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Standard Specification for Shaped Wire Compact Concentric-Lay-Stranded Aluminum Conductors, Coated-Steel Supported (ACSS/TW)¹

This standard is issued under the fixed designation B 857; 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 shaped wire compact concentric-lay-stranded aluminum conductors, steel supported (ACSS/TW) for use as overhead electrical conductors (see Explanatory Note 1).

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 the values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.2.1 *Exceptions*—For conductor sizes designated by AWG or kcmil sizes, the requirements in SI units are numerically converted from the corresponding requirements in inch-pound units. For conductor sizes designation 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. For density, resistivity, and temperature, the values stated in SI units are to be regarded as standard.

1.3 ACSS/TW is designed to increase the aluminum area for a given diameter of conductor by the use of trapezoidal shaped wires (TW). The conductors consist of a central core of round steel wire(s) surrounded by two or more layers of trapezoidal aluminum 1350-0 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 (see 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 specified sizes of standard ACSR, ACSS, and ACSR/TW so as to facilitate conductor selection.

2. Referenced Documents

2.1 The following documents of the issue in effect on date of material purchase form part of this specification to the extent referenced herein:

2.2 *ASTM Standards*:²

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

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

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

B 354 Terminology Relating to Uninsulated Metallic Electrical Conductors

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

B 500/B 500M Specification for Metallic Coated Stranded Steel Core for Use in Overhead Electrical Conductors

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

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

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

B 609/B 609M Specification for Aluminum 1350 Round Wire, Annealed and Intermediate Tempers, for Electrical Purposes

B 779 Specification for Shaped Wire Compact Concentric-Lay-Stranded Aluminum Conductors, Steel-Reinforced (ACSR/TW)

¹ This specification is under the jurisdiction of ASTM Committee B01 on Electrical Conductors and is the direct responsibility of Subcommittee B01.07 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*, Vol 02.03, 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 Supported^A

NOTE 1—Sized to have area equal to ACSR or ACSS, Class AA.

ACSS/TW Conductor Size		Code Word ^B	Size and Stranding of ACSS with Equal Area		Aluminum Stranding		Steel Core Stranding		Nominal Mass ACSS/HS/TW, lb/1000 ft	Rated Strength (by type of steel core wire)			Nominal Outside Diameter in.
kc-mil ^C	Type		kcml	Stranding	Number of Aluminum Wires	Number of Layers	Number of Wires	Individual Strand Wire Diameter, in.		ACSS/HS/TW ACSS/MS/TW, KIPS	ACSS/GA/TW ACSS/MA/TW, KIPS	ACSS/AW/TW, KIPS	
336.4	23	Oriole/ACSS/TW	336.4	30/7	17	2	7	0.1059	526	16.3	14.8	14.2	0.693
477.0	13	Flicker/ACSS/TW	477.0	24/7	18	2	7	0.0940	612	14.2	13.0	12.5	0.78
477.0	16	Hawk/ACSS/TW	477.0	26/7	18	2	7	0.1053	655	17.1	15.6	14.9	0.79
477.0	23	Hen/ACSS/TW	477.0	30/7	17	2	7	0.1261	746	22.7	21.0	20.1	0.825
556.5	13	Parakeet/ACSS/TW	556.5	24/7	18	2	7	0.1015	714	16.6	15.2	14.6	0.84
556.5	16	Dove/ACSS/TW	556.5	26/7	20	2	7	0.1138	764	19.9	18.2	17.5	0.85
636.0	13	Rook/ACSS/TW	636.0	24/7	18	2	7	0.1085	818	19.0	17.3	16.7	0.89
636.0	16	Grosbeak/ACSS/TW	636.0	26/7	20	2	7	0.1216	873	22.4	20.7	19.9	0.91
795.0	7	Tern/ACSS/TW	795.0	45/7	17	2	7	0.0886	891	15.2	14.2	13.5	0.96
795.0	10	Puffin/ACSS/TW	795.0	22/7	18	2	7	0.1108	974	20.6	18.9	18.3	0.98
795.0	13	Condor/ACSS/TW	795.0	54/7	20	2	7	0.1213	1020	23.3	21.7	20.9	0.99
795.0	16	Drake/ACSS/TW	795.0	26/7	20	2	7	0.1360	1091	28.0	25.9	24.4	1.01
795.0	23	Mallard/ACSS/TW	795.0	30/19	22	2	19	0.0977	1234	37.9	34.3	32.9	1.046
954.0	5	Phoenix/ACSS/TW	954.0	42/7	30	3	7	0.0837	1028	15.2	14.2	13.6	1.05
954.0	7	Rail/ACSS/TW	954.0	45/7	32	3	7	0.0971	1074	18.0	16.7	16.2	1.06
954.0	13	Cardinal/ACSS/TW	954.0	54/7	20	2	7	0.1329	1227	28.0	26.0	24.6	1.08
1033.5	5	Snowbird/ACSS/TW	1033.5	42/7	30	3	7	0.0871	1114	16.4	15.4	14.8	1.09
1033.5	7	Ortolan/ACSS/TW	1033.5	45/7	32	3	7	0.1010	1163	19.5	18.1	17.6	1.10
1033.5	13	Curlew/ACSS/TW	1033.5	54/7	21	2	7	0.1383	1326	30.3	28.2	26.1	1.13
1113.0	5	Avocet/ACSS/TW	1113.0	42/7	30	3	7	0.0904	1199	17.5	16.3	15.9	1.13
1113.0	7	Bluejay/ACSS/TW	1113.0	45/7	33	3	7	0.1049	1253	21.0	19.5	18.9	1.14
1113.0	13	Finch/ACSS/TW	1113.0	54/19	38	3	19	0.0862	1427	33.2	30.4	28.8	1.19
1192.5	5	Oxbird/ACSS/TW	1192.5	42/7	30	3	7	0.0936	1285	18.7	17.5	17.0	1.17
1192.5	7	Bunting/ACSS/TW	1192.5	45/7	33	3	7	0.1085	1342	22.5	20.9	20.3	1.18
1192.5	13	Grackle/ACSS/TW	1192.5	54/19	38	3	19	0.0892	1529	35.5	32.6	30.8	1.22
1272.0	5	Scissortail/ACSS/TW	1272.0	42/7	30	3	7	0.0967	1371	20.0	18.7	18.2	1.20
1272.0	7	Bittern/ACSS/TW	1272.0	45/7	35	3	7	0.1121	1432	24.0	22.3	21.6	1.22
1272.0	13	Pheasant/ACSS/TW	1272.0	54/19	39	3	19	0.0921	1630	37.3	34.1	32.8	1.26
1351.5	7	Dipper/ACSS/TW	1351.5	45/7	35	3	7	0.1155	1521	25.5	23.7	23.0	1.26
1351.5	13	Martin/ACSS/TW	1351.5	54/19	39	3	19	0.0949	1732	39.6	36.2	34.9	1.30
1431.0	7	Bobolink/ACSS/TW	1431.0	45/7	36	3	7	0.1189	1611	27.0	25.1	24.3	1.29
1431.0	13	Plover/ACSS/TW	1431.0	54/19	39	3	19	0.0977	1834	41.9	38.4	36.9	1.34
1590.0	7	Lapwing/ACSS/TW	1590.0	45/7	36	3	7	0.1253	1790	29.6	27.9	27.0	1.36
1590.0	13	Falcon/ACSS/TW	1590.0	54/19	42	3	19	0.1030	2038	46.6	42.6	41.1	1.41
1780.0	8	Chukar/ACSS/TW	1780.0	84/19	37	3	19	0.0874	2061	38.2	35.3	33.6	1.45
2156.0	8	Bluebird/ACSS/TW	2156.0	84/19	64	4	19	0.0961	2512	45.5	42.1	40.7	1.61

^A Conversion factors:

- 1 cmil = 5.067E-04 mm² (0.0005067 mm³)
- 1 in. = 2.54E+01 mm (25.4 mm)
- 1 lb/1000ft = 1.488 kg/km
- 1 ft = 3.048E-01 m (0.3048 m)
- 1 lb = 4.536E-01 kg (0.4536 kg)
- 1 lbf = 4.448E-03 kN (0.004448 kN)

^B 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.

^C See Explanatory Note 4.

[B 802/B 802M Specification for Zinc-5% Aluminum-Mischmetal Alloy-Coated Steel Core Wire for Aluminum Conductors, Steel-Reinforced \(ACSR\)²](#)—Specification for Zinc5 % Aluminum-Mischmetal Alloy-Coated Steel Core Wire for Aluminum Conductors, Steel Reinforced (ACSR)

[B 803 Specification for High-Strength Zinc-5% Aluminum-Mischmetal Alloy-Coated Steel Core Wire for Aluminum and Aluminum-Alloy Conductors, Steel-Reinforced²](#)—Specification for High-Strength Zinc5 % Aluminum-Mischmetal Alloy-Coated Steel Core Wire for Use in Overhead Electrical Conductors

[B 856 Specification for Concentric-Lay-Stranded Aluminum Conductors, Coated Steel Supported \(ACSS\)](#)

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

[E 527 Practice for Numbering Metals and Alloys \(UNS\)](#)—Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

2.3 Other Standards:

TABLE 2 Construction Requirements for Shaped Wire Compact Concentric-Lay-Stranded Aluminum Conductors, Coated Steel Supported^A

NOTE 1—Sized to have diameter equal to ACSR or ACSS, Class AA.

ACSS/TW Conductor Size		Code Word ^B	Size and Stranding of ACSS with Equal Diameter		Aluminum Stranding		Steel Core Stranding		Nominal Mass ACSS/HS/TW, lb/1000 ft	Rated Strength (by type of steel core wire)			Nominal Outside Diameter in.
kcmil ^C	Type		kcmil	Stranding	Number of Aluminum Wires	Number of Layers	Number of Wires	Individual Strand Wire Diameter, in.		ACSS/MS/TW, KIPS	ACSS/GA/TW, KIPS	ACSS/AW/TW, KIPS	
571.7	13	Mohawk/ACSS/TW	477.0	24/7	18	2	7	0.1030	734	17.1	15.6	15.0	0.85
565.3	16	Calumet/ACSS/TW	477.0	26/7	20	2	7	0.1146	776	20.2	18.4	17.7	0.86
666.6	13	Mystic/ACSS/TW	556.5	24/7	20	2	7	0.1111	856	19.9	18.2	17.5	0.91
664.8	16	Oswego/ACSS/TW	556.5	26/7	20	2	7	0.1244	913	23.4	21.7	20.9	0.93
768.2	13	Maumee/ACSS/TW	636.0	24/7	20	2	7	0.1195	987	23.0	21.0	20.2	0.98
762.8	16	Wabash/ACSS/TW	636.0	26/7	20	2	7	0.1331	1047	26.8	24.9	23.4	0.99
957.2	7	Kettle/ACSS/TW	795.0	45/7	32	3	7	0.0973	1078	18.1	16.8	16.3	1.06
946.7	10	Fraser/ACSS/TW	795.0	22/7	35	3	7	0.1154	1140	22.9	21.1	20.3	1.08
966.2	13	Columbia/ACSS/TW	795.0	54/7	21	2	7	0.1338	1240	28.3	26.4	24.9	1.09
959.6	16	Suwannee/ACSS/TW	795.0	26/7	22	2	7	0.1493	1317	33.1	30.7	28.2	1.11
1080.0	7	...	900.0	45/7	20	2	7	0.1033	1211	20.4	18.9		1.13
1168.1	5	Cheyenne/ACSS/TW	954.0	42/7	30	3	7	0.0926	1259	18.3	17.2	16.7	1.16
1158.0	7	Genesee/ACSS/TW	954.0	45/7	33	3	7	0.1078	1307	22.1	20.5	19.9	1.17
1158.4	13	Hudson/ACSS/TW	954.0	54/7	25	2	7	0.1467	1488	33.5	31.1	28.7	1.20
1272.0	5	Catawba/ACSS/TW	1033.5	42/7	30	3	7	0.0967	1371	20.0	18.7	18.2	1.20
1257.1	7	Nelson/ACSS/TW	1033.5	45/7	35	3	7	0.1115	1416	23.8	22.1	21.4	1.21
1233.6	13	Yukon/ACSS/TW	1033.5	54/7	38	3	19	0.0910	1584	36.3	33.2	32.0	1.25
1372.5	5	Truckee/ACSS/TW	1113.0	42/7	30	3	7	0.1004	1479	21.5	20.2	19.6	1.25
1359.7	7	Mackenzie/ACSS/TW	1113.0	45/7	36	3	7	0.1159	1531	25.7	23.9	23.1	1.26
1334.6	13	Thames/ACSS/TW	1113.0	54/19	39	3	19	0.0944	1711	39.1	35.8	34.5	1.29
1467.8	5	St. Croix/ACSS/TW	1192.5	42/7	33	3	7	0.1041	1583	23.1	21.6	21.0	1.29
1455.3	7	Miramichi/ACSS/TW	1192.5	45/7	36	3	7	0.1200	1639	27.1	25.6	24.8	1.30
1433.6	13	Merrimack/ACSS/TW	1192.5	54/19	39	3	19	0.0978	1838	42.0	38.4	37.0	1.34
1569.0	5	Platte/ACSS/TW	1272.0	42/7	33	3	7	0.1074	1691	24.6	23.1	22.4	1.33
1557.4	7	Potomac/ACSS/TW	1272.0	45/7	36	3	7	0.1241	1754	29.0	27.3	26.5	1.35
1533.3	13	Rio Grande/ACSS/TW	1272.0	54/19	39	3	19	0.1012	1966	45.0	41.2	39.6	1.38
1657.4	7	Schuykill/ACSS/TW	1351.5	45/7	36	3	7	0.1280	1866	30.9	29.1	28.2	1.39
1622.0	13	Pecos/ACSS/TW	1351.5	54/19	39	3	19	0.1064	2105	49.3	45.0	43.3	1.42
1758.6	7	Pee Dee/ACSS/TW	1431.0	45/7	37	3	7	0.1319	1980	32.8	30.9	29.4	1.43
1730.6	13	James/ACSS/TW	1431.0	54/19	39	3	19	0.1075	2219	50.8	46.4	44.7	1.47
1949.6	7	Athabaska/ACSS/TW	1590.0	45/7	42	3	7	0.1392	2197	36.5	34.3	31.7	1.50
1926.9	13	Cumberland/ACSS/TW	1590.0	54/19	42	3	19	0.1133	2469	56.4	51.6	49.7	1.55
2153.8	8	Powder/ACSS/TW	1780.0	84/19	64	4	19	0.0961	2510	45.5	42.1	40.7	1.60
2627.3	8	Santee/ACSS/TW	2156.0	84/19	64	4	19	0.1062	3063	55.6	51.3	49.7	1.76

^A Conversion factors:

- 1 cmil = 5.067E-04 mm² (0.0005067 mm²)
- 1 in. = 2.54E+01 mm (25.4 mm)
- 1 lb/1000 ft = 1.488 kg/km
- 1 ft = 3.048E-01 m (0.3048 m)
- 1 lb = 4.536E-01 kg (0.4536 kg)
- 1 lbf = 4.448E-03 kN (0.004448 kN)

^B 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.

^C See Explanatory Note 4.

NBS *Handbook 100*—Copper Wire Tables of the National Bureau of Standards³
 Aluminum Association Publication 50 Code Words for Overhead Aluminum Electrical Conductors⁴

3. Terminology

3.1 *Definitions:* For definitions of terms relating to conductors, also refer to definitions found in Specification B 354.

3.1.1 *aluminized*—aluminum coated.

3.1.2 *aluminum-clad*—aluminum bonded.

3.1.3 *galvanized*—zinc coated.

3.2 *Abbreviations:*

³ Annual Book of ASTM Standards, Vol 14.02.

³ Available from National Technical Information Service (NTIS), 5285 Port Royal Rd., Springfield, VA 22161, <http://www.ntis.gov>.

⁴ Annual Book of ASTM Standards, Vol 01.01.

⁴ Available from Aluminum Association, Inc., 1525 Wilson Blvd., Suite 600, Arlington, VA 22209, <http://www.aluminum.org>.

TABLE 3 Comparison of ACSS/TW With Equivalent Stranding of ACSR^A and ACSS^B

ACSS/TW Type Number ^C	Conventional ACSR and ACSS Stranding ^D
5	42/7
7	45/7
8	84/19
10	22/7
13	54/7
13	24/7
16	26/7
23	30/7
23	30/19

^A The equivalent stranding is that stranding of conventional ACSR that has the same area of aluminum and steel as a given ACSS/TW type.

^B The equivalent stranding is that stranding of conventional ACSS that has the same area of aluminum and steel as a given ACSS/TW type.

^C ACSS/TW type number is the approximate ratio of the steel area to the aluminum area in percent.

^D See Specifications B 232, B 549, and B 856.

3.2.1 ACSS/TW—shaped wire aluminum conductor, steel supported.

3.2.2 ACSS/TW/AZ—supported with aluminized steel core wire in accordance with Specification B 341/B 341M.

3.2.3 ACSS/TW/AW—supported with aluminum-clad core wire in accordance with Specification B 502.

3.2.4 ACSS/TW/GA—supported with galvanized steel core wire, coating Class A in accordance with Specification B 498/B 498M.

3.2.5 ACSS/TW/GB—supported with galvanized steel core wire, coating Class B in accordance with Specification B 498/B 498M.

3.2.6 ACSS/TW/GC—supported with galvanized steel core wire, coating Class C in accordance with Specification B 498/B 498M.

3.2.7 ACSS/TW/HS—supported with high-strength galvanized steel core wire in accordance with Specification B 606.

3.2.8 ACSS/TW/MA—supported with Zn-5Al-MM coated steel core wire, coating Class A in accordance with Specification B 802.

3.2.9 ACSS/TW/MB—supported with Zn-5Al-MM coated steel core wire, coating Class B in accordance with Specification B 802.

3.2.10 ACSS/TW/MC—supported with Zn-5Al-MM coated steel core wire, coating Class C in accordance with Specification B 802.

3.2.11 ACSS/TW/MS—supported with high-strength Zn-5Al-MM coated steel core wire in accordance with Specification B 803.

3.2.12 Zn-5Al-MM—zinc-5 % aluminum-mischmetal alloy.

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, (Table 1 and Table 2),

4.1.4 Type of steel core wire and class (if applicable) of coating (see 5.2),

4.1.5 Direction of lay of outer layer of aluminum wires if other than right-hand (see 7.6),

4.1.6 Special tension test, if desired (see 14.3),

4.1.7 Package size and type (see 16.1),

4.1.8 Special package markings, if required (see 16.4),

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

4.1.10 Place of inspection (see Section 15).

5. Requirement for Wires

5.1 After stranding, the trapezoidal aluminum wires (see Definitions B 354) shall conform to the requirements of Specification B 609 except for shape and diameter tolerance requirements. The tensile strength and elongation requirements of trapezoidal wires shall be the same as for round wires of equal area. The area tolerances for trapezoidal wires shall be such that the finished conductor conforms to Section 13-. The elongation shall not be less than 20 % after stranding.

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, or B 803 whichever is applicable.

5.3 The stranded steel core shall meet the requirements of Specification B 500 or B 549, as applicable.

6. Joints

6.1 Electric-butt welds, cold-pressure welds, and electric-butt, cold upset welds in the finished individual aluminum wires