Designation: ~~B801 – 16~~ B801 – 18

Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation[1]

This standard is issued under the fixed designation B801; 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 aluminum alloys in the 8000 series cited in B800 in tempers "0" and H1X or H2X bare compact-round, compressed and conventional concentric-lay-stranded conductors made from round or shaped wires used as covered or insulated electrical conductors. These conductors shall be composed of a central core surrounded by one or more compacted, compressed or conventional layers of helically applied wires (Explanatory Note 1 and Note 2).

1.2 The SI values for resistivity are regarded as standard. For all other properties, the inch-pound units are regarded as standard and the SI units may be approximate.

1.3 Sealed conductors that are intended to prevent longitudinal water propagation are also permitted within the guidelines of this specification.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

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

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

B354 Terminology Relating to Uninsulated Metallic Electrical Conductors

B800 Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes—Annealed and Intermediate Tempers

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

2.3 *ANSI Standard:*[3]

ANSI H35.1 Alloy and Temper Designation Systems for Aluminum

2.4 *National Bureau of Standards:*[4]

~~NBS~~NBS Handbook 100 ~~Handbook 100—Copper~~ —Copper Wire Tables

3. Classification

3.1 For the purpose of this specification, conductors are classified as follows:

3.1.1 *Class A*—For conductors to be covered with weather/resistant materials.

3.1.2 *Class B*—For conductors to be insulated with various materials such as rubber, paper, varnished cloth, etc., and for the conductors indicated under Class A where greater flexibility is required.

3.1.3 *Class C and D*—For conductors where greater flexibility is required than is provided by Class B conductors.

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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 B01.07 on Conductors of Light Metals.

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

[4] Available from National Technical Information Service (NTIS), 5285 Port Royal Rd., Springfield, VA 22161, http://www.ntis.gov.

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 (Table 1).
4.1.2 Conductor size; circular-mil area or Awg (Section 7),
4.1.3 Class (See 3.1),
4.1.4 Temper (Section 12),
4.1.5 Lay direction if nonstandard (See 6.3 and 6.4), reversed or unidirectional (See 6.3) or special (See 6.4),
4.1.6 Special tension test, if required (See 8.2),
4.1.7 Packaging (Section 19),
4.1.8 Special package marking (Section 19), and
4.1.9 Place of inspection (Section 18).

5. Joints

5.1 Joints may be made in any of the wires of any stranding by electric-butt welding, cold-pressure welding, or electric-butt, cold-upset welding.

5.2 Joints in the individual wires in a finished conductor shall be not closer together than 1 ft (0.3 m) for conductors of 19 wires or less, or closer than 1 ft (0.3 m) in a layer for conductors of more than 19 wires.

5.3 No joint or splice shall be made in a stranded conductor as a whole.

6. Lay

6.1 The length of lay for all classes shall be not less than 8 nor more than 16 times the outside diameter of that layer, except that for conductors composed of 37 wires or more, this requirement shall apply only to the two outer layers. The lay of the layers other than the two outer layers shall be at the option of the manufacturer, unless otherwise agreed upon.

6.1.1 For conductors to be used in covered or insulated wires or cables, the lay length of the wires shall be not less than 8 nor more than 16 times the outer diameter of the finished conductor. For conductors of 37 wires or more, this requirement shall apply to the wires in the outer two layers. The lay of the layers other than the two outer layers shall be at the option of the manufacturer, unless otherwise agreed upon.

6.2 The direction of lay for Class A conductors shall be right-hand.

6.3 The direction of lay of the outer layer shall be left-hand for all other classes, unless the direction is specified otherwise by the purchaser.

6.4 The direction of lay shall be reversed in successive layers in conventional and compressed constructions. In compact constructions, the lay of the successive layers may be either reversed or unidirectional.

6.4.1 For conductors to be used in covered or insulated wires or cables, the direction of lay of the outer layer shall be left-hand and may be reversed or unidirectional or unilay in successive layers, unless otherwise agreed upon with the purchaser.

6.5 The maximum length of lay for compact conductors AWG 2 and smaller shall be 17.5 times the outside diameter of that layer.

6.6 Other lay requirements may be furnished by special agreement between the manufacturer and the purchaser.

7. Construction

7.1 The construction of the conductors shall be as shown in Table 1 as to number of wires and cross-sectional area of the completed conductor, and the lay shall be in accordance with Section 6.

7.2 Wire used in the fabrication of conductor shall be of such dimensions as to produce a finished conductor having a nominal cross-sectional area and diameter as prescribed in Table 1.

7.3 Where compressed stranding is required in order to insulate the conductor properly, one or more layers of any stranded conductor consisting of seven wires or more may be slightly compressed, thereby reducing the outside diameter of the conductor by not more than 3 %, provided that the area of cross-section after compressing is in accordance with Section 15.

8. Mechanical and Electrical Tests of Conductors in 8000 Series Alloys in "0" Temper, H1X or H2X Wire and Not Annealed After Stranding

8.1 Tests for the mechanical and electrical properties of wire composing the conductor shall be made before, but not after stranding, unless otherwise agreed upon between the manufacturer and the purchaser as provided in 8.2 (Explanatory Note 4).

8.2 At the option of the purchaser, at the time of placing the order, tension and elongation tests of wire before stranding may be waived, and the completed conductor may be tested as a unit. The minimum breaking strength of conductors so tested shall be not less than the minimum rated strength of 8000 Series Aluminum Alloys "0" Temper or H1X and H2X conductors, whichever

TABLE 1 Construction Requirements for Aluminum Conductors in the 8000 Series Alloys

Conductor Size			Class	Number[A] of Wires	Nominal Conductor Diameter						Compact		Nominal Mass		Nominal d-c resistance[B] at 20°C	
					Conventional		Reverse Concentric Compressed		Unilay Compressed[C]							
Cmil	AWG	mm²			in.	mm	in.	mm	in.	mm.	in	mm	lbs/1000 ft	kg/km	Ω/1000 ft	Ω/km
1500000		760	B, A	91[D,E]	1.412	35.9	1.370	34.8	1.327	33.7	1.299	33.0	1406	2092	0.0116	0.0380
1250000		633	B, A	91[D,E]	1.289	32.7	1.250	31.8	1.212	30.8	1.184	30.1	1172	1744	0.0138	0.0453
1100000		557	B, A	91[D,E]	1.209	30.7	1.173	29.8	1.137	28.9	1.060	28.2	1031	1534	0.0158	0.0518
1000000		507	D	127	1.153	29.3	1.119	28.4			1.060	26.9	941	1400	0.0173	0.0568
1000000		507	C	91	1.153	29.3	1.118	28.4	1.084	27.5	1.060	26.9	941	1400	0.0173	0.0568
1000000		507	B, A	61	1.152	29.3	1.117	28.4			1.060	26.9	941	1400	0.0173	0.0568
900000		456	D	127	1.095	27.8	1.062	27.0			0.999	25.4	847	1260	0.0193	0.0633
900000		456	C	91	1.093	27.8	1.060	26.9	1.028	26.1	0.999	25.4	847	1260	0.0193	0.0633
900000		456	B, A	61	1.093	27.8	1.060	26.9			0.999	25.4	847	1260	0.0193	0.0633
800000		405	D	127	1.032	26.2	1.001	25.4			0.938	23.8	753	1120	0.0217	0.0712
800000		405	C	91	1.032	26.2	1.001	25.4	0.969	24.6	0.938	23.8	753	1120	0.0217	0.0712
800000		405	B, A	61	1.031	26.2	1.000	25.4			0.938	23.8	753	1120	0.0217	0.0712
750000		380	D	127	0.998	25.3	0.968	24.6			0.908	23.1	706	1050	0.0231	0.0758
750000		380	C	91	0.999	25.4	0.969	24.6	0.939	23.9	0.908	23.1	706	1050	0.0231	0.0758
750000		380	B, A	61	0.998	25.3	0.968	24.6			0.908	23.1	706	1050	0.0231	0.0758
700000		355	D	127	0.965	24.5	0.936	23.8			0.877	22.3	659	981	0.0248	0.0814
700000		355	C	91	0.965	24.5	0.936	23.8	0.907	23.0	0.877	22.3	659	981	0.0248	0.0814
700000		355	B, A	61	0.964	24.5	0.935	23.7			0.877	22.3	659	981	0.0248	0.0814
650000		329	D	127	0.930	23.6	0.902	22.9			0.845	21.5	612	911	0.0267	0.0876
650000		329	C	91	0.930	23.6	0.902	22.9	0.874	22.2	0.845	21.5	612	911	0.0267	0.0876
650000		329	B	61	0.929	23.6	0.901	22.9			0.845	21.5	612	911	0.0267	0.0876
650000		329	A	37	0.928	23.6	0.900	22.9			0.845	21.5	612	911	0.0267	0.0876
600000		304	D	127	0.893	22.7	0.866	22.0			0.813	20.7	565	841	0.0289	0.0948
600000		304	C	91	0.893	22.7	0.866	22.0	0.840	21.3	0.813	20.7	565	841	0.0289	0.0948
600000		304	B	61	0.893	22.7	0.866	22.0			0.813	20.7	565	841	0.0289	0.0948
600000		304	A	37	0.891	22.6	0.864	21.9			0.813	20.7	565	841	0.0289	0.0948
556500		282	D	127	0.861	21.9	0.835	21.2			0.780	19.8	524	780	0.0312	0.1024
556500		282	C	91	0.860	21.8	0.834	21.2			0.780	19.8	524	780	0.0312	0.1024
556500		282	B	61	0.860	21.8	0.834	21.2			0.780	19.8	524	780	0.0312	0.1024
556500		282	A	37	0.858	21.8	0.832	21.1			0.780	19.8	524	780	0.0312	0.1024
550000		279	D	127	0.855	21.7	0.829	21.1			0.775	19.7	518	771	0.0315	0.1034
550000		279	C	91	0.855	21.7	0.829	21.1			0.775	19.7	518	771	0.0315	0.1034
550000		279	B	61	0.855	21.7	0.829	21.1	0.804	20.4	0.775	19.7	518	771	0.0315	0.1034
550000		279	A	37	0.853	21.7	0.827	21.0			0.775	19.7	518	771	0.0315	0.1034
500000		253	D	91	0.815	20.7	0.791	20.1			0.736	18.7	471	701	0.0347	0.1139
500000		253	C	61	0.815	20.7	0.791	20.1	0.766	19.5	0.736	18.7	471	701	0.0347	0.1139
500000		253	B, A	37	0.813	20.7	0.789	20.0			0.736	18.7	471	701	0.0347	0.1139
477000		242	D	91	0.796	20.2	0.772	19.6			0.722	18.3	449	668	0.0364	0.1194
477000		242	C	61	0.796	20.2	0.772	19.6			0.722	18.3	449	668	0.0364	0.1194
477000		242	B, A	37	0.795	20.2	0.771	19.6			0.722	18.3	449	668	0.0364	0.1194
450000		228	D	91	0.773	19.6	0.750	19.0			0.700	17.8	424	631	0.0385	0.1263
450000		228	C	61	0.773	19.6	0.750	19.0	0.727	18.5	0.700	17.8	424	631	0.0385	0.1263
450000		228	B, A	37	0.772	19.6	0.749	19.0			0.700	17.8	424	631	0.0385	0.1263
400000		203	D	91	0.729	18.5	0.707	18.0			0.659	16.7	376	559	0.0434	0.1424
400000		203	C	61	0.729	18.5	0.707	18.0	0.685	17.4	0.659	16.7	376	559	0.0434	0.1424
400000		203	B, A	37	0.728	18.5	0.706	17.9			0.659	16.7	376	559	0.0434	0.1424
397500		201	D	91	0.727	18.5	0.705	17.9			0.659	16.7	374	557	0.0436	0.1431
397500		201	C	61	0.726	18.4	0.704	17.9			0.659	16.7	374	557	0.0436	0.1431
397500		201	B	37	0.725	18.4	0.703	17.9			0.659	16.7	374	557	0.0436	0.1431
397500		201	A	19	0.724	18.4	0.702	17.8			0.659	16.7	374	557	0.0436	0.1431
350000		177	D	91	0.682	17.3	0.661	16.8			0.616	15.6	329	490	0.0495	0.1624
350000		177	C	61	0.681	17.3	0.661	16.8	0.641	16.3	0.616	15.6	329	490	0.0495	0.1624
350000		177	B	37	0.681	17.3	0.661	16.8			0.616	15.6	329	490	0.0495	0.1624
350000		177	A	19	0.679	17.2	0.659	16.7			0.616	15.6	329	490	0.0495	0.1624
336400		170	C	61	0.669	17.0	0.649	16.5			0.603	15.3	317	472	0.0516	0.1693
336400		170	B	37	0.668	17.0	0.648	16.5			0.603	15.3	317	472	0.0516	0.1693
~~336400~~		~~170~~	~~A~~	~~19~~	~~0.666~~	~~16.9~~	~~0.646~~	~~16.4~~			~~0.603~~	~~15.3~~	~~317~~	~~472~~	~~0.0516~~	~~0.1693~~
336400		170	A	19	0.666	16.9	0.646	16.4			0.603	15.3	317	472	0.0516	0.1693
~~300000~~		~~152~~	~~C~~	~~61~~	~~0.631~~	~~16.0~~	~~0.612~~	~~15.5~~			~~0.570~~	~~14.5~~	~~282~~	~~420~~	~~0.0578~~	~~0.1896~~
300000		152	C	61	0.631	16.0	0.612	15.5			0.570	14.5	282	420	0.0578	0.1896
~~300000~~		~~152~~	~~B~~	~~37~~	~~0.630~~	~~16.0~~	~~0.611~~	~~15.5~~	~~0.594~~	~~15.1~~	~~0.570~~	~~14.5~~	~~282~~	~~420~~	~~0.0578~~	~~0.1896~~
300000		152	B	37	0.630	16.0	0.611	15.5	0.594	15.1	0.570	14.5	282	420	0.0578	0.1896
~~300000~~		~~152~~	~~A~~	~~19~~	~~0.629~~	~~16.0~~	~~0.610~~	~~15.5~~			~~0.576~~	~~14.5~~	~~282~~	~~420~~	~~0.0578~~	~~0.1896~~
300000		152	A	19	0.629	16.0	0.610	15.5			0.576	14.5	282	420	0.0578	0.1896
~~266800~~		~~135~~	~~C~~	~~61~~	~~0.595~~	~~15.1~~	~~0.577~~	~~14.7~~			~~0.537~~	~~13.6~~	~~251~~	~~373~~	~~0.0650~~	~~0.2133~~
266800		135	C	61	0.595	15.1	0.577	14.7			0.537	13.6	251	373	0.0650	0.2133
~~266800~~		~~135~~	~~B~~	~~37~~	~~0.594~~	~~15.1~~	~~0.576~~	~~14.6~~			~~0.537~~	~~13.6~~	~~251~~	~~373~~	~~0.0650~~	~~0.2133~~
266800		135	B	37	0.594	15.1	0.576	14.6			0.537	13.6	251	373	0.0650	0.2133
~~266800~~		~~135~~	~~A~~	~~19~~	~~0.593~~	~~15.0~~	~~0.575~~	~~14.6~~			~~0.537~~	~~13.6~~	~~251~~	~~373~~	~~0.0650~~	~~0.2133~~

TABLE 1 *Continued*

Conductor Size			Class	Number[A] of Wires	Nominal Conductor Diameter						Compact		Nominal Mass		Nominal d-c resistance[B] at 20°C	
					Conventional		Reverse Concentric Compressed		Unilay Compressed[C]							
Cmil	AWG	mm^2			in.	mm	in.	mm	in.	mm.	in	mm	lbs/1000 ft	kg/km	Ω/1000 ft	Ω/km
266800		135	A	19	0.593	15.0	0.575	14.6			0.537	13.6	251	373	0.0650	0.2133
250000		127	C	61	0.576	14.6	0.559	14.2			0.520	13.2	235	350	0.0694	0.2277
250000		127	B	37	0.575	14.6	0.558	14.2	0.542	13.8	0.520	13.2	235	350	0.0694	0.2277
250000		127	B	37	0.575	14.6	0.558	14.2	0.542	13.8	0.520	13.2	235	350	0.0694	0.2277
250000		127	A	19	0.574	14.6	0.557	14.1			0.520	13.2	235	350	0.0694	0.2277
211600	0000	107	C	37	0.529	13.4	0.513	13.0			0.475	12.1	199	296	0.0820	0.2690
211600	0000	107	C	37	0.529	13.4	0.513	13.0			0.475	12.1	199	296	0.0820	0.2690
211600	0000	107	B	19	0.528	13.4	0.512	13.0	0.498	12.6	0.475	12.1	199	296	0.0820	0.2690
211600	0000	107	B	19	0.528	13.4	0.512	13.0	0.498	12.6	0.475	12.1	199	296	0.0820	0.2690
211600	0000	107	A	7	0.522	13.3	0.506	13.0			0.475	12.1	199	296	0.0820	0.2690
167800	000	85.0	C	37	0.471	12.0	0.457	11.6			0.423	10.7	158	235	0.1033	0.3389
167800	000	85.0	B	19	0.470	11.9	0.456	11.6	0.443	11.3	0.423	10.7	158	235	0.1033	0.3389
167800	000	85.0	B	19	0.470	11.9	0.456	11.6	0.443	11.3	0.423	10.7	158	235	0.1033	0.3389
167800	000	85.0	A	7	0.464	11.8	0.450	11.4			0.423	10.7	158	235	0.1033	0.3389
133100	00	67.4	B	19	0.419	10.6	0.406	10.3	0.395	10.0	0.376	9.55	125	186	0.1303	0.4275
133100	00	67.4	A	7	0.414	10.5	0.402	10.2			0.376	9.55	125	186	0.1303	0.4275
105600	0	53.5	B	19	0.373	9.46	0.362	9.19			0.336	8.53	99.4	148	0.1642	0.5387
105600	0	53.5	A	7	0.368	9.36	0.357	9.07	0.352	8.94	0.336	8.53	99.4	148	0.1642	0.5387
105600	0	53.5	A	7	0.368	9.36	0.357	9.07	0.352	8.94	0.336	8.53	99.4	148	0.1642	0.5387
83690	1	42.4	B	19	0.332	8.43	0.322	8.18	0.313	7.95	0.299	7.59	78.8	117	0.2072	0.6798
66360	2	33.6	B, A	7	0.292	7.42	0.283	7.19			0.268	6.81	62.5	93.0	0.2613	0.8573
52620	3	26.7	B, A	7	0.260	6.61	0.252	6.41			0.238	6.05	49.5	73.7	0.3296	1.0814
41740	4	21.2	B, A	7	0.232	5.88	0.225	5.72			0.213	5.41	39.3	58.5	0.4155	1.3633
26240	6	13.3	B, A	7	0.184	4.66	0.178	4.53			0.169	4.29	24.7	36.8	0.6609	2.1684
16510	8	8.37	B, A	7	0.146	3.70	0.142	3.60			0.134	3.40	15.5	23.1	1.0504	3.4464

[A] For compact-stranded constructions, the number of wires may be reduced as follows:
19-Wire Constructions—18 Wires Minimum
37-Wire Constructions—35 Wires Minimum
61-Wire Constructions—58 Wires Minimum
91-Wire Constructions—87 Wires Minimum
127-Wire Constructions—122 Wires Minimum

[B] Nominal d-c resistance is based on 61.0 % IACS conductivity (17.002 Ω/cmil/ft).
See Explanatory Note 3.

[C] The diameters listed in the Unilay Compressed column correspond to Class B conductor constructions.

[D] For 91-Wire Class B Constructions of 1100, 1250 and 1500 kcmil, as agreed upon between the manufacturer and the customer, these sizes may be produced with a 61 wire constructions of the appropriate wire size.

[E] For 91-Wire Compact Constructions of 1100, 1250 and 1500 kcmil, as agreed upon between the manufacturer and the customer, these sizes may be produced with a 61 to 58 wire constructions of the appropriate wire size.

is applicable. The minimum breaking strength of bare conductors shall be not less than minimum rated strength if failure occurs in the free length at least 1 in. (25 mm) beyond the end of either gripping device, or shall be not less than 95 % of the minimum rated strength if failure occurs inside, or within 1 in. of the end of either gripping device. The maximum breaking strength of 8000 Series Aluminum Alloys "0" Temper or H1X and H2X conductors, whichever is applicable, shall be not greater than their maximum rated strengths. The free length between grips of the test specimen shall be not less than 24 in. (600 mm) and care shall be taken to ensure that the wires in the conductor are evenly gripped during the test (Section 13 and Explanatory Note 5).

9. Mechanical and Electrical Tests of Conductors Fabricated from Wires Other Than 8000-H2X and Annealed After Stranding to Meet 8000 "0" Temper or H2X Requirements

9.1 At the option of the manufacturer, mechanical and electrical tests may be performed in accordance with either paragraph 9.1.1 or 9.1.2.

9.1.1 The completed conductor shall be tested as a unit. The minimum breaking strength of bare conductors shall be not less than minimum rated strength if failure occurs in the free length at least 1 in. (25 mm) beyond the end of either gripping device, or shall be not less than 95 % of the minimum rated strength if failure occurs inside, or within 1 in. of the end of either gripping device. The maximum breaking strength of 8000 "0" Temper, or H2X conductors shall be not greater than their maximum rated