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## Standard Specification for Shaped Wire Compact Concentric-Lay-Stranded Aluminum Conductors, Steel-Reinforced (ACSR/TW)<sup>1</sup>

This standard is issued under the fixed designation B779; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This specification covers shaped wire compact concentric-lay-stranded aluminum conductor, steel-reinforced (ACSR/TW) and its component wires for use as overhead electrical conductors (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.

NOTE 1—ACSR/TW is designed to increase the aluminum area for a given diameter of conductor by the use of trapezoidally shaped wires (TW). The conductors consist of a central core of round steel wire(s) surrounded by two or more layers of trapezoidal aluminum 1350-H19 wires. 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](#), [Table 2](#) and [Table 3](#)). For the purpose of this specification, the sizes listed in [Table 1](#) and [Table 2](#) are tabulated on the basis of the finished conductor having an area or outside diameter equal to that of specific sizes of standard ACSR so as to facilitate conductor selection.

NOTE 2—The aluminum and temper designations conform to ANSI Standard H 35.1. Aluminum 1350 corresponds to Unified Numbering System (UNS) A91350 in accordance with Practice [E527](#).

### 2. Referenced Documents

#### 2.1 ASTM Standards:<sup>2</sup>

[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Specification for Aluminum-Coated (Aluminized) Steel Core Wire for Aluminum Conductors, Steel Reinforced (ACSR/AZ) (Withdrawn 2007)<sup>3</sup>

[B354](#) Terminology Relating to Uninsulated Metallic Electrical Conductors

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

[B500/B500M](#) Specification for Metallic Coated or Aluminum Clad Stranded Steel Core 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

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

<sup>1</sup> 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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<sup>2</sup> 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 for Shaped Wire Compact Concentric-Lay-Stranded Aluminum Conductors, Coated Steel Reinforced Size to Have Area Equal to ACSR, Class AA**

ACSR/TW Conductor Size		Size and Stranding of ACSR with Equal Area		Number of Aluminum Wires	Number of Layers	Steel Core Stranding		Mass per Unit Length, <sup>A</sup> lb/1000 ft	Rated Strength, 1000 lb <sup>B</sup>	Nominal Outside Diameter, in.
kcmil	Type	kcmil	Stranding			Number of Wires	Diameter, in.			
336.4	6	336.4	18/1	14	2	1	0.1367	365	8.6	0.63
477.0	13	477.0	24/7	18	2	7	0.0940	613	17.2	0.78
477.0	16	477.0	26/7	18	2	7	0.1053	655	19.4	0.79
556.5	13	556.5	24/7	18	2	7	0.1015	715	20.0	0.84
556.5	16	556.5	26/7	20	2	7	0.1138	765	22.6	0.85
636.0	3	636.0	36/1	27	3	1	0.1329	646	13.5	0.85
636.0	13	636.0	24/7	18	2	7	0.1085	816	22.9	0.89
636.0	16	636.0	26/7	20	2	7	0.1216	874	25.4	0.91
795.0	7	795.0	45/7	17	2	7	0.0886	892	21.0	0.96
795.0	10	795.0	22/7	18	2	7	0.1108	975	25.9	0.98
795.0	13	795.0	54/7	20	2	7	0.1213	1021	28.2	0.99
795.0	16	795.0	26/7	20	2	7	0.1360	1092	31.8	1.01
954.0	5	954.0	42/7	30	3	7	0.0837	1029	23.7	1.05
954.0	7	954.0	45/7	32	3	7	0.0971	1075	25.9	1.06
954.0	13	954.0	54/7	20	2	7	0.1329	1226	33.5	1.08
1033.5	5	1033.5	42/7	30	3	7	0.0871	1115	25.7	1.09
1033.5	7	1033.5	45/7	32	3	7	0.1010	1165	28.1	1.10
1033.5	13	1033.5	54/7	21	2	7	0.1363	1327	36.3	1.13
1113.0	5	1113.0	42/7	30	3	7	0.0904	1201	27.5	1.13
1113.0	7	1113.0	45/7	33	3	7	0.1049	1254	30.3	1.14
1113.0	13	1113.0	54/19	38	3	19	0.0862	1429	39.1	1.19
1192.5	5	1192.5	42/7	30	3	7	0.0936	1286	29.5	1.17
1192.5	7	1192.5	45/7	33	3	7	0.1085	1343	32.4	1.18
1192.5	13	1192.5	54/19	38	3	19	0.0892	1530	41.9	1.22
1272.0	5	1272.0	42/7	30	3	7	0.0967	1372	31.4	1.20
1272.0	7	1272.0	45/7	35	3	7	0.1121	1433	34.6	1.22
1272.0	13	1272.0	54/19	39	3	19	0.0921	1632	44.1	1.26
1351.5	7	1351.5	45/7	35	3	7	0.1155	1522	36.7	1.26
1351.5	13	1351.5	54/19	39	3	19	0.0949	1734	46.8	1.30
1431.0	7	1431.0	45/7	36	3	7	0.1189	1613	38.9	1.29
1431.0	13	1431.0	54/19	39	3	19	0.0977	1836	49.6	1.34
1590.0	7	1590.0	45/7	36	3	7	0.1253	1792	42.2	1.36
1590.0	13	1590.0	54/19	42	3	19	0.1030	2040	55.1	1.41
1780.0	8	1780.0	84/19	37	3	19	0.0874	2063	50.7	1.45
2156.0	8	2156.0	84/19	64	4	19	0.0961	2515	61.1	1.61

<sup>A</sup> Mass per unit length is based on Class A zinc-coated steel.

<sup>B</sup> Rated strengths were calculated in accordance with 9.1 using steel stresses at 1 % for Class A coating in accordance with Specification B498/B498M (1 kip = 1000 lbf = 4.448 kN).

<https://standards.iteh.ai/catalog/standards/sist/02465434-74bf-4101-b96c-f6bd078fd351/astm-b779-12>

2.2 Other Documents:

ANSI H35.1 American National Standard Alloy and Temper Designation Systems for Aluminum<sup>3</sup>

NBS Handbook 100—Copper Wire Tables of the National Bureau of Standards<sup>4</sup>

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 ACSR/TW 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 and Note 8):

3.1.2 ~~ACSR/TW/AW—ACSR/TW/AW2—ACSR/TW using aluminum-clad steel wire—wire, normal strength (Specification B502).~~

3.1.3 ~~ACSR/TW/AZ—ACSR/TW/AW3—ACSR/TW using aluminum-coated (aluminized) steel wire—aluminum-clad steel wire, high strength (Specification B341/B341MB502).~~

3.1.4 ~~ACSR/TW/GA—ACSR/TW/GA2—ACSR/TW using Class A zinc-coated steel wire (Specification B498/B498M).~~

3.1.5 ~~ACSR/TW/GB—ACSR/TW/GC2—ACSR/TW using Class BC zinc-coated steel wire (Specification B498/B498M).~~

3.1.6 ~~ACSR/TW/GC—ACSR/TW/GA3—ACSR/TW using Class C high-strength, zinc-coated steel wire (Specification B498/B498MB606).~~

3.1.7 ~~ACSR/TW/HS—ACSR/TW using extra high-strength steel wire (Specification B606).~~

<sup>3</sup> Available from American National Standards Institute, 11 West 42nd Street, Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036-10036, <http://www.ansi.org/B01>

<sup>4</sup> Available from National Technical Information Service—Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161-22161, <http://www.ntis.gov>.

**TABLE 2 Construction Requirements for Shaped Wire Compact Concentric-Lay-Stranded Aluminum Conductors, Coated Steel Reinforced Sized to Have Diameter Equal to ACSR, Class AA**

Code Word <sup>A</sup>	ACSR/TW Conductor Size		Size and Stranding of ACSR with Equal Diameter		Number of Aluminum Wires	Number of Layers	Steel Core Stranding		Mass per Unit Length, <sup>B</sup> lb/1000 ft	Rated Strength, 1000 lb <sup>C</sup>	Nominal Outside Diameter, in. <sup>D</sup>
	kcmil <sup>E</sup>	Type	kcmil <sup>E</sup>	Stranding			Number of Wires	Diameter, in. <sup>D</sup>			
Monongahela/TW	405.1	6	336.4	18/1	14	2	1	0.1520	441	10.2	0.68
Mohawk/TW	571.7	13	477.0	24/7	18	2	7	0.1030	735	20.6	0.85
Calumet/TW	565.3	16	477.0	26/7	20	2	7	0.1146	776	22.9	0.86
Mystic/TW	666.6	13	556.5	24/7	20	2	7	0.1111	856	24.0	0.91
Oswego/TW	664.8	16	556.5	26/7	20	2	7	0.1244	913	26.6	0.93
Maumee/TW	768.2	13	636.0	24/7	20	2	7	0.1195	988	27.7	0.98
Wabash/TW	762.8	16	636.0	26/7	20	2	7	0.1331	1047	30.5	0.99
Nechako/TW	768.9	3	636.0	36/1	27	3	1	0.1520	785	16.4	0.93
Kettle/TW	957.2	7	795.0	45/7	32	3	7	0.0973	1079	26.0	1.06
Fraser/TW	946.7	10	795.0	22/7	35	3	7	0.1154	1142	29.6	1.08
Columbia/TW	966.2	13	795.0	54/7	21	2	7	0.1338	1241	34.0	1.09
Suwannee/TW	959.6	16	795.0	26/7	22	2	7	0.1493	1318	37.0	1.11
Cheyenne/TW	1168.1	5	954.0	42/7	30	3	7	0.0926	1260	28.9	1.16
Genesee/TW	1158.0	7	954.0	45/7	33	3	7	0.1078	1308	31.6	1.17
Hudson/TW	1158.4	13	954.0	54/7	25	2	7	0.1467	1489	39.6	1.20
Catawba/TW	1272.0	5	1033.5	42/7	30	3	7	0.0967	1372	31.4	1.20
Nelson/TW	1257.1	7	1033.5	45/7	35	3	7	0.1115	1417	34.2	1.21
Yukon/TW	1233.6	13	1033.5	54/7	38	3	19	0.0910	1586	42.9	1.25
Truckee/TW	1372.5	5	1113.0	42/7	30	3	7	0.1004	1481	33.4	1.25
Mackenzie/TW	1359.7	7	1113.0	45/7	36	3	7	0.1159	1530	36.9	1.26
Thames/TW	1334.6	13	1113.0	54/19	39	3	19	0.0944	1713	46.3	1.29
St. Croix/TW	1467.8	5	1192.5	42/7	33	3	7	0.1041	1585	35.8	1.29
Miramichi/TW	1455.3	7	1192.5	45/7	36	3	7	0.1200	1640	39.2	1.30
Merrimack/TW	1433.6	13	1192.5	54/19	39	3	19	0.0978	1840	49.7	1.34
Platte/TW	1569.0	5	1272.0	42/7	33	3	7	0.1074	1693	38.2	1.33
Potomac/TW	1557.4	7	1272.0	45/7	36	3	7	0.1241	1755	41.9	1.35
Rio Grande/TW	1533.3	13	1272.0	54/19	39	3	19	0.1012	1968	53.2	1.38
Schuykill/TW	1657.4	7	1351.5	45/7	36	3	7	0.1280	1868	44.0	1.39
Pecos/TW	1622.0	13	1351.5	54/19	39	3	19	0.1064	2107	57.5	1.42
Pee Dee/TW	1758.6	7	1431.0	45/7	37	3	7	0.1319	1982	46.7	1.43
James/TW	1730.6	13	1431.0	54/19	39	3	19	0.1075	2221	59.4	1.47
Athabaska/TW	1949.6	7	1590.0	45/7	42	3	7	0.1392	2199	51.9	1.50
Cumberland/TW	1926.9	13	1590.0	54/19	42	3	19	0.1133	2471	65.3	1.55
Powder/TW	2153.8	8	1780.0	84/19	64	4	19	0.0961	2498	61.1	1.60
Santee/TW	2627.3	8	2156.0	84/19	64	4	19	0.1062	3048	74.5	1.76

<sup>A</sup>Code words shown in this column are obtained from "Publication 50, Code Words for Overhead Aluminum Electrical Conductors," by the Aluminum Association. They are provided for information only.

<sup>B</sup>Mass per unit length is based on Class A zinc-coated steel. To convert to kg/km, multiply the lb/1000 ft value x 1.4887.

<sup>C</sup>Rated strength was calculated in accordance with 9.1 using steel stresses at 1 % for Class A coating in accordance with Specification B498/B498M (1 kip = 1000 lbf = 4.445 kN).

<sup>D</sup>To convert the diameter (inches) to mm, multiply the inch value x 25.4.

<sup>E</sup>To convert from kcmil to mm<sup>2</sup> area, multiply the kcmil value x 5.067 x 10<sup>-4</sup>.

**TABLE 3 Construction Requirements for Shaped Wire Compact Concentric-Lay Stranded Aluminum Conductors Coated, Steel Reinforced**

ACSR/TW Conductor Size kcmil	Number of Aluminum Wires	Number of Layers	Steel Core Stranding		Mass per Unit Length, lb/1000 ft	Rated Strength, 1000 lb	Nominal Outside Diameter, in.
			Number of Wires	Diameter, in.			
795.5	17	2	7	0.0866	886.0	21.2	0.95
1109.7	17	2	7	0.0700	1132.0	23.6	1.10
1524.1	33	3	7	0.0966	1617.0	35.8	1.30
1935.4	31	3	7	0.0866	1958.0	41.0	1.45

3.1.7 ~~ACSR/TW/MA—ACSR/TW/MA2—~~ACSR/TW using Class A zinc-5%-zinc-5% aluminum-mischmetal alloy-coated steel core wire (Specification **B802/B802M**).

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

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

3.1.8 ~~ACSR/TW/MS—ACSR/TW/MA3—~~ACSR/TW using high-strength zinc-5%-zinc-5% mischmetal alloy-coated steel core wire (Specification **B803**).

#### 4. Ordering Information

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

4.1.1 Quantity of each size,

4.1.2 Conductor size: kcmil area and diameter,

4.1.3 Conductor type and number of wires, aluminum and steel (**Tables 1-3**),

4.1.4 Type of steel core wire and if zinc or Zn-5% -MM alloy coated, Class (~~A, B, and~~ A or 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 and type (see **16.1**),

4.1.8 Special package markings, if required (Section **16**), and

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

#### 5. Requirement for Wires

5.1 Before stranding, the trapezoidal aluminum wires (see Terminology **B354**) shall conform to the requirements of Specification **B230/B230M** except for shape and diameter tolerance. 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.

5.3 Following stranding, the steel core shall meet the requirements of Specification **B500/B500M**.

#### 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 preferred lay of the outside layer of aluminum wires of shaped wire compact aluminum conductors, steel-reinforced, having a steel core of 7 or 19 wires and having multiple layers of aluminum wires, is 11 times the outside diameter of the conductor but the lay shall not be less than 10 nor more than 13 times that diameter (Explanatory **Note 4**).

7.2 The preferred lay of the layer immediately beneath the outside layer of aluminum wires is 13 times the outside diameter of such layer but the lay shall be not less than 10 nor more than 16 times that diameter.

7.3 The lay of the inner layers of aluminum wires shall be not less than 10 nor more than 17 times the outside diameter of such layer.

7.4 The preferred lay of the ~~6-wire layer of 7- and 19-wire steel cores is 25 times the outside diameter of the 6-wire layer but the lay shall be not less than 18 nor~~ steel core shall be as set forth by Specification **B500/B500M** ~~more than 30 times that diameter.~~