



Designation: B857 – 11^{ε1}

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 B857; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

^{ε1} NOTE—Sections 8.2.9 and 8.2.10 were editorially updated in February 2013.

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 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.

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 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), or to reduce the diameter for a given area of aluminum. 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.

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.

Current edition approved April 1, 2011. Published July 2011. Originally approved in 1995. Last previous edition approved in 2009 as B857 – 09. DOI: 10.1520/B0857-11E01.

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

[B263 Test Method for Determination of Cross-Sectional Area of Stranded Conductors](#)

[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](#)

[B609/B609M Specification for Aluminum 1350 Round Wire, Annealed and Intermediate Tempers, for Electrical Purposes](#)

[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](#)

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.

TABLE 1 Construction Requirements for Shaped Wire Compact Concentric-Lay-Stranded Aluminum Conductors, Coated Steel Supported^A

NOTE 1—Sized to have area equal aluminum cross-sectional area to an ACSR or ACSS, Class AA conductor.

ACSS/TW Conductor Size	Code Word ^B	Size and Stranding of ACSS with Equal Aluminum Cross-Sectional Area				Steel Core Stranding	Nominal Mass ACSS/TW	ACSS/TW Conductor Rated Strength (by type of steel core wire)				Nominal Outside Diameter		
		Stranding	Number of Aluminum Wires	Number of Layers	Number of Wires			GA2/MA2 KIPS	GA3/MA3 KIPS	GA4/MA4 KIPS	GA5/MA5 KIPS			
kcmil ^C	Type	kcmil	Number of Aluminum Wires	Number of Layers	Number of Wires	Individual Strand Wire Diameter, in.	GAX Core lb/1000 ft	GA2/MA2 KIPS	GA3/MA3 KIPS	GA4/MA4 KIPS	GA5/MA5 KIPS	AW2 KIPS	AW3 KIPS	in.
266.8	16	Partridge/ACSS/TW	267	2	7	0.0788	349	8.90	9.70	10.8	11.4	8.40	8.90	0.58
336.4	23	Oriole/ACSS/TW	307	2	7	0.1059	526	14.8	16.3	18.2	19.1	14.2	14.8	0.69
477.0	13	Flicker/ACSS/TW	247	2	7	0.0940	612	13.0	14.2	15.7	16.4	12.5	13.0	0.78
477.0	16	Hawk/ACSS/TW	267	2	7	0.1053	655	15.6	17.1	18.9	19.8	14.9	15.6	0.79
477.0	23	Hen/ACSS/TW	307	2	7	0.1261	746	21.0	22.7	25.4	26.7	20.1	20.5	0.83
556.5	13	Parakeet/ACSS/TW	247	2	7	0.1015	714	15.2	16.6	18.3	19.1	14.6	15.2	0.84
556.5	16	Dove/ACSS/TW	267	2	7	0.1138	764	19.0	18.2	22.1	23.1	17.5	18.2	0.85
636.0	13	Rook/ACSS/TW	247	2	7	0.1085	818	19.0	17.3	20.9	21.9	16.7	17.3	0.89
636.0	16	Grosbeak/ACSS/TW	267	2	7	0.1216	873	22.4	20.7	24.8	26.0	19.9	20.3	0.91
795.0	7	Terr/ACSS/TW	457	2	7	0.0886	891	15.2	14.2	16.6	17.5	13.5	14.2	0.96
795.0	10	Puffin/ACSS/TW	227	2	7	0.1108	974	20.6	18.9	22.6	23.7	18.3	18.9	0.98
795.0	13	Condor/ACSS/TW	547	2	7	0.1213	1020	23.3	21.7	25.7	26.9	20.9	21.3	0.99
795.0	16	Drake/ACSS/TW	267	2	7	0.1360	1091	28.0	25.9	31.0	32.5	24.4	25.4	1.01
795.0	23	Mallard/ACSS/TW	307	2	19	0.0977	1234	37.9	34.3	42.1	44.3	32.9	34.3	1.05
954.0	5	Phoenix/ACSS/TW	427	3	7	0.0837	1028	15.2	14.2	16.3	17.1	13.6	14.2	1.05
954.0	7	Rail/ACSS/TW	457	3	7	0.0971	1074	18.0	16.7	19.6	20.4	16.2	16.7	1.06
954.0	13	Cardinal/ACSS/TW	547	2	7	0.1329	1227	28.0	26.0	30.9	32.3	24.6	25.5	1.08
1033.5	5	Snowbird/ACSS/TW	427	3	7	0.0871	1114	16.4	15.4	17.7	18.5	14.8	15.4	1.09
1033.5	7	Ortolan/ACSS/TW	457	3	7	0.1010	1163	19.5	18.1	21.2	22.0	17.6	18.1	1.10
1033.5	13	Curlew/ACSS/TW	547	2	7	0.1383	1326	30.3	28.2	33.4	35.0	26.1	27.7	1.13
1113.0	5	Avocet/ACSS/TW	427	3	7	0.0904	1199	17.5	16.3	18.8	19.5	15.9	16.3	1.13
1113.0	7	Bluejay/ACSS/TW	457	3	7	0.1049	1253	21.0	19.5	22.9	23.8	18.9	19.5	1.14
1113.0	13	Finch/ACSS/TW	547	3	19	0.0862	1427	33.2	30.4	36.5	38.7	28.8	30.4	1.19
1192.5	5	Oxbird/ACSS/TW	427	3	7	0.0936	1285	18.7	17.5	20.2	20.9	17.0	17.5	1.17
1192.5	7	Bunting/ACSS/TW	457	3	7	0.1085	1342	22.5	20.9	24.5	25.5	20.3	20.9	1.18
1192.5	13	Grackle/ACSS/TW	547	3	19	0.0892	1529	35.5	32.6	39.1	41.5	30.8	32.6	1.22
1272.0	5	Scissortail/ACSS/TW	427	3	7	0.0967	1371	20.0	18.7	21.5	22.3	18.2	18.7	1.20
1272.0	7	Blitern/ACSS/TW	457	3	7	0.1121	1432	24.0	22.3	26.1	27.2	21.6	22.3	1.22
1272.0	13	Pheasant/ACSS/TW	547	3	19	0.0921	1630	37.3	34.1	41.1	43.0	32.8	34.1	1.26
1351.5	7	Dipper/ACSS/TW	457	3	7	0.1155	1521	25.5	23.7	27.7	28.8	23.0	23.7	1.26
1351.5	13	Marlin/ACSS/TW	547	3	19	0.0949	1732	39.6	36.2	43.6	45.6	34.9	36.2	1.30
1431.0	7	Bobolink/ACSS/TW	457	3	7	0.1189	1611	27.0	25.1	29.4	30.5	24.3	25.1	1.29
1431.0	13	Plover/ACSS/TW	547	3	19	0.0977	1834	41.9	38.4	46.2	48.3	36.9	38.4	1.34
1590.0	7	Lapwing/ACSS/TW	457	3	7	0.1253	1790	29.6	27.9	32.2	33.5	27.0	27.5	1.36
1590.0	13	Falcon/ACSS/TW	547	3	19	0.1030	2038	46.6	42.6	51.3	53.7	41.1	42.6	1.41
1780.0	8	Chukar/ACSS/TW	847	3	19	0.0874	2061	38.2	35.3	41.6	43.9	33.6	35.3	1.45
2156.0	8	Bluebird/ACSS/TW	847	4	19	0.0961	2512	45.5	42.1	49.6	51.7	40.7	42.1	1.61

^A Conversion factors:

1 cmil = 5.067E-04 mm² (0.0005067 mm²)

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 (0.0044448 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.

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

NOTE 1—Sized to have a diameter equal to a concentric round ACSR or ACSS, Class AA conductor.

ACSS/TW Conductor Size	Code Word ^B	Size and Stranding of ACSS with Equal Overall Conductor Diameter		Aluminum Stranding	Steel Core Stranding		Nominal Mass ACSS/TW	ACSS/TW Conductor Rated Strength (by type of steel core wire)					Nominal Outside Diameter				
		kcml	Stranding		Number of Aluminum Wires	Number of Wires		Individual Strand Wire Diameter, in.	GAX Core lb/1000 ft	GA2/MA2 KIPS	GA3/MA3 KIPS	GA4 / MA4 KIPS		GA5 / MA5 KIPS	AW2 KIPS	AW3 KIPS	
kcml ^C	Type																in.
571.7	13	Mohawk/ACSS/TW	477.0	24/7	18	2	7	0.1030	734	17.1	15.6	18.8	19.7	15.0	15.6	18.4	0.85
565.3	16	Calumet/ACSS/TW	477.0	26/7	20	2	7	0.1146	776	20.2	18.4	22.4	23.5	17.7	18.4	22.4	0.86
666.6	13	Mythic/ACSS/TW	556.5	24/7	20	2	7	0.1111	856	19.9	18.2	21.9	22.9	17.5	18.2	21.9	0.91
664.8	16	Oswego/ACSS/TW	556.5	26/7	20	2	7	0.1244	913	23.4	21.7	26.0	27.2	20.9	21.3	26.0	0.93
768.2	13	Maumee/ACSS/TW	636.0	24/7	20	2	7	0.1195	987	23.0	21.0	25.3	26.5	20.2	21.0	25.3	0.98
762.8	16	Wabash/ACSS/TW	636.0	26/7	20	2	7	0.1331	1047	26.8	24.9	29.7	31.2	23.4	24.4	29.7	0.99
957.2	7	Kettler/ACSS/TW	795.0	45/7	32	3	7	0.0973	1078	18.1	16.8	19.7	20.4	16.3	16.8	19.7	1.06
946.7	10	Fraser/ACSS/TW	795.0	22/7	35	3	7	0.1154	1140	22.9	21.1	25.1	26.2	20.3	21.1	25.1	1.08
966.2	13	Columbia/ACSS/TW	795.0	54/7	21	2	7	0.1398	1240	28.3	26.4	31.3	32.8	24.9	25.9	31.3	1.09
959.6	16	Suwannee/ACSS/TW	795.0	26/7	22	2	7	0.1493	1317	33.1	30.7	36.8	38.6	28.2	30.0	36.8	1.11
1080.0	7	...	900.0	45/7	20	2	7	0.1033	1211	20.4	18.9	22.2	23.1	18.4	18.9	22.2	1.13
1168.1	5	Cheyenne/ACSS/TW	954.0	42/7	30	3	7	0.0926	1259	18.3	17.2	19.7	20.4	16.7	17.1	19.7	1.16
1158.0	7	Genesee/ACSS/TW	954.0	45/7	33	3	7	0.1078	1307	22.1	20.5	24.0	25.0	19.9	20.5	24.0	1.17
1158.4	13	Hudson/ACSS/TW	954.0	54/7	25	2	7	0.1467	1488	33.5	31.1	37.0	38.8	28.7	30.5	37.0	1.20
1272.0	5	Catawba/ACSS/TW	1033.5	42/7	30	3	7	0.0967	1371	20.0	18.7	21.5	22.3	18.2	18.7	21.5	1.20
1257.1	7	Nelson/ACSS/TW	1033.5	45/7	35	3	7	0.1115	1416	23.8	22.1	25.8	26.9	21.4	22.1	25.8	1.21
1233.6	13	Yukon/ACSS/TW	1033.5	54/7	38	3	19	0.0910	1584	36.3	33.2	40.0	41.9	32.0	33.2	40.0	1.25
1372.5	5	Truckee/ACSS/TW	1113.0	42/7	30	3	7	0.1004	1479	21.5	20.2	23.2	24.0	19.6	20.2	23.2	1.25
1359.7	7	Mackenzie/ACSS/TW	1113.0	45/7	36	3	7	0.1159	1531	25.7	23.9	27.9	29.0	23.1	23.8	27.9	1.26
1334.6	13	Thames/ACSS/TW	1113.0	54/19	33	3	19	0.0944	1711	39.1	35.8	43.1	45.1	34.5	35.8	43.1	1.29
1467.8	5	St. Croix/ACSS/TW	1192.5	42/7	33	3	7	0.1041	1583	23.1	21.6	24.9	25.8	21.0	21.6	24.9	1.29
1455.3	7	Miramichi/ACSS/TW	1192.5	45/7	36	3	7	0.1200	1639	27.1	25.6	29.5	30.7	24.8	25.2	29.5	1.30
1433.6	13	Merrimack/ACSS/TW	1192.5	54/19	39	3	19	0.0978	1838	42.0	38.4	46.3	48.4	37.0	38.4	46.3	1.34
1569.0	5	Platte/ACSS/TW	1272.0	42/7	33	3	7	0.1074	1691	24.6	23.1	26.5	27.5	22.4	23.1	26.5	1.33
1557.4	7	Potomac/ACSS/TW	1272.0	45/7	36	3	7	0.1241	1754	29.0	27.3	31.6	32.8	26.5	26.9	31.6	1.35
1533.3	13	Rio Grande/ACSS/TW	1272.0	54/19	39	3	19	0.1012	1966	45.0	41.2	49.6	51.9	39.6	41.2	49.6	1.38
1657.4	7	Schuykill/ACSS/TW	1351.5	45/7	36	3	7	0.1280	1866	30.9	29.1	33.6	34.9	28.2	28.6	33.6	1.39
1622.0	13	Pecos/ACSS/TW	1351.5	54/19	39	3	19	0.1064	2105	49.3	45.0	54.3	56.9	43.3	45.0	54.3	1.42
1758.6	7	Pee Dee/ACSS/TW	1431.0	45/7	37	3	7	0.1319	1980	32.8	30.9	35.7	37.1	29.4	30.4	35.7	1.43
1730.6	13	James/ACSS/TW	1431.0	54/19	39	3	19	0.1075	2219	50.8	46.4	55.9	58.5	44.7	46.4	55.9	1.47
1949.6	7	Athabaska/ACSS/TW	1590.0	45/7	42	3	7	0.1392	2197	36.5	34.3	39.3	40.8	31.7	33.5	39.3	1.50
1926.9	13	Cumberland/ACSS/TW	1590.0	54/19	42	3	19	0.1133	2469	56.4	51.6	62.2	65.0	49.7	51.6	62.2	1.55
2153.8	8	Powder/ACSS/TW	1780.0	84/19	64	4	19	0.0961	2510	45.5	42.1	49.6	51.7	40.7	42.1	49.6	1.60
2627.3	8	Santee/ACSS/TW	2156.0	84/19	64	4	19	0.1062	3063	55.6	51.3	60.6	63.1	49.7	51.3	60.6	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.

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 **B549** and **B856**.

B856 Specification for Concentric-Lay-Stranded Aluminum Conductors, Coated Steel Supported (ACSS)

B957 Specification for Extra-High-Strength and Ultra-High-Strength Zinc-Coated (Galvanized) Steel Core Wire for Overhead Electrical Conductors

B958 Specification for Extra-High-Strength and Ultra-High-Strength Class A 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)

2.3 *Other Standards:*

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 **B354**.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *aluminum-clad*—aluminum bonded.

3.2.2 *galvanized*—zinc coated.

3.2.3 *Zn-5Al-MM*—zinc-5 % aluminum-mischmetal alloy coated.

3.3 *Abbreviations:*

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

3.3.2 *ACSS/TW/AW2*—supported with regular strength aluminum-clad core wires in accordance with Specification **B502**.

3.3.3 *ACSS/TW/AW3*—supported with high-strength aluminum-clad core wires in accordance with Specification **B502**.

3.3.4 *ACSS/TW/GA2*—ACSS using Class A zinc-coated regular strength steel core wires in accordance with Specification **B498/B498M**.

3.3.5 *ACSS/TW/GA3*—ACSS using Class A zinc-coated high-strength steel core wires in accordance with Specification **B606**.

3.3.6 *ACSS/TW/GA4*—ACSS using Class A zinc-coated extra-high-strength steel core wires in accordance with Specification **B957**.

3.3.7 *ACSS/TW/GA5*—ACSS using Class A zinc-coated ultra-high-strength steel core wires in accordance with Specification **B957**.

3.3.8 *ACSS/TW/GC2*—ACSS using Class C zinc-coated regular strength steel core wires in accordance with Specification **B498/B498M**.

3.3.9 *ACSS/TW/MA2*—ACSS using Class A Zn-5Al-MM coated regular strength steel core wires in accordance with Specification **B802/B802M**.

3.3.10 *ACSS/TW/MA3*—ACSS using Class A Zn-5Al-MM coated high strength steel core wires in accordance with Specification **B803**.

3.3.11 *ACSS/TW/MA4*—ACSS using Class A Zn-5Al-MM coated extra-high-strength steel core wires in accordance with Specification **B958**.

3.3.12 *ACSS/TW/MA5*—ACSS using Class A Zn-5Al-MM coated ultra-high-strength steel core wires in accordance with Specification **B958**.

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 **7.7**),

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 **B354**) shall conform to the requirements of O Temper in accordance with Specification **B609/B609M** 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

³ Available from National Technical Information Service (NTIS), 5301 Shawnee Rd., Alexandria, VA 22312, <http://www.ntis.gov>.

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