



Designation: B701/B701M – 06

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

This standard is issued under the fixed designation B701/B701M; 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 [Notes 1 and 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 [E527](#).

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

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. 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

[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](#)

[B549 Specification for Concentric-Lay-Stranded Aluminum Conductors, Aluminum-Clad Steel Reinforced for Use in Overhead Electrical Conductors](#)

[B606 Specification for High-Strength Zinc-Coated \(Galvanized\) Steel Core Wire for Aluminum and Aluminum-Alloy Conductors, Steel Reinforced](#)

[B802/B802M Specification for Zinc–5 % Aluminum-Mischmetal Alloy-Coated Steel Core Wire for Aluminum Conductors, Steel Reinforced \(ACSR\)](#)

[B803 Specification for High-Strength Zinc–5 % Aluminum-Mischmetal Alloy-Coated Steel Core Wire for Use in Overhead Electrical Conductors](#)

[E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications](#)

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.

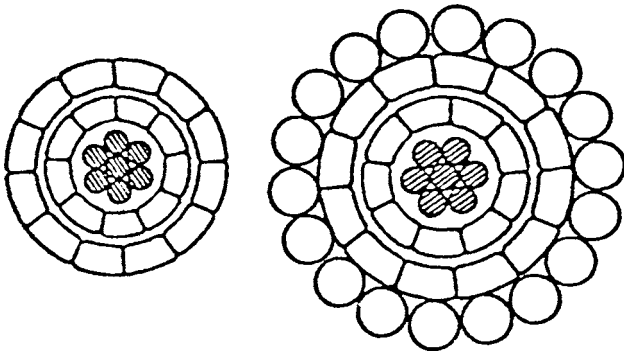


FIG. 1 Illustrations of Typical ACSR/SD Strandings

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

2.3 *ANSI Documents:*⁴

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

2.4 *NIST Documents:*⁵

NBS Handbook 100—Copper Wire Tables of the National Bureau of Standards

2.5 *Aluminum Association Documents:*⁶

Publication 50, Code Words for Overhead Aluminum Electrical Conductors

3. Terminology

3.1 *Abbreviations:*

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):

3.1.2 ACSR/SD/AW—ACSR/SD using aluminum-clad steel wire (Specification B502).

3.1.3 ACSR/SD/AZ—ACSR/SD using aluminum-coated (aluminized) steel wire (Specification B341/B341M).

3.1.4 ACSR/SD/GA—ACSR/SD using Class A zinc-coated steel wire (Specification B498/B498M).

3.1.5 ACSR/SD/GB—ACSR/SD using Class B zinc-coated steel wire (Specification B498/B498M).

3.1.6 ACSR/SD/GC—ACSR/SD using Class C zinc-coated steel wire (Specification B498/B498M).

3.1.7 ACSR/SD/HS—ACSR/SD using extra highstrength steel wire (Specification B606).

3.1.8 ACSR/SD/MA—ACSR/SD using Class A zinc-5 % aluminum-mischmetal alloy-coated steel core wire (Specification B802/B802M).

3.1.9 ACSR/SD/MB—ACSR/SD using Class B zinc-5 % aluminum-mischmetal alloy-coated steel core wire (Specification B802/B802M).

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

⁵ Available from National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 3460, Gaithersburg, MD 20899-3460.

⁶ Available from Aluminum Association Inc., 900 19th Street, NW, Suite 300, Washington, DC 20006.

3.1.10 ACSR/SD/MC—ACSR/SD using Class V zinc-5 % aluminum-mischmetal alloy-coated steel core wire (Specification B802/B802M).

3.1.11 ACSR/SD/MS—ACSR/SD using high-strength zinc-5 % Aluminum-mischmetal alloy-coated steel core wire (Specification B803).

3.2 For definitions of terms relating to conductors, refer to Terminology Standard B354.

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 B230/B230M 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 B341/B341M, B498/B498M, B502, B606, B802/B802M, or B803, 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 3).

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 and Note 4).

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 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 a layer 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			