of a compact round conductor are greater than the total of these characteristics of the compressed wires composing the finished conductor, depending upon the lay. The standard increment of mass