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Standard Specification for Compact Round Concentric-Lay-Stranded Aluminum Conductors, Steel-Reinforced (ACSR/COMP)[1]

This standard is issued under the fixed designation B401; 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 compact round concentric-lay-stranded conductors made from aluminum 1350-H19 (extra hard) wires and round zinc-coated, aluminum-coated, or aluminum-clad steel core wires usually used in overhead lines. These conductors shall be constructed with one steel core wire surrounded by one or more layers of helically-laid compacted or otherwise shaped aluminum wires (Explanatory Note 1 and Note 2).

1.2 Compact ACSR covered by this specification has five types of steel core wire which are designated by abbreviations as follows (Explanatory Note 2).

1.2.1 *ACSR/GA/COMP*—Compact ACSR using Class A zinc-coated steel wire,

1.2.2 *ACSR/GB/COMP*—Compact ACSR using Class B zinc-coated steel wire,

1.2.3 *ACSR/GC/COMP*—Compact ACSR using Class C zinc-coated steel wire,

1.2.4 *ACSR/AZ/COMP*—Compact ACSR using aluminum-coated (aluminized) steel wire, and

1.2.5 *ACSR/AW/COMP*—Compact ACSR using aluminum-clad steel wire.

1.3 The SI values of density and resistivity are to be regarded as standard. For all other properties the inch-pound values are to be regarded as standard and the SI units may be approximate.

NOTE 1—Prior to 1975, aluminum 1350 was designated 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 E527.

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

B230/B230M Specification for Aluminum 1350–H19 Wire for Electrical Purposes

B232/B232M Specification for Concentric-Lay-Stranded Aluminum Conductors, Coated-Steel Reinforced (ACSR)

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

B341/B341M Specification for Aluminum-Coated (Aluminized) Steel Core Wire for Aluminum Conductors, Steel Reinforced (ACSR/AZ) (Withdrawn 2007)[3]

B354 Terminology Relating to Uninsulated Metallic Electrical Conductors

B498/B498M Specification for Zinc-Coated (Galvanized) Steel Core Wire for Use in Overhead Electrical Conductors

B502 Specification for Aluminum-Clad Steel Core Wire for Use in Overhead Electrical Aluminum Conductors

B802M Specification for Zinc-5% Aluminum-Mischmetal Alloy-Coated Steel Core Wire for Aluminum Conductors, Steel Reinforced (ACSR)[Metric](Discontinued 1998-Replaced by B 802/B802M) (Withdrawn 1998)[3]

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

E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

2.3 *Other Documents*:

ANSI H35.1, American National Standard Alloy and Temper Designation Systems For Aluminum[4]

NBS *Handbook 100—Copper Wire Tables of the National Bureau of Standards*[5]

[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] The last approved version of this historical standard is referenced on www.astm.org.

[4] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

[5] Available from National Technical Information Service (NTIS), U.S. Department of Commerce, 5285 Port Royal Rd., Springfield, VA 22161.

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3. Ordering Information

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

3.1.1 Quantity of each size and stranding (Table 1),

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

3.1.3 Steel wire coating or aluminum-clad (see 11.3),

3.1.4 Special tension test, if required (see 15.3),

3.1.5 Place of inspection (Section 16), and

3.1.6 Packaging and Package Marking (Section 17).

4. Joints

4.1 Electric-butt welds, electric-butt, cold-upset welds, or cold-pressure welds in the individual round-drawn or shaped aluminum wires may be made during the stranding process. No weld shall occur within 50 ft (15 m) of a weld in the same wire or in any other wire of the completed conductor.

4.2 There shall be no joints of any kind made in the finished coated, or aluminum-clad steel wires.

5. Lay

5.1 The preferred lay of the aluminum wires of aluminum conductors, steel-reinforced, having a single wire steel core and one layer of aluminum wires is 14 times the outside diameter of the conductor but the lay shall be not less than 13 nor more than 16 times that diameter.

5.2 The preferred lay of the outside layer of aluminum wires of aluminum conductors, steel-reinforced, having multiple layers of aluminum wires is 12 times the outside diameter of the conductor but the lay shall be not less than 11 nor more than 14 times that diameter.

5.3 The preferred lay of the layer immediately beneath the outside layer of aluminum wires of aluminum conductors, steel-reinforced, having multiple layers of aluminum wires is 14 times the outside diameter of such layer but the lay shall be not less than 11 nor more than 17.5 times that diameter.

5.4 The direction of lay of the outside layer of aluminum wires shall be right hand.

5.5 The direction of lay shall be reversed in successive layers.

6. Construction

6.1 The diameter of the steel core wire, the number of aluminum wires, the aluminum cross-sectional area, the diameter and weight of the compact round concentric-lay-stranded aluminum conductors, steel-reinforced, shall be as shown in Table 1.

7. Rated Strength of Conductor

7.1 The rated strength of a completed conductor shall be taken as the aggregate strength of the aluminum and steel components, calculated as follows: The strength contribution of the aluminum wires shall be taken as the percentage, according to the number of layers of aluminum wires, indicated in Table 2, of the sum of the strengths of the 1350-H19 wires, calculated on the basis of the nominal wire diameter for the corresponding noncompacted construction given in Specification B232/B232M and the appropriate specified minimum average tensile strength given in Specification B230/B230M. The strength contribution of the steel core shall be taken as 96 % of the strength of the steel wire calculated from its specified nominal diameter and the appropriate specified minimum stress at 1 % extension given in Specification B341/B341M, B498/B498M, B502, or B802M, whichever is applicable.

7.2 Rated strength and breaking strength values shall be rounded to three significant figures, in the final value only, in accordance with Practice E29.

7.3 Rated strength of conductors are given in Table 3.

8. Density

8.1 For the purpose of calculating mass, mass per unit length, cross sections, and so forth, the density of aluminum 1350 shall be taken as 2705 kg/m^3 (0.0975 lb/in.^{3}) at 20°C.

8.2 For the purpose of calculating mass, mass per unit length, cross sections, and so forth, the density of coated steel wire shall be taken as 7780 kg/m^3 (0.281 lb/in. ^{3}) at 20°C.

TABLE 1 Construction Requirements for Compact Round Concentric-Lay-Stranded Aluminum Conductors, Steel Reinforced

Required Construction								Nominal Mass for Conductors With:			
Conductor Size (Aluminum Wires)			Number of Aluminum Wires	Steel Wire Diameter		Compact Conductor Diameter		Coated Steel Core Wire		Aluminum-Clad Steel Core Wire	
cmil	mm^2	AWG		in.	mm	in.	mm	lb/1000 ft	kg/km	lb/1000 ft	kg/km
336 400	170.2	...	18	0.1367	3.47	0.628	15.95	364.8	543.3	357.2	531.1
266 800	135.0	...	18	0.1217	3.09	0.559	14.20	289.1	430.8	283.1	421.1
211 600	107.2	0000	6	0.1878	4.77	0.517	13.13	290.8	433.4	276.5	412.1
167 800	85.1	000	6	0.1672	4.25	0.461	11.71	230.5	343.9.0	219.2	327.1
133 100	67.3	00	6	0.1489	3.78	0.410	10.41	182.8	272.3	173.8	258.9
105 600	53.5	0	6	0.1327	3.37	0.365	9.27	145.2	216.4	138.1	205.8
83 690	42.4	1	6	0.1181	3.00	0.326	8.28	115.0	171.4	109.4	163.0
66 360	33.6	2	7	0.1299	3.30	0.298	7.57	106.6	158.6	99.8	148.4
66 360	33.6	2	6	0.1052	2.67	0.290	7.37	91.2	135.9	86.8	129.2
52 620	26.7	3	6	0.0937	2.38	0.258	6.55	72.4	107.9	68.8	102.6
41 740	21.1	4	7	0.1029	2.61	0.236	5.99	67.0	99.7	62.7	93.4
41 740	21.2	4	6	0.0834	2.12	0.229	5.82	57.3	85.6	54.5	81.4
26 240	13.3	6	6	0.0661	1.68	0.182	4.62	36.0	53.7	...	...

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