Designation: B 701/B 701M – 00

Standard Specification for Concentric-Lay-Stranded Self-Damping Aluminum Conductors, Steel Reinforced (ACSR/SD)[1]

This standard is issued under the fixed designation B 701/B 701M; 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 concentric-lay-stranded self-damping aluminum conductor, steel-reinforced (ACSR/SD) and its component wires for use as overhead electrical conductors (Explanatory Note 1 and Note 2).

1.2 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 non-conformance 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.

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

NOTE 1—ACSR/SD is designed to control aeolian vibration by integral damping. The conductors consist of a central core of a round steel wire or wires surrounded by two layers of trapezoidal aluminum 1350-H19 wires or two layers of trapezoidal aluminum 1350-H19 wires and one layer of round aluminum 1350-H19 wires (Fig. 1). The trapezoidal-wire layers are separated from each other and from the steel core by two small annular gaps that provide the conductors self-damping characteristics. The round aluminum wires are in tight layer contact between themselves and the underlying trapezoidal wire layer. Different strandings of the same size of conductor are identified by type, which is the approximate ratio of steel area to aluminum area, expressed in percent (Table 1 and Table 2).

NOTE 2—The aluminum and temper designations conform to ANSI Standard H 35.1. Aluminum 1350 corresponds to UNS A91350 in accordance with Practice E 527.

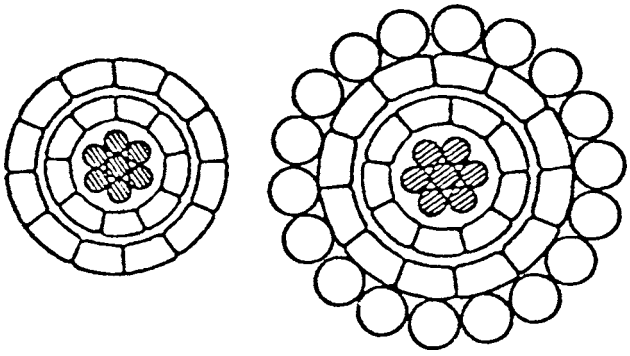

FIG. 1 Illustrations of Typical ACSR/SD Strandings

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:*

B 230/B 230M Specification for Aluminum 1350-H19 Wire for Electrical Purposes[2]

B 232/B 232M Specification for Concentric-Lay-Stranded Aluminum Conductors, Coated Steel-Reinforced (ACSR)[2]

B 263 Test Method for Determination of Cross-Sectional Area of Stranded Conductors[2]

B 341/B 341M Specification for Aluminum-Coated (Aluminized) Steel Core Wire for Aluminum Conductors, Steel Reinforced (ACSR/AZ)[2]

B 354 Terminology Relating to Uninsulated Metallic Electrical Conductors[2]

B 498/B 498M Specification for Zinc-Coated (Galvanized) Steel Core Wire for Aluminum Conductors, Steel Reinforced (ACSR)[2]

B 502 Specification for Aluminum-Clad Steel Core Wire for Aluminum Conductors, Aluminum-Clad Steel Reinforced[2]

B 549 Specification for Concentric-Lay-Stranded Aluminum Conductors, Aluminum-Clad Steel Reinforced (ACSR/AW)[2]

B 606 Specification for High-Strength Zinc-Coated (Galvanized) Steel Core Wire for Aluminum and Aluminum Alloy Conductors, Steel Reinforced[2]

B 802/B 802M Specification for Zinc-5 % Aluminum-Mischmetal Alloy-Coated Steel Core Wire for Aluminum Conductors, Steel Reinforced (ACSR)[2]

[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] *Annual Book of ASTM Standards*, Vol 02.03.

B 803 Specification for High-Strength Zinc-5 % Aluminum-Mischmetal Alloy-Coated Steel Core Wire for Aluminum and Aluminum-Alloy Conductors, Steel Reinforced[2]

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications[3]

E 527 Practice for Numbering Metals and Alloys (UNS)[4]

2.3 *ANSI Documents:*

ANSI H35.1 American National Standard Alloy and Temper Designation Systems for Aluminum[5]

2.4 *NIST Documents:*

NBS Handbook 100 —*Copper Wire Tables of the National Bureau of Standards*[6]

2.5 *Aluminum Association Documents:*

Publication 50, Code Words for Overhead Aluminum Electrical Conductors[7]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 ACSR/SD covered by this specification has five types of coated core wire and one type of aluminum-clad core wire which are designated by abbreviations as follows (Explanatory Note 2):

3.1.1.1 *ACSR/SD/AW*—ACSR/SD using aluminum-clad steel wire (Specification B 502).

3.1.1.2 *ACSR/SD/AZ*—ACSR/SD using aluminum-coated (aluminized) steel wire (Specification B 341/B 341M).

3.1.1.3 *ACSR/SD/GA*—ACSR/SD using Class A zinc-coated steel wire (Specification B 498/B 498M).

3.1.1.4 *ACSR/SD/GB*—ACSR/SD using Class B zinc-coated steel wire (Specification B 498/B 498M).

3.1.1.5 *ACSR/SD/GC*—ACSR/SD using Class C zinc-coated steel wire (Specification B 498/B 498M).

3.1.1.6 *ACSR/SD/HS*—ACSR/SD using extra highstrength steel wire (Specification B 606).

3.1.1.7 *ACSR/SD/MA*—ACSR/SD using Class A zinc-5 % aluminum-mischmetal alloy-coated steel core wire (Specification B 802/B 802M).

3.1.1.8 *ACSR/SD/MB*—ACSR/SD using Class B zinc-5 % aluminum-mischmetal alloy-coated steel core wire (Specification B 802/B 802M).

3.1.1.9 *ACSR/SD/MC*—ACSR/SD using Class V zinc-5 % aluminum-mischmetal alloy-coated steel core wire (Specification B 802/B 802M).

3.1.1.10 *ACSR/SD/MS*—ACSR/SD using high-strength zinc-5 % Aluminum-mischmetal alloy-coated steel core wire (Specification B 803).

4. Ordering Information

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

4.1.1 Quantity of each size and type (Note 1),

4.1.2 Conductor size: kcmil area,

4.1.3 Conductor type and number of wires, aluminum and steel (Table 1),

4.1.4 Type of steel core wire and if zinc or Zn-5 % Al-MM alloy coated, area density (Classes A, B, and C) of coating (see 5.2),

4.1.5 Special tension test, if required (see 9.2),

4.1.6 Place of inspection (Section 15),

4.1.7 Package size (see 16.1),

4.1.8 Special package marking, if required (Section 17), and

4.1.9 Heavy wood lagging, if required (see 16.3).

5. Requirement For Wires

5.1 Before stranding, the round and trapezoidal aluminum wires shall conform to the requirements of Specification B 230 except for shape and diameter tolerance of the trapezoidal wires. The tensile strength and elongation requirements of trapezoidal wires shall be the same as for round wires of equal area. The area tolerances shall be such that the finished conductor conforms to Section 12.

5.2 Before stranding, the steel core wire shall meet the requirements of Specifications B 341/B 341M, B 498/B 498M, B 502, B 606, B 802/B 802M, or B 803, whichever is applicable.

6. Joints

6.1 Electric-butt welds, electric-butt, cold-upset welds, or cold-pressure welds may be made in the individual aluminum wires during the stranding process. No weld shall occur within 50 ft. (15 m) of any other weld in the completed conductor (Explanatory Note 2).

6.2 There shall be no joints made in the finished steel wires.

7. Lay

7.1 The nominal lay factors for the trapezoidal aluminum wires are shown in Table 1 (Explanatory Note 1).

7.2 The lay factor for the round aluminum wires shall be not less than 10 nor more than 13.

7.3 The lay factor for the 6-wire layer of 7 and 19-wire steel cores shall be not less than 18 nor more than 30.

7.4 The lay factor for the 12-wire layer of 19-wire steel cores shall be no less than 16 nor more than 24.

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

7.6 The direction of lay of the aluminum and steel wires shall be reversed in successive layers.

7.7 For the purpose of this specification the lay factor is the length of lay of a given layer divided by its outside diameter.

8. Construction

8.1 The nominal aluminum cross-sectional area, type, stranding, and equivalent wire diameters shall be as shown in Table 1 (Explanatory Note 1).

8.2 The smaller sizes of ACSR/SD consist of a steel core, an inner gap surrounded by a layer of trapezoidal aluminum wires (called the inner layer), and an outer gap surrounded by a second layer of trapezoidal aluminum wire (called the outer layer). The larger sizes of ACSR/SD consist of a steel core, an

[3] *Annual Book of ASTM Standards*, Vol 14.02.

[4] *Annual Book of ASTM Standards*, Vol 01.01.

[5] Available from American National Standards Institute, 11 West 42nd St., 13th Floor, New York, NY 10036.

[6] Available from National Institute of Standards and Technology (NIST), Gaithersburg, MD 20899.

[7] Available from Aluminum Association Inc., 900 19th Street, NW, Suite 300, Washington, DC 20006.

inner gap surrounded by a layer of trapezoidal aluminum wires (called the inner layer), an outer gap surrounded by a layer of trapezoidal aluminum wires (called the middle layer), and one of round aluminum wires (called the outer layer) fitting tightly over the middle layer. The diameter and number of steel core wires, the number and equivalent round wire diameters of the trapezoidal aluminum wires, and the number and diameter of the round aluminum wires shall be as shown in Table 1.

8.3 All conductor gaps shall be measured radially. The nominal thickness of the gap is 0.030 in. (0.75 mm). The tolerance of both the inner and outer gaps shall be plus 0.000 in. (0.00 mm) and minus 0.010 in. (0.25 mm).

TABLE 1 Construction Requirements of Aluminum Conductors, Self Damping, Concentric-Lay-Stranded, Steel-Reinforced

Conductor Size		Stranding Number of Wires and Diameter, in.[A]				Nominal Aluminum Lay Factor	Mass per 1000 ft, lb	Rated Strength, kip[A,B]	Nominal Outside Diameter, in.
			Aluminum		Steel[C]				
kcmil	Type[D]	Code Word[E]	Round	Trapezoidal[F]	Round				
2156	8	Bluebird		10 × 0.2179	19 × 0.0961	14.5	2504	60.7	1.716
				15 × 0.2184		12.1			
			21 × 0.2145			11.0			
1780	8	Chukar		9 × 0.2041	19 × 0.0874	14.5	2068	51.1	1.565
				13 × 0.2150		12.0			
			21 × 0.1957			11.0			
1780	5	Smew		8 × 0.2171	7 × 0.1144	16.0	1921	43.6	1.531
				14 × 0.2128		12.5			
			21 × 0.1914			11.5			
1590	13	Falcon		10 × 0.1891	19 × 0.1030	13.5	2039	55.1	1.521
				14 × 0.1977		11.7			
			24 × 0.1690			11.5			
1590	7	Lapwing		8 × 0.2059	7 × 0.1253	15.9	1791	42.6	1.468
				12 × 0.2130		12.8			
			21 × 0.1835			11.5			
1590	5	Ratite		8 × 0.2095	7 × 0.1083	15.4	1715	39.1	1.447
				13 × 0.2143		12.5			
			23 × 0.1669			11.5			
1431	13	Plover		10 × 0.1792	19 × 0.0977	13.5	1835	49.6	1.448
				14 × 0.1868		11.7			
			24 × 0.1609			11.5			
1431	7	Bobolink		8 × 0.1946	7 × 0.1189	15.1	1612	38.9	1.398
				12 × 0.2015		12.2			
			21 × 0.1747			11.5			
1431	5	Popinjay		8 × 0.1936	7 × 0.1025	16.0	1544	35.3	1.381
				13 × 0.1972		12.5			
			21 × 0.1726			11.5			
1351.5	13	Martin		11 × 0.1604	19 × 0.0949	14.7	1733	46.8	1.417
				15 × 0.1652		12.8			
			21 × 0.1772			11.5			
1351.5	10	Frigate		9 × 0.1786	7 × 0.1377	14.5	1629	41.7	1.389
				14 × 0.1757		12.2			
			21 × 0.1735			11.0			
1351.5	7	Dipper		8 × 0.1890	7 × 0.1155	15.2	1522	36.7	1.361
				12 × 0.1954		12.2			
			21 × 0.1701			11.0			
1351.5	5	Ringdove		8 × 0.1946	7 × 0.0997	16.0	1458	33.4	1.344
				12 × 0.1949		12.8			
			21 × 0.1680			11.5			
1272	13	Pheasant		11 × 0.1552	19 × 0.0921	14.7	1631	44.1	1.378
				15 × 0.1599		12.8			
			21 × 0.1723			11.5			
1272	7	Bittern		8 × 0.1829	7 × 0.1121	14.5	1433	34.6	1.323
				12 × 0.1894		12.3			
			21 × 0.1653			11.5			
1272	5	Scissortail		7 × 0.1929	7 × 0.0967	15.7	1372	31.4	1.305
				11 × 0.2029		12.3			
			21 × 0.1631			11.5			
1192.5	13	Grackle		10 × 0.2147	19 × 0.0892	14.2	1526	41.9	1.274
				16 × 0.2138		11.5			
1192.5	7	Bunting		8 × 0.1768	7 × 0.1085	15.1	1343	32.4	1.284
				12 × 0.1831		12.2			
			21 × 0.1604			11.5			
1192.5	5	Oxbird		7 × 0.1868	7 × 0.0936	15.7	1286	29.5	1.266
				11 × 0.1960		12.3			
			21 × 0.1582			11.5			
1113	13	Finch		9 × 0.2188	19 × 0.0862	14.2	1424	39.1	1.233
				15 × 0.2133		11.5			
1113	7	Bluejay		8 × 0.1705	7 × 0.1049	15.9	1254	30.3	1.242
				12 × 0.1765		12.8			
			21 × 0.1553			11.5			