



Designation: B857 – 18

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 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 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.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recom-*

mendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

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](#)

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

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 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.

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

B1006 Specification for Electrical Overhead Conductor Code Word Names

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-5A1-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-5A1-MM coated regular strength steel core wires in accordance with Specification **B802/B802M**.

3.3.10 *ACSS/TW/MA3*—ACSS using Class A Zn-5A1-MM coated high strength steel core wires in accordance with Specification **B803**.

3.3.11 *ACSS/TW/MA4*—ACSS using Class A Zn-5A1-MM coated extra-high-strength steel core wires in accordance with Specification **B958**.

3.3.12 *ACSS/TW/MA5*—ACSS using Class A Zn-5A1-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 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 **B498/B498M**, **B502**, **B606**, **B802/B802M**, **B803**, **B957**, or **B958** whichever is applicable.

5.3 The stranded steel core shall meet the requirements of Specification **B500/B500M** or **B549**, as applicable.

6. Joints

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

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>.

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	Size and Stranding of ACSS with Equal Aluminum Cross-Sectional Area			Nominal Mass ACSS/TW	ACSS/TW Conductor Rated Strength (by type of steel core wire)					Nominal Outside Diameter				
	Code Word ^B	Stranding	Number of Aluminum Wires		Aluminum Stranding	Steel Core Stranding	Individual Strand Wire Diameter, in.	GAX Core lb/1000 ft	GA2 / MA2 KIPS		GA3 / MA3 KIPS	GA4 / MA4 KIPS	GA5 / MA5 KIPS	AW2 KIPS
kcml ^C Type	kcml	Stranding	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	18	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	17	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	18	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	18	2	7	0.1053	655	15.6	17.1	19.8	14.9	15.6	15.6	0.79
477.0	23	Hen/ACSS/TW	17	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	18	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	20	2	7	0.1138	764	18.2	19.9	22.1	23.1	17.5	18.2	0.85
636.0	13	Rook/ACSS/TW	18	2	7	0.1085	818	17.3	19.0	20.9	21.9	16.7	17.3	0.89
636.0	16	Grosbeak/ACSS/TW	20	2	7	0.1216	873	20.7	22.4	24.8	26.0	19.9	20.3	0.91
795.0	7	Tem/ACSS/TW	17	2	7	0.0886	891	14.2	15.2	16.6	17.5	13.5	14.2	0.96
795.0	10	Puffin ^D /ACSS/TW	18	2	7	0.1108 ^D	974	18.9	20.6	22.6	23.7	18.3	18.9	0.98
795.0	13	Condor/ACSS/TW	20	2	7	0.1213	1020	21.7	23.3	25.7	26.9	20.9	21.3	0.99
795.0	16	Drake/ACSS/TW	20	2	7	0.1360	1020	25.9	28.0	31.0	32.5	24.4	25.4	1.01
795.0	23	Mallard/ACSS/TW	22	2	19	0.0977	1234	34.3	37.9	42.1	44.3	32.9	34.3	1.05
954.0	5	Phoenix/ACSS/TW	30	3	7	0.0837	1028	14.2	15.2	16.3	17.1	13.6	14.2	1.05
954.0	7	Rail/ACSS/TW	32	3	7	0.0971	1074	16.7	18.0	19.6	20.4	16.2	16.7	1.06
954.0	13	Cardinal/ACSS/TW	20	2	7	0.1329	1227	26.0	28.0	30.9	32.3	24.6	25.5	1.08
1033.5	5	Snowbird/ACSS/TW	30	3	7	0.0871	1114	15.4	16.4	17.7	18.5	14.8	15.4	1.09
1033.5	7	Ortolan/ACSS/TW	32	3	7	0.1010	1163	18.1	19.5	21.2	22.0	17.6	18.1	1.10
1033.5	13	Curlaw/ACSS/TW	21	2	7	0.1383	1326	28.2	30.3	33.4	35.0	26.1	27.7	1.13
1113.0	5	Avocet/ACSS/TW	30	3	7	0.0904	1199	16.3	17.5	18.8	19.5	15.9	16.3	1.13
1113.0	7	Bluejay/ACSS/TW	33	3	7	0.1049	1253	19.5	21.0	22.9	23.8	18.9	19.5	1.14
1113.0	13	Finch/ACSS/TW	38	3	19	0.0862	1427	30.4	33.2	36.5	38.7	28.8	30.4	1.19
1192.5	5	Oxbrid/ACSS/TW	30	3	7	0.0936	1285	17.5	18.7	20.2	20.9	17.0	17.5	1.17
1192.5	7	Bunting/ACSS/TW	33	3	7	0.1085	1342	20.9	22.5	24.5	25.5	20.3	20.9	1.18
1192.5	13	Grackle/ACSS/TW	38	3	19	0.0892	1529	32.6	35.5	39.1	41.5	30.8	32.6	1.22
1272.0	5	Scissortail/ACSS/TW	30	3	7	0.0967	1371	18.7	20.0	21.5	22.3	18.2	18.7	1.20
1272.0	7	Blittern/ACSS/TW	35	3	7	0.1121	1432	22.3	24.0	26.1	27.2	21.6	22.3	1.22
1272.0	13	Pheasant/ACSS/TW	39	3	19	0.0921	1630	34.1	37.3	41.1	43.0	32.8	34.1	1.26
1351.5	7	Dipper/ACSS/TW	35	3	7	0.1155	1521	23.7	25.5	27.7	28.8	23.0	23.7	1.26
1351.5	13	Martin/ACSS/TW	39	3	19	0.0949	1732	36.2	39.6	43.6	45.6	34.9	36.2	1.30
1431.0	7	Bobolink/ACSS/TW	36	3	7	0.1189	1611	25.1	27.0	29.4	30.5	24.3	25.1	1.29
1431.0	13	Plover/ACSS/TW	39	3	19	0.0977	1834	38.4	41.9	46.2	48.3	36.9	38.4	1.34
1590.0	7	Lapwing/ACSS/TW	36	3	7	0.1253	1790	27.9	29.6	32.2	33.5	27.0	27.5	1.36
1590.0	13	Falcon/ACSS/TW	42	3	19	0.1030	2038	42.6	46.6	51.3	53.7	41.1	42.6	1.41
1780.0	8	Chukar/ACSS/TW	37	3	19	0.0874	2061	35.3	38.2	41.6	43.9	33.6	35.3	1.45
2156.0	8	Bluebird/ACSS/TW	64	4	19	0.0961	2512	42.1	45.5	49.6	51.7	40.7	42.1	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 Specification B1006. They are provided for information only.

^C See Explanatory Note 4.

^D For 795 kcml Type 10 (Puffin ACSS TW) conductor the indicated 0.1108 in. steel wire size does not correspond with the concentric round wire 795 kcml 22/7 Puffin ACSS conductor. The round wire construction utilizes a 0.1056 in. diameter steel core wire. The industry accepted dimension for the Puffin ACSS TW steel wire is 0.1108 in. Technically this renders the construction as a Type 11 conductor. The conductor mass, rated strength and diameter values correspond to the 0.1108 in. diameter steel core.

