



Standard Specification for Concentric-Lay-Stranded Aluminum Conductors, Coated-Steel Reinforced (ACSR)¹

This standard is issued under the fixed designation B232/B232M; 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 conductors made from round aluminum 1350-H19 (extra hard) wires and round, coated steel core wire(s) for use as overhead electrical conductors (Explanatory [Note 1](#) and Explanatory [Note 2](#)).

1.2 ACSR covered by this specification has nine types of coated steel core wire which are designated by abbreviations as follows (Explanatory [Note 2](#)):

1.2.1 *ACSR/GA* or *ACSR/GA2*—ACSR using Class A zinc-coated steel wire,

1.2.2 *ACSR/GC* or *ACSR/GC2*—ACSR using Class C zinc-coated steel wire,

1.2.3 *ACSR/MA* or *ACSR/MA2*—ACSR using Class A Zn-5A1-MM coated steel wire,

1.2.4 *ACSR/HS* or *ACSR/GA3*—ACSR using Class A zinc-coated high-strength steel wires,

1.2.5 *ACSR/MS* or *ACSR/MA3*—ACSR using Class A Zn-5A1-MM coated high-strength steel wires,

1.2.6 *ACSR/GA4*—ACSR using Class A zinc-coated extra-high-strength steel wires,

1.2.7 *ACSR/MA4*—ACSR using Class A Zn-5A1-MM coated extra-high-strength steel wires,

1.2.8 *ACSR/GA5*—ACSR using Class A zinc-coated ultra-high-strength steel wires,

1.2.9 *ACSR/MA5*—ACSR using Class A Zn-5A1-MM coated ultra-high-strength steel wires.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

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 Oct. 1, 2011. Published November 2011. Originally approved in 1948. Last previous edition approved in 2009 as B232/B232M – 09. DOI: 10.1520/B0232_B0232M-11.

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

[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

[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

[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 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.



2.3 ANSI Documents:

ANSI H35.1 American National Standard Alloy and Temper Designation Systems for Aluminum³

ANSI H35.1M American National Standard for Alloy and Temper Designations Systems for Aluminum [Metric]³

2.4 NIST Document:

NBS Handbook 100—Copper Wire Tables⁴

2.5 Aluminum Association Document:

Publication 50, Code Words for Overhead Aluminum Electrical Conductors⁵

3. Terminology

3.1 Definitions:

3.1.1 *Galvanized*—zinc coated.

3.1.2 *Aluminized*—aluminum coated.

3.2 Abbreviations:

3.2.1 *Zn-5A1-MM*—zinc-5 % aluminum-mischmetal alloy.

3.2.2 *ACSR*—aluminum conductor, steel reinforced.

3.2.3 *ACSR/GA* or *ACSR/GA2*—reinforced with galvanized steel core wire, coating Class A in accordance with Specification **B498/B498M**.

3.2.4 *ACSR/GC* or *ACSR/GC2*—reinforced with galvanized steel core wire, coating Class C in accordance with Specification **B498/B498M**.

3.2.5 *ACSR/HS* or *ACSR/GA3*—reinforced with high-strength galvanized steel core wire in accordance with Specification **B606**.

3.2.6 *ACSR/MA* or *ACSR/MA2*—reinforced with Zn-5A1-MM coated steel core wire, coating Class A in accordance with Specification **B802/B802M**.

3.2.7 *ACSR/MS* or *ACSR/MA3*—reinforced with high-strength Zn-5A1-MM coated steel core wire in accordance with Specification **B803**.

3.2.8 *ACSR/MA4*—reinforced with extra-high-strength Zn-5A1-MM coated steel core wire in accordance with Specification **B958**.

3.2.9 *ACSR/GA4*—reinforced with extra-high-strength galvanized steel core wire in accordance with Specification **B957**.

3.2.10 *ACSR/MA5*—reinforced with ultra-high-strength Zn-5A1-MM coated steel core wire in accordance with Specification **B958**.

3.2.11 *ACSR/GA5*—reinforced with ultra-high-strength galvanized steel core wire in accordance with Specification **B957**.

4. Classification

4.1 For the purpose of this specification conductors are classified as follows (Explanatory **Notes 1 and 2**):

4.1.1 *Class AA*—For bare conductors usually used in overhead lines. These conductors are divided into two types as follows:

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

⁴ Available from National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 1070, Gaithersburg, MD 20899-1070, <http://www.nist.gov>.

⁵ Available from Aluminum Association, Inc., 1525 Wilson Blvd., Suite 600, Arlington, VA 22209, <http://www.aluminum.org>.

4.1.1.1 Conductors used for regular over-head line construction, and

4.1.1.2 Conductors having a high ratio of mechanical strength to current-carrying capacity used for overhead ground wires and for extra-long span construction. These are denoted under the Class column in **Table 1** and **Table 2** as “(HS)” for High Strength.

4.1.2 *Class A*—For conductors to be covered with weather-resistant materials.

5. Ordering Information

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

5.1.1 Quantity of each size, stranding, and class,

5.1.2 Conductor size, circular-mil area or AWG (Section 9 and **Table 1**),

5.1.3 Number of wires, aluminum and steel (see **Tables 1-5**),

5.1.4 Type of steel core wire and type and area density (if applicable) of coating (see **6.2**),

5.1.5 Direction of lay of outer layer of aluminum wires if other than right-hand (see **8.3**),

5.1.6 Special tension test, if desired (see **15.3**),

5.1.7 Place of inspection (Section 16),

5.1.8 Package size and type (see **17.1**),

5.1.9 Heavy wood lagging, if required (see **17.3**), and

5.1.10 Special package marking, if required (see **17.4**).

6. Requirement for Wires

6.1 Before stranding, the aluminum wire used shall meet the requirements of Specification **B230/B230M**.

6.2 Before stranding, the steel core wire used shall meet the requirements of Specification **B498/B498M**, **B606**, **B802/B802M**, **B803**, **B957**, or **B958**, whichever is applicable.

7. Joints

7.1 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 (Explanatory **Note 3**).

7.2 There shall be no joints of any kind made in the finished zinc-coated or zinc-5% aluminum-mischmetal alloy coated steel wires.

8. Lay

8.1 The length of lay of the various layers of aluminum wires in a conductor shall conform to **Table 5** (see Explanatory **Note 4**).

8.2 The length of lay of the various layers of steel wire shall conform to the requirements of **B500/B500M**.

8.3 The direction of lay of the outside layer of aluminum wires shall be right hand unless otherwise specified in the purchaser order. The direction of lay of the aluminum and steel wires shall be reversed in successive layers.

**TABLE 1 Construction Requirements of Aluminum Conductors, Steel Reinforced (ACSR)**

Size		Code Words ⁴	Class	Stranding Design Aluminum/ Steel	Stranding						Nominal O.D. of Conductors, in.	Mass, lb/1000 ft
cmil	AWG				Aluminum Wires			Steel Wires				
					Number	Diameter, in.	Layers	Number	Diameter, in.	Layers		
2 312 000	...	Thrasher	AA	76/19	76	0.1744	4	19	0.0814	2	1.802	2523
2 167 000	...	Kiwi	AA	72/7	72	0.1735	4	7	0.1157	1	1.735	2301
2 156 000	...	Bluebird	AA	84/19	84	0.1602	4	19	0.0961	2	1.762	2508
1 780 000	...	Chukar	AA	84/19	84	0.1456	4	19	0.0874	2	1.602	2072
1 590 000	...	Falcon	AA	54/19	54	0.1716	3	19	0.1030	2	1.545	2042
1 590 000	...	Lapwing	AA	45/7	45	0.1880	3	7	0.1253	1	1.504	1790
1 510 500	...	Parrot	AA	54/19	54	0.1672	3	19	0.1003	2	1.505	1938
1 510 500	...	Nuthatch	AA	45/7	45	0.1832	3	7	0.1221	1	1.466	1700
1 431 000	...	Plover	AA	54/19	54	0.1628	3	19	0.0977	2	1.465	1838
1 431 000	...	Bobolink	AA	45/7	45	0.1783	3	7	0.1189	1	1.427	1611
1 351 500	...	Martin	AA	54/19	54	0.1582	3	19	0.0949	2	1.424	1735
1 351 500	...	Dipper	AA	45/7	45	0.1733	3	7	0.1155	1	1.386	1521
1 272 000	...	Pheasant	AA	54/19	54	0.1535	3	19	0.0921	2	1.382	1634
1 272 000	...	Bittern	AA	45/7	45	0.1681	3	7	0.1121	1	1.345	1432
1 272 000	...	Skylark	AA	36/1	36	0.1880	3	1	0.1880	0	1.316	1286
1 192 500	...	Grackle	AA	54/19	54	0.1486	3	19	0.0892	2	1.338	1531
1 192 500	...	Bunting	AA	45/7	45	0.1628	3	7	0.1085	1	1.302	1342
1 113 000	...	Finch	AA	54/19	54	0.1436	3	19	0.0862	2	1.293	1430
1 113 000	...	Bluejay	AA	45/7	45	0.1573	3	7	0.1049	1	1.259	1254
1 033 500	...	Curlew	AA	54/7	54	0.1383	3	7	0.1383	1	1.245	1329
1 033 500	...	Ortolan	AA	45/7	45	0.1515	3	7	0.1010	1	1.212	1163
1 033 500	...	Tanager	AA	36/1	36	0.1694	3	1	0.1694	0	1.186	1044
954 000	...	Cardinal	AA	54/7	54	0.1329	3	7	0.1329	1	1.196	1227.1
954 000	...	Rail	AA	45/7	45	0.1456	3	7	0.0971	1	1.165	1074
954 000	...	Catbird	AA	36/1	36	0.1628	3	1	0.1628	0	1.140	964
900 000	...	Canary	AA	54/7	54	0.1291	3	7	0.1291	1	1.162	1158
900 000	...	Ruddy	AA	45/7	45	0.1414	3	7	0.0943	1	1.131	1013
795 000	...	Mallard	AA	30/19	30	0.1628	2	19	0.0977	2	1.140	1233.9
795 000	...	Condor	AA	54/7	54	0.1213	3	7	0.1213	1	1.092	1022
795 000	...	Tern	AA	45/7	45	0.1329	3	7	0.0886	1	1.063	895
795 000	...	Drake	AA	26/7	26	0.1749	2	7	0.1360	1	1.108	1093
795 000	...	Cuckoo	AA	24/7	24	0.1820	2	7	0.1213	1	1.092	1023
795 000	...	Coot	AA	36/1	36	0.1486	3	1	0.1486	0	1.040	803.6
715 500	...	Redwing	AA	30/19	30	0.1544	2	19	0.0926	2	1.081	1109.3
715 500	...	Starling	AA	26/7	26	0.1659	2	7	0.1290	1	1.051	983.7
715 500	...	Stilt	AA	24/7	24	0.1727	2	7	0.1151	1	1.036	921
666 600	...	Gannet	AA	26/7	26	0.1601	2	7	0.1245	1	1.014	916.2
666 600	...	Flamingo	AA	24/7	24	0.1667	2	7	0.1111	1	1.000	857.9
636 000	...	Egret	AA	30/19	30	0.1456	2	19	0.0874	2	1.019	987.2
636 000	...	Scoter	AA	30/7	30	0.1456	2	7	0.1456	1	1.019	995.1
636 000	...	Grosbeak	AA	26/7	26	0.1564	2	7	0.1216	1	0.990	874.2
636 000	...	Rook	AA	24/7	24	0.1628	2	7	0.1085	1	0.977	818.2
636 000	...	Swift	AA	36/1	36	0.1329	3	1	0.1329	0	0.930	642.8
636 000	...	Kingbird	AA	18/1	18	0.1880	2	1	0.1880	0	0.940	689.9
605 000	...	Teal	AA	30/19	30	0.1420	2	19	0.0852	2	0.994	938.6
605 000	...	Wood Duck	AA	30/7	30	0.1420	2	7	0.1420	1	0.994	946.5
605 000	...	Squab	AA	26/7	26	0.1525	2	7	0.1186	1	0.966	831.3
605 000	...	Peacock	AA	24/7	24	0.1588	2	7	0.1059	1	0.953	778.8
556 500	...	Eagle	AA	30/7	30	0.1362	2	7	0.1362	1	0.953	870.7
556 500	...	Dove	AA	26/7	26	0.1463	2	7	0.1138	1	0.927	765.2
556 500	...	Parakeet	AA	24/7	24	0.1523	2	7	0.1015	1	0.914	716.1
556 500	...	Osprey	AA	18/1	18	0.1758	2	1	0.1758	0	0.879	603.3
477 000	...	Hen	AA	30/7	30	0.1261	2	7	0.1261	1	0.883	746.4
477 000	...	Hawk	AA	26/7	26	0.1354	2	7	0.1053	1	0.858	655.3
477 000	...	Flicker	AA	24/7	24	0.1410	2	7	0.0940	1	0.846	613.9
477 000	...	Pelican	AA	18/1	18	0.1628	2	1	0.1628	0	0.814	517.3
397 500	...	Lark	AA	30/7	30	0.1151	2	7	0.1151	1	0.806	621.8
397 500	...	Ibis	AA	26/7	26	0.1236	2	7	0.0961	1	0.783	546.0
397 500	...	Brant	AA	24/7	24	0.1287	2	7	0.0858	1	0.772	511.4
397 500	...	Chickadee	AA	18/1	18	0.1486	2	1	0.1486	0	0.743	431.0
336 400	...	Oriole	AA	30/7	30	0.1059	2	7	0.1059	1	0.741	526.4
336 400	...	Linnet	AA	26/7	26	0.1137	2	7	0.0884	1	0.720	462.0
336 400	...	Merlin	AA	18/1	18	0.1367	2	1	0.1367	0	0.684	364.8
300 000	...	Ostrich	AA	26/7	26	0.1074	2	7	0.0835	1	0.680	412.2
266 800	...	Partridge	AA	26/7	26	0.1013	2	7	0.0788	1	0.642	366.9
266 800	...	Waxwing	AA	18/1	18	0.1217	2	1	0.1217	0	0.609	289.1
211 600	0000	Penguin	AA, A	6/1	6	0.1878	1	1	0.1878	0	0.563	290.8
211 300	...	Cochin	AA (HS)	12/7	12	0.1327	1	7	0.1327	1	0.664	526.8
203 200	...	Brahma	AA (HS)	16/19	16	0.1127	1	19	0.0977	2	0.714	674.6
190 800	...	Dorking	AA (HS)	12/7	12	0.1261	1	7	0.1261	1	0.631	475.7
176 900	...	Dotterel	AA (HS)	12/7	12	0.1214	1	7	0.1214	1	0.607	440.9

**TABLE 1** *Continued*

Size		Code Words ^A	Class	Stranding Design Aluminum/ Steel	Stranding						Nominal O.D. of Conductors, in.	Mass, lb/1000 ft
cmil	AWG				Aluminum Wires			Steel Wires				
					Number	Diameter, in.	Layers	Number	Diameter, in.	Layers		
167 800	000	Pigeon	AA, A	6/1	6	0.1672	1	1	0.1672	0	0.502	230.5
159 000	...	Guinea	AA (HS)	12/7	12	0.1151	1	7	0.1151	1	0.576	396.3
134 600	...	Leghorn	AA (HS)	12/7	12	0.1059	1	7	0.1059	1	0.530	335.5
133 100	00	Quail	AA, A	6/1	6	0.1489	1	1	0.1489	0	0.447	182.8
110 800	...	Minorca	AA (HS)	12/7	12	0.0961	1	7	0.0961	1	0.481	276.3
105 600	0	Raven	AA, A	6/1	6	0.1327	1	1	0.1327	0	0.398	145.2
101 800	...	Petrel	AA (HS)	12/7	12	0.0921	1	7	0.0921	1	0.461	253.8
83 690	1	Robin	AA, A	6/1	6	0.1181	1	1	0.1181	0	0.354	115.0
80 000	...	Grouse	AA (HS)	8/1	8	0.1000	1	1	0.1670	0	0.367	148.8
66 360	2	Sparate	AA, A	7/1	7	0.0974	1	1	0.1299	0	0.325	106.63
66 360	2	Sparrow	AA, A	6/1	6	0.1052	1	1	0.1052	0	0.316	91.2
41 740	4	Swanate	AA, A	7/1	7	0.0772	1	1	0.1029	0	0.257	66.95
41 740	4	Swan	AA, A	6/1	6	0.0834	1	1	0.0834	0	0.250	57.35
33 090	5	...	A	6/1	6	0.0743	1	1	0.0743	0	0.223	45.51
26 240	6	Turkey	AA, A	6/1	6	0.0661	1	1	0.0661	0	0.198	36.02

^A Code words shown are provided here for information only. These code names apply to Class AA Bare Aluminum Conductors, Steel Reinforced (ACSR) as shown above. They do not apply to Class A products shown in the above table.

Conversion factors:

1 cmil = 5.067 E – 0.4 mm²

1 in. = 2.54 E + 01 mm

1 lb/1000ft = 1.488 E + 00 kg/km

1 ft = 3.048 E – 01 m

1 lb = 4.536 E – 01 kg

1 lbf = 4.448 E – 03 kN

9. Construction

9.1 ACSR may be constructed using steel core wire with any one of two types of protective coatings. The acceptable core wires are:

9.1.1 Galvanized steel core wires, with coating Classes A or C in accordance with Specification **B498/B498M**;

9.1.2 High-strength galvanized steel core wire, coating Class A in accordance with Specification **B606**;

9.1.3 Zn-5A1-MM coated steel core wire, coating Class A, in accordance with Specification **B802/B802M**;

9.1.4 High-strength Zn-5A1-MM coated steel core wire, coating Class A in accordance with Specification **B803**;

9.1.5 Extra-high-strength galvanized steel core wire coating Class A in accordance with Specification **B957**;

9.1.6 Extra-high-strength Zn-5A1-MM coated steel core wire, coating Class A in accordance with Specification **B958**;

9.1.7 Ultra-high-strength galvanized steel core wire coating Class A in accordance with Specification **B957**; or

9.1.8 Ultra-high-strength Zn-5A1-MM coated steel core wire, coating Class A in accordance with Specification **B958**.

9.2 The number and diameter of aluminum and steel wires and the area of cross section of aluminum wires shall conform to the requirements prescribed in **Tables 1-5**.

9.3 Where compressed stranding is required in order to insulate the conductor properly, one or more aluminum layers of any stranded conductor consisting of 7 wires or more may be slightly compressed. The nominal diameter of the compressed conductor is 3 % below the nominal diameter of noncompressed conductor and the area of cross section after compressing is in accordance with Section 13.

9.4 For “HS” (High Strength) type conductors as denoted in **Table 1** and **Table 2**, unless specified by the customer, the

default strength of steel shall be regular strength Type GA2 to Specification **B498/B498M** or MA2 to Specification **B802/B802M**.

9.5 All steel wires shall lie naturally in their position in the stranded core, and where the core is cut, the wire ends shall remain in position or be readily replaced by hand and then remain approximately in position. This requirement also applies to the outer layer of aluminum wires of a conductor.

9.6 The stranded steel core shall be free from waviness and kinks.

9.7 Before stranding, aluminum and steel wires shall have approximately uniform temperatures.

9.8 The diameter of the finished conductor shall be not less than 99 % nor more than 101 % of that shown in **Table 1** and **Table 2** when measured with a diameter tape between the closing die(s) and the capstan of the strander.

10. A Rated Strength of Conductor

10.1 The rated strength of a completed conductor shall be taken as the aggregate strength of the aluminum and steel components, calculated as follows. The strength contribution of the aluminum wires shall be taken as the percentage, indicated in **Table 6**, of the sum of the strengths of the 1350-H19 wires, calculated from their specified nominal wire diameter and the appropriate specified minimum average tensile strength given in Specification **B230/B230M**. The strength contribution of the steel core wires shall be taken as the percentage, according to the number of layers of steel wires, indicated in **Table 6**, of the sum of the strengths of the steel wires, calculated from their specified nominal wire diameter and the appropriate specified minimum stress at 1 %

TABLE 2 Construction Requirements—Aluminum Conductors, Steel Reinforced (ACSR)

Size, mm ²	Class	Stranding Design	Stranding						Nominal Outside Diameter of Conductors, mm	Mass, kg/km
			Aluminum Wires			Steel Wires				
			Number	Diameter, mm	Layers	Number	Diameter, mm	Layers		
1250	AA	84/19	84	4.35	4	19	2.61	2	47.85	4274
1250	AA	76/19	76	4.58	4	19	2.14	2	47.34	4023
1250	AA	72/7	72	4.70	4	7	3.13	1	46.99	3901
1120	AA	84/19	84	4.12	4	19	2.47	2	45.31	3833
1120	AA	76/19	76	4.33	4	19	2.02	2	44.74	3595
1120	AA	72/7	72	4.45	4	7	2.97	1	44.51	3499
1000	AA	84/19	84	3.89	4	19	2.33	2	42.77	3416
1000	AA	72/7	72	4.21	4	7	2.81	1	42.11	3132
900	AA	84/19	84	3.69	4	19	2.21	2	40.57	3073
900	AA	72/7	72	3.99	4	7	2.66	1	39.9	2812
800	AA	54/19	54	4.34	3	19	2.60	2	39.04	3015
800	AA	45/7	45	4.76	3	7	3.17	1	38.07	2652
710	AA	54/19	54	4.09	3	19	2.45	2	36.79	2678
710	AA	45/7	45	4.48	3	7	2.99	1	35.85	2351
630	AA	54/19	54	3.85	3	19	2.31	2	34.65	2375
630	AA	45/7	45	4.22	3	7	2.81	1	33.75	2084
560	AA	54/19	54	3.63	3	19	2.18	2	32.68	2112
560	AA	45/7	45	3.98	3	7	2.65	1	31.83	1854
500	AA	54/7	54	3.43	3	7	3.43	1	30.87	1889
500	AA	45/7	45	3.76	3	7	2.51	1	30.09	1656
450	AA	54/7	54	3.26	3	7	3.26	1	29.34	1706
450	AA	45/7	45	3.57	3	7	2.38	1	28.56	1492
400	AA	30/19	30	4.12	2	19	2.47	2	28.83	1824
400	AA	26/7	26	4.43	2	7	3.45	1	28.07	1622
400	AA	24/7	24	4.61	2	7	3.07	1	27.65	1515
355	AA	30/19	30	3.88	2	19	2.33	2	27.17	1620
355	AA	26/7	26	4.17	2	7	3.24	1	26.4	1435
355	AA	24/7	24	4.34	2	7	2.89	1	26.03	1343
315	AA	30/19	30	3.66	2	19	2.20	2	25.64	1443
315	AA	26/7	26	3.93	2	7	3.06	1	24.9	1277
315	AA	24/7	24	4.09	2	7	2.73	1	24.55	1194
315	AA	18/1	18	4.72	2	1	4.72	0	23.6	1014
280	AA	30/7	30	3.45	2	7	3.45	1	24.15	1291
280	AA	26/7	26	3.70	2	7	2.88	1	23.44	1131
280	AA	24/7	24	3.85	2	7	2.57	1	23.11	1058
280	AA	18/1	18	4.45	2	1	4.45	0	22.25	901.0
250	AA	30/7	30	3.26	2	7	3.26	1	22.82	1152
250	AA	26/7	26	3.50	2	7	2.72	1	22.16	1011
250	AA	24/7	24	3.64	2	7	2.43	1	21.85	946.0
250	AA	18/1	18	4.21	2	1	4.21	0	21.05	806.4
224	AA	30/7	30	3.08	2	7	3.08	1	21.56	1029
224	AA	26/7	26	3.31	2	7	2.57	1	20.95	904.0
224	AA	24/7	24	3.45	2	7	2.30	1	20.7	849.2
224	AA	18/1	18	3.98	2	1	3.98	0	19.9	720.7
200	AA	30/7	30	2.91	2	7	2.91	1	20.37	918.2
200	AA	26/7	26	3.13	2	7	2.43	1	19.81	808.3
200	AA	24/7	24	3.26	2	7	2.17	1	19.55	757.6
200	AA	18/1	18	3.76	2	1	3.76	0	18.8	643.2
180	AA	30/7	30	2.76	2	7	2.76	1	19.32	826.0
180	AA	26/7	26	2.97	2	7	2.31	1	18.81	728.6
180	AA	24/7	24	3.09	2	7	2.06	1	18.54	681.2
180	AA	18/1	18	3.57	2	1	3.57	0	17.85	579.9
160	AA	30/7	30	2.61	2	7	2.61	1	18.27	738.6
160	AA	26/7	26	2.80	2	7	2.18	1	17.74	648.0
160	AA	24/7	24	2.91	2	7	1.94	1	17.46	604.2
160	AA	18/1	18	3.36	2	1	3.36	0	16.8	513.7
140	AA	26/7	26	2.62	2	7	2.04	1	16.6	567.4
140	AA	24/7	24	2.73	2	7	1.82	1	16.38	531.8



TABLE 2 Continued

Size, mm ²	Class	Stranding Design	Stranding						Nominal Outside Diameter of Conductors, mm	Mass, kg/km
			Aluminum Wires			Steel Wires				
			Number	Diameter, mm	Layers	Number	Diameter, mm	Layers		
140	AA	18/1	18	3.15	2	1	3.15	0	15.75	451.5
125	AA	26/7	26	2.47	2	7	1.92	1	15.64	503.7
125	AA	24/7	24	2.58	2	7	1.72	1	15.48	474.9
125	AA	18/1	18	2.97	2	1	2.97	0	14.85	401.3
100	AA (HS)	16/19	16	2.82	1	19	2.44	2	17.84	972.4
100	AA (HS)	12/7	12	3.26	1	7	3.26	1	16.3	734.1
100	AA, A	6/1	6	4.61	1	1	4.61	0	13.83	404.8
90	AA (HS)	12/7	12	3.09	1	7	3.09	1	15.45	659.5
80	AA (HS)	12/7	12	2.91	1	7	2.91	1	14.55	584.9
80	AA, A	6/1	6	4.12	1	1	4.12	0	12.36	323.3
71	AA (HS)	12/7	12	2.74	1	7	2.74	1	13.7	518.6
63	AA (HS)	12/7	12	2.59	1	7	2.59	1	12.95	463.4
63	AA, A	6/1	6	3.66	1	1	3.66	0	10.98	255.2
56	AA (HS)	12/7	12	2.44	1	7	2.44	1	12.2	411.2
50	AA (HS)	12/7	12	2.30	1	7	2.30	1	11.5	365.4
50	AA, A	6/1	6	3.26	1	1	3.26	0	9.78	202.4
40	AA (HS)	8/1	8	2.52	1	1	4.20	0	9.24	217.9
40	AA, A	6/1	6	2.91	1	1	2.91	0	8.73	161.3
31.5	AA, A	7/1	7	2.39	1	1	3.19	0	7.97	148.4
31.5	AA, A	6/1	6	2.59	1	1	2.59	0	7.77	127.8
25	AA, A	7/1	7	2.13	1	1	2.84	0	7.1	117.8
25	AA, A	6/1	6	2.30	1	1	2.30	0	6.9	100.8
20	AA, A	7/1	7	1.91	1	1	2.55	0	6.37	94.80
20	AA, A	6/1	6	2.06	1	1	2.06	0	6.18	80.83
16	AA, A	6/1	6	1.84	1	1	1.84	0	5.52	64.49
12.5	AA, A	6/1	6	1.63	1	1	1.63	0	4.89	50.61

extension given in Specification **B498/B498M**, **B606**, **B802/B802M**, or **B803**, whichever is applicable.

10.2 Rated strength and breaking strength values shall be rounded to three significant figures, in the final value only, in accordance with the rounding method of Practice **E29**.

10.3 Rated strength of various constructions are given in **Table 3** or **Table 4**.

11. Density

11.1 For the purpose of calculating mass per unit length, cross sections, etc., the density of aluminum 1350 shall be taken as 2705 kg/m³ [0.0975 lb/in.³] at 20°C (Explanatory **Note 5**).

11.2 For the purpose of calculating mass per unit length, cross sections, etc., the density of galvanized or aluminized steel wire shall be taken as 7780 kg/m³ [0.281 lb/in.³] at 20°C.

12. Mass Per Unit Length and Electrical Resistance

12.1 The mass per unit length and electrical resistance of a unit length of stranded conductor are a function of the length of lay. The approximate mass and electrical resistance may be determined using the standard increments shown in **Table 6**. When greater accuracy is desired, the increment based on the specific lay of the conductor may be calculated (Explanatory **Note 6**).

12.2 In the calculation of the electrical resistance of a conductor, the zinc-coated or Zn-5Al-MM coated steel core wires may be included.

13. Variation in Area

13.1 The area of cross section of the aluminum wires of a conductor shall be not less than 98 % of the area specified. Unless otherwise specified by the purchaser, the manufacturer may have the option of determining the cross-sectional area by either of the following methods, except that in case of question regarding area compliance, the method of **13.1.2** shall be used:

13.1.1 The area of cross section may be determined by calculations from diameter measurements, expressed to four decimal places, of the component aluminum wires at any point when measured perpendicularly to their axes.

13.1.2 The area of cross section of the aluminum wires of a conductor may be determined by Test Method **B263**. In applying that test method the increment in mass per unit length resulting from stranding may be the applicable value specified in **12.1** or may be calculated from the measured component dimensions of the sample under test. In case of question regarding area compliance, the actual mass per unit length increment due to stranding shall be calculated.

14. Workmanship, Finish, and Appearance

14.1 The conductor shall be clean and free of imperfections not consistent with good commercial practice.



TABLE 3 Rated Strength Aluminum Conductors, Steel Reinforced (ACSR)

Size		Class	Stranding Design Aluminum/Steel	ACSR/GA2 ACSR/MA2, kips	ACSR/GC2 kips	ACSR/GA3 ACSR/MA3, kips	ACSR/GA4 ACSR/MA4, kips	ACSR/GA5, ACSR/MA5, kips
cmil	AWG							
2 312 000	...	AA	76/19	56.7	54.8	58.5	59.9	60.4
2 167 000	...	AA	72/7	49.8	48.4	51.3	52.3	52.7
2 156 000	...	AA	84/19	60.3	57.7	62.8	64.8	65.4
1 780 000	...	AA	84/19	51.0	48.9	53.1	54.7	55.2
1 590 000	...	AA	54/19	54.5	51.6	57.5	59.7	60.4
1 590 000	...	AA	45/7	42.2	40.5	43.9	45.1	45.5
1 510 000	...	AA	54/19	51.7	48.9	54.5	56.6	57.3
1 510 000	...	AA	45/7	40.1	38.5	41.6	42.8	43.2
1 431 000	...	AA	54/19	49.1	46.4	51.7	53.7	54.4
1 431 000	...	AA	45/7	38.3	36.9	39.8	41.0	41.3
1 351 000	...	AA	54/19	46.3	43.8	48.8	50.7	51.3
1 351 000	...	AA	45/7	36.2	34.8	37.6	38.7	39
1 272 000	...	AA	54/19	43.6	41.2	46.0	47.7	48.3
1 272 000	...	AA	45/7	34.1	32.8	35.4	36.4	36.7
1 272 000	...	AA	36/1	26.4	26.0	27.0	27.4	27.6
1 192 500	...	AA	54/19	41.9	39.7	44.1	45.7	46.3
1 192 500	...	AA	45/7	32.0	30.7	33.2	34.1	34.4
1 113 000	...	AA	54/19	39.1	37.0	41.2	42.7	43.2
1 113 000	...	AA	45/7	29.8	28.7	31.0	31.9	32.2
1 033 500	...	AA	54/7	36.6	34.6	38.6	40.2	40.7
1 033 500	...	AA	45/7	27.7	26.6	28.8	29.6	29.8
1 033 500	...	AA	36/1	21.4	21.1	21.9	22.3	22.4
954 000	...	AA	54/7	33.8	32.0	35.7	37.1	37.6
954 000	...	AA	45/7	25.9	24.9	26.9	27.9	27.9
954 000	...	AA	36/1	19.8	19.5	20.3	20.6	20.7
900 000	...	AA	54/7	31.9	30.2	33.7	35.0	35.4
900 000	...	AA	45/7	24.4	23.5	25.4	26.1	26.3
795 000	...	AA	30/19	38.4	35.8	41.1	43.1	43.7
795 000	...	AA	54/7	28.2	26.6	29.7	30.9	31.3
795 000	...	AA	45/7	22.1	21.2	22.9	23.5	23.7
795 000	...	AA	26/7	31.5	29.6	33.5	34.9	35.4
795 000	...	AA	24/7	27.9	26.4	29.5	30.6	31.0
795 000	...	AA	36/1	16.8	16.5	17.2	17.4	17.5
715 500	...	AA	30/19	34.6	32.2	36.9	38.7	39.3
715 500	...	AA	26/7	28.4	26.6	30.1	31.4	31.9
715 500	...	AA	24/7	25.5	24.1	26.9	27.9	28.3
666 600	...	AA	26/7	26.4	24.8	28.0	29.3	29.7
666 600	...	AA	24/7	23.7	22.4	25.0	26.0	26.3
636 000	...	AA	30/19	31.5	29.4	33.6	35.2	35.8
636 000	...	AA	30/7	30.4	28.7	33.2	34.9	35.4
636 000	...	AA	26/7	25.2	23.6	26.8	27.9	28.3
636 000	...	AA	24/7	22.6	21.4	23.9	24.8	25.1
636 000	...	AA	36/1	13.8	13.5	14.0	14.2	14.3
636 000	...	AA	18/1	15.7	15.3	16.3	16.7	16.9
605 000	...	AA	30/19	30.0	28.0	32.0	33.5	34.0
605 000	...	AA	30/7	28.9	27.3	31.6	33.2	33.7
605 000	...	AA	26/7	24.3	22.8	25.8	26.9	27.3
605 000	...	AA	24/7	21.6	20.4	22.7	23.6	23.9
556 500	...	AA	30/7	27.8	25.8	29.7	31.2	31.7
556 500	...	AA	26/7	22.6	21.2	24.0	25.0	25.3
556 500	...	AA	24/7	19.8	18.7	20.9	21.7	22.0
556 500	...	AA	18/1	13.7	13.4	14.3	14.6	14.8
477 000	...	AA	30/7	23.8	22.1	25.5	26.8	27.2
477 000	...	AA	26/7	19.5	18.4	20.7	21.6	21.9
477 000	...	AA	24/7	17.2	16.2	18.1	18.8	19.0
477 000	...	AA	18/1	11.8	11.5	12.3	12.6	12.7
397 500	...	AA	30/7	20.3	18.9	21.7	22.8	23.1
397 500	...	AA	26/7	16.3	15.3	17.2	18.0	18.2
397 500	...	AA	24/7	14.6	13.9	15.4	16.0	16.2
397 500	...	AA	18/1	9.94	9.7	10.4	10.6	10.7
336 400	...	AA	30/7	17.3	16.2	18.5	19.4	19.7
336 400	...	AA	26/7	14.1	13.3	14.9	15.5	15.7
336 400	...	AA	18/1	8.68	8.4	8.96	9.17	9.24
300 000	...	AA	26/7	12.7	12.0	13.4	14.0	14.2
266 800	...	AA	26/7	11.3	10.6	11.9	12.4	12.6
266 800	...	AA	18/1	6.88	6.7	7.1	7.27	7.32
211 600	0000	AA, A	6/1	8.35	7.95	9.01	9.41	9.55
211 300	...	AA (HS)	12/7	20.7	18.9	22.6	24.0	24.4
203 200	...	AA (HS)	16/19	28.4	25.8	31.1	33.1	33.7
190 800	...	AA (HS)	12/7	18.7	17.0	20.4	21.6	22.1
176 900	...	AA (HS)	12/7	17.3	15.8	18.9	20.1	20.4
167 800	000	AA, A	6/1	6.62	6.30	7.15	7.46	7.57



TABLE 3 Continued

Size		Class	Stranding Design Aluminum/Steel	ACSR/GA2 ACSR/MA2, kips	ACSR/GC2 kips	ACSR/GA3 ACSR/MA3, kips	ACSR/GA4 ACSR/MA4, kips	ACSR/GA5, ACSR/MA5, kips
cmil	AWG							
159 000	...	AA (HS)	12/7	16.0	14.6	17.4	18.4	18.8
134 600	...	AA (HS)	12/7	13.6	12.4	14.8	15.7	16.0
133 100	00	AA, A	6/1	5.30	5.05	5.72	5.97	6.05
110 800	...	AA (HS)	12/7	11.3	10.3	12.2	13.0	13.2
105 600	0	AA, A	6/1	4.38	4.12	4.65	4.85	4.91
101 800	...	AA (HS)	12/7	10.4	9.46	11.2	11.9	12.1
83 690	1	AA, A	6/1	3.55	3.34	3.76	3.92	3.98
80 000	...	AA (HS)	8/1	5.20	4.89	5.73	6.04	6.15
66 360	2	AA, A	7/1	3.64	3.39	3.90	4.09	4.15
66 360	2	AA, A	6/1	2.85	2.68	3.01	3.14	3.18
41 740	4	AA, A	7/1	2.36	2.20	2.52	2.64	2.68
41 740	4	AA, A	6/1	1.86	1.76	1.97	2.05	2.07
33 090	5	A	6/1	1.49	1.41	1.57	1.64	1.66
26 240	6	AA, A	6/1	1.19	1.12	1.26	1.30	1.32

15. Mechanical and Electrical Tests

15.1 Tests for mechanical and electrical properties of aluminum wires shall be made before stranding (Explanatory Note 7).

15.2 All aluminum wires composing the conductors shall be capable of meeting the bending properties stated in Specification B230/B230M after stranding.

15.3 Routine production testing after stranding is not required. However, when such tests are requested by the purchaser and agreed to by the manufacturer at the time of placing the order (or made for other reasons) aluminum wires removed from the completed conductor shall have tensile strengths of not less than 95 % of the minimum tensile strength specified for the wire before stranding. The electrical resistivity shall meet the minimum resistivity specified for the wire before stranding. Elongation tests may be made for information purposes only and no minimum values are assigned (Explanatory Note 7). The frequency of these tests shall be agreed upon between the purchaser and the manufacturer.

15.4 Tests for demonstration of rated strength of the completed conductor are not required by this specification but may be made if agreed upon between the manufacturer and the purchaser at the time of placing an order. If tested, the breaking strength of the completed conductor shall be not less than the rated strength if failure occurs in the free length at least 1 in. [25 mm] beyond the end of either gripping device, or shall be not less than 95 % of the rated strength if failure occurs inside, or within 1 in. [25 mm] of the end of, either gripping device (Explanatory Note 8).

15.5 Tests for all properties of zinc-coated, or Zn-5A1-MM coated steel wires shall be made before stranding (Explanatory Note 7).

16. Inspection

16.1 Unless otherwise specified in the contract or purchase order, the manufacturer shall be responsible for the performance of all inspection and test requirements specified.

16.2 All inspections and tests shall be made at the place of manufacture unless otherwise especially agreed upon between the manufacturer and the purchaser at the time of the purchase.

16.3 The manufacturer shall afford the inspector representing the purchaser all reasonable access to manufacturer's facilities to satisfy him that the material is being furnished in accordance with this specification.

17. Packaging and Package Marking

17.1 Package sizes and kind of package, reels or coils, shall be agreed upon between the manufacturer and the purchaser at the time of placing the order. Recommended package sizes are shown in Table 7 or Table 8 (Explanatory Note 9).

17.2 There shall be only one length of conductor on a reel. (See Table 9.)

17.3 The conductors shall be protected against damage in ordinary handling and shipping. If heavy wood lagging is required, it shall be specified by the purchaser at the time of placing the purchase order.

NOTE 1—Multiple lengths per package are allowable only when the bare conductor is intended for re-manufacture, such as adding a covering or insulation. In such cases, the position of each end of a length is to be clearly marked and the length of each portion shall be shown on the tag attached to the end of the conductor.

17.4 The net mass, length, size, kind of conductors, stranding, type of coating, class of zinc or Zn-5A1-MM coating (if used), and any other necessary identification shall be marked on a tag attached to the end of the conductor inside the package. This same information, together with the purchase order number, the manufacturer's serial number (if any), and all shipping marks and other information required by the purchaser shall appear on the outside of each package.

18. Keywords

18.1 aluminum conductor; concentric-lay-stranded aluminum conductor; electrical conductors; electrical conductors, aluminum; steel-reinforced conductors; stranded aluminum conductors

TABLE 4 Rated Strength—Aluminum Conductor, Steel Reinforced (ACSR)

Size, mm ²	Class	Stranding Design	Rated Strength (by type of steel core wire)				
			ACSR/GA2 ACSR/MA2, kN	ACSR/GC2 kN	ACSR/GA3 ACSR/MA3, kN	ACSR/GA4 ACSR/MA4 kN	ACSR/GA5 ACSR/MA5, kN
1250	AA	84/19	306	293	319	329	332
1250	AA	76/19	269	260	278	284	286
1250	AA	72/7	250	242	257	262	264
1120	AA	84/19	275	263	286	295	298
1120	AA	76/19	240	232	248	254	256
1120	AA	72/7	226	219	232	237	238
1000	AA	84/19	245	234	254	262	265
1000	AA	72/7	202	196	208	212	213
900	AA	84/19	226	217	236	243	245
900	AA	72/7	181	176	186	190	192
800	AA	54/19	240	227	252	262	265
800	AA	45/7	186	179	193	199	201
710	AA	54/19	213	201	224	233	236
710	AA	45/7	167	160	173	178	180
630	AA	54/19	189	179	199	207	209
630	AA	45/7	148	142	153	158	159
560	AA	54/19	173	164	182	189	191
560	AA	45/7	132	126	136	140	142
500	AA	54/7	154	145	163	169	171
500	AA	45/7	118	113	122	125	127
450	AA	54/7	139	131	147	153	155
450	AA	45/7	108	104	112	115	116
400	AA	30/19	170	158	181	190	193
400	AA	26/7	139	131	148	154	157
400	AA	24/7	123	116	130	135	137
355	AA	30/19	151	140	161	169	171
355	AA	26/7	123	115	131	136	138
355	AA	24/7	111	105	117	121	123
315	AA	30/19	138	128	147	154	156
315	AA	26/7	110	103	117	122	123
315	AA	24/7	98.7	93.2	104	108	109
315	AA	18/1	68.0	66.3	70.8	72.7	73.2
280	AA	30/7	122	113	131	137	140
280	AA	26/7	100	94.1	106	111	112
280	AA	24/7	87.5	82.6	92.0	95.7	96.9
280	AA	18/1	60.4	58.9	63.0	64.6	65.1
250	AA	30/7	109	101	117	123	125
250	AA	26/7	89.5	84.1	94.6	98.7	100
250	AA	24/7	79.4	75.0	83.4	86.7	87.8
250	AA	18/1	54.1	52.7	56.4	57.8	58.2
224	AA	30/7	97.4	90.4	104	109	111
224	AA	26/7	80.0	75.1	84.5	88.2	89.4
224	AA	24/7	72.0	68.1	74.8	77.8	78.7
224	AA	18/1	48.3	47.1	50.4	51.7	52.0
200	AA	30/7	89.7	83.4	95.5	100	102
200	AA	26/7	71.5	67.2	75.6	78.8	79.9
200	AA	24/7	64.2	60.7	67.7	70.2	70.9
200	AA	18/1	43.1	42.1	45.0	46.1	46.4
180	AA	30/7	80.7	75.0	85.9	90.1	91.5
180	AA	26/7	65.4	61.4	69.0	72.0	73
180	AA	24/7	57.8	54.7	60.9	63.2	63.8
180	AA	18/1	40.4	39.1	41.4	42.4	42.7
160	AA	30/7	72.9	67.9	77.6	81.3	82.6
160	AA	26/7	58.9	55.4	62.4	64.9	65.7
160	AA	24/7	52.0	49.2	54.8	56.8	57.4
160	AA	18/1	35.8	34.6	37.0	37.8	38.1
140	AA	26/7	52.2	49.2	55.3	57.5	58.2
140	AA	24/7	46.4	44.0	48.9	50.6	51.1
140	AA	18/1	31.5	30.4	32.5	33.3	33.5

TABLE 4 Continued

Size, mm ²	Class	Stranding Design	Rated Strength (by type of steel core wire)				
			ACSR/GA2 ACSR/MA2, kN	ACSR/GC2 kN	ACSR/GA3 ACSR/MA3, kN	ACSR/GA4 ACSR/MA4 kN	ACSR/GA5 ACSR/MA5, kN
125	AA	26/7	46.9	44.2	49.6	51.6	52.2
125	AA	24/7	41.5	39.3	43.6	45.2	45.7
125	AA	18/1	28.8	27.9	29.7	30.4	30.6
100	AA (HS)	16/19	123	111	133	142	145
100	AA (HS)	12/7	85.9	78.0	93.8	99.4	101
100	AA, A	6/1	34.6	33.0	37.3	39.1	39.6
90	AA (HS)	12/7	77.2	70.1	84.2	89.3	91.0
80	AA (HS)	12/7	70.6	64.4	76.4	81.1	82.7
80	AA, A	6/1	27.6	26.4	29.8	31.2	31.6
71	AA (HS)	12/7	62.9	57.4	68.1	72.3	73.6
63	AA (HS)	12/7	56.2	51.3	60.8	64.6	65.8
63	AA, A	6/1	22.1	21.1	23.8	24.9	25.3
56	AA (HS)	12/7	50.2	45.8	54.3	57.6	58.7
50	AA (HS)	12/7	45.4	41.5	48.2	51.2	52.1
50	AA, A	6/1	18.1	17.0	19.2	20.0	20.3
40	AA (HS)	8/1	22.5	21.1	24.7	26.2	26.6
40	AA, A	6/1	14.9	14.0	15.7	16.4	16.6
31.5	AA, A	7/1	15.1	14.0	16.2	16.9	17.2
31.5	AA, A	6/1	11.9	11.2	12.6	13.1	13.3
25	AA, A	7/1	12.3	11.5	13.1	13.8	14.0
25	AA, A	6/1	9.53	9.09	10.1	10.5	10.6
20	AA, A	7/1	10.0	9.34	10.7	11.2	11.4
20	AA, A	6/1	7.84	7.39	8.29	8.61	8.70
16	AA, A	6/1	6.33	5.97	6.69	6.94	7.02
12.5	AA, A	6/1	4.97	4.69	5.25	5.45	5.51

TABLE 5 Lay Factors for Aluminum Conductors, Steel-Reinforced, Concentric-Lay-Stranded⁴

Stranding Class	Stranding	Ratio of Length of Lay of a Layer to Nominal Outside Diameter of That Layer									
		Aluminum Wire Layers									
		First (Outside)			Second			Third		Fourth (Inside)	
		Min	Preferred	Max	Min	Preferred	Max	Min	Max	Min	Max
A	6/1, 7/1	8	...	16	...	...	...	...	...	...	...
AA	76/19, 84/19	10	11	13	10	13	16	10	17	10	17
	72/7	10	11	13	10	13	16	10	17	10	17
	54/19	10	11	13	10	13	16	10	17	...	...
	54/7, 45/7	10	11	13	10	13	16	10	17	...	...
	30/19	10	11	13	10	13	16	...	...	...	...
	30/7, 26/7, 24/7	10	11	13	10	13	16	...	...	...	...
	18/1	10	11	13	10	13	16	...	...	...	...
	16/19	10	12.5	14.5	...	...	...	...	...	...	...
	12/7	10	12.5	14.5	...	...	...	...	...	...	...
	6/1, 7/1, 8/1	12	13	14.5	...	...	...	...	...	...	...

⁴ See Specification B500/B500M for the lay factors of the steel wire layers.

TABLE 6 Standard Increments and Rating Factors for Mass Per Unit Length, Resistivity, and Rated Strength Determination

Stranding Design Aluminum/ Steel	Standard Increments Due to Stranding (for mass per unit length and resistivity) Increase		Rating Factors (for rated strength)	
	Aluminum (%)	Steel (%)	Aluminum (%)	Steel (%)
6/1	1.5	0	96	96
7/1	1.5	0	96	96
8/1	2.0	0	96	96
18/1	2.0	0	93	96
36/1	2.0	0	91	96
12/7	2.5	0.4	96	96
24/7	2.5	0.4	93	96
26/7	2.5	0.4	93	96
30/7	2.75	0.4	93	96
42/7	2.5	0.4	91	96
45/7	2.5	0.4	91	96
48/7	2.5	0.4	91	96
54/7	2.5	0.4	91	96
72/7	3.0	0.4	90	96
16/19	2.5	0.6	96	93
30/19	2.75	0.6	93	93
54/19	3.0	0.6	91	93
76/19	3.0	0.6	90	93
84/19	3.0	0.6	90	93



TABLE 7 Packaging Information Recommended Reel Sizes, Shipping Lengths and Net Masses

Size		Stranding Design Aluminum/ Steel	Reel Types								
cmil	AWG		RMT			RM			NR		
		Reel Size ^A	Length on Reel, ft	Net Mass, lb	Reel Size ^A	Length on Reel, ft	Net Mass, lb	Reel Size ^A	Length on Reel, ft	Net Mass, lb	
2 312 000	...	76/19	96.60	7000	17 660	...	...	...	...	...	...
2 167 000	...	72/7	96.60	7000	16 100	...	...	...	...	...	...
2 156 000	...	84/19	96.60	7500	18 810	...	...	...	...	...	...
1 780 000	...	84/19	96.60	9200	19 060	...	...	...	...	...	...
1 590 000	...	54/19	90.45	5740	11 720	68.38	2870	5860	...	...	...
1 590 000	...	45/7	90.45	6000	10 740	68.38	3000	5370	60.28	2000	3580
1 510 000	...	54/19	90.45	6040	11 710	68.38	3020	5850	...	...	...
1 510 000	...	45/7	90.45	6320	10 740	68.38	3160	5370	60.28	2110	3590
1 431 000	...	54/19	90.45	6375	11 720	68.38	3190	5860	...	...	...
1 431 000	...	45/7	90.45	6665	10 730	68.38	3335	5370	60.28	2220	3580
1 351 000	...	54/19	90.45	6755	11 720	68.38	3375	5860	...	...	...
1 351 000	...	45/7	90.45	7060	10 740	68.38	3530	5370	60.28	2355	3580
1 272 000	...	54/19	90.45	7175	11 720	68.38	3585	5860	...	...	...
1 272 000	...	45/7	90.45	7500	10 740	68.38	3750	5370	60.28	2500	3580
1 272 000	...	36/1	84.45	6020	7 740	...	...	...	...	...	...
1 192 500	...	54/19	90.45	7650	11 720	68.38	3825	5860	...	...	...
1 192 500	...	45/7	90.45	8000	10 740	68.38	4000	5370	60.28	2665	3580
1 113 000	...	54/19	90.45	8200	11 730	68.38	4100	5860	...	...	...
1 113 000	...	45/7	90.45	8570	10 740	68.38	4285	5370	60.28	2855	3580
1 033 500	...	54/7	90.45	8870	11 790	68.38	4435	5890	...	...	...
1 033 500	...	45/7	90.45	9230	10 730	68.38	4615	5370	60.28	3075	3580
1 033 500	...	36/1	84.45	7420	7750	...	...	...	...	...	...
954 000	...	54/7	90.45	9600	11 780	68.38	4800	5890	...	...	...
954 000	...	45/7	90.45	10 000	10 740	68.38	5000	5370	60.28	3335	3580
954 000	...	36/1	84.45	8030	7740	...	...	...	...	...	...
900 000	...	54/7	90.45	10 180	11 790	68.38	5090	5890	...	...	...
900 000	...	45/7	90.45	10 590	10 730	68.38	5295	5360	60.28	3530	3580
795 000	...	30/19	84.45	7980	9850	66.32	3990	4920	...	...	...
795 000	...	54/7	90.45	11 520	11 780	68.38	5760	5890	...	...	...
795 000	...	45/7	90.45	12 000	10 740	68.38	6000	5370	60.28	4000	3580
795 000	...	26/7	84.36	6940	7590	...	...	...	60.28	3470	3790
795 000	...	24/7	84.36	6400	6540	...	...	...	60.28	3200	3270
795 000	...	36/1	84.45	9640	7750	...	...	...	...	...	...
715 500	...	30/19	84.45	8880	9850	66.32	4440	4930	...	...	...
715 500	...	26/7	84.36	7710	7580	...	...	...	60.28	3855	3790
715 500	...	24/7	84.36	7100	6540	...	...	...	60.28	3550	3270
666 600	...	26/7	84.36	8280	7590	...	...	...	60.28	4140	3790
666 600	...	24/7	84.36	7630	6550	...	...	...	60.28	3815	3270
636 000	...	30/19	84.45	9980	9850	66.32	4990	4930	...	...	...
636 000	...	30/7	...	...	...	66.32	5005	4980	...	...	...
636 000	...	26/7	84.36	8670	7580	...	...	...	60.28	4335	3790
636 000	...	24/7	84.36	8000	6550	...	...	...	60.28	4000	3270
636 000	...	36/1	...	...	...	66.32	6025	3870	...	...	...
636 000	...	18/1	...	...	...	66.32	6020	4150	48.28	3010	2080
...	42.28	2005	1380
605 000	...	30/19	84.45	10 490	9850	66.32	5245	4920	...	...	...
605 000	...	30/7	...	...	...	66.32	5245	4960	...	...	...
605 000	...	26/7	84.36	9110	7570	...	...	...	60.28	4555	3790
605 000	...	24/7	84.36	8410	6550	...	...	...	60.28	4205	3270
556 500	...	30/7	...	...	...	66.32	5700	4960	...	...	...
556 500	...	26/7	84.36	9910	7580	...	...	...	60.28	4955	3790
556 500	...	24/7	84.36	9140	6550	...	...	...	60.28	4570	3270
556 500	...	18/1	...	...	...	66.32	6890	4160	48.28	3445	2080
...	42.28	2295	1380
477 000	...	30/7	...	...	...	66.32	6650	4960	...	...	...
477 000	...	26/7	84.36	11 560	7580	...	...	...	60.28	5780	3790
477 000	...	24/7	84.36	10 660	6540	...	...	...	60.28	5330	3270
477 000	...	18/1	...	...	...	66.32	8030	4150	48.28	4015	2080
...	42.28	2675	1380
397 500	...	30/7	...	...	...	66.32	7980	4960	...	...	...
397 500	...	26/7	84.36	13 870	7570	...	...	...	60.28	6935	3790
397 500	...	24/7	84.36	12 790	6540	...	...	...	60.28	6395	3270
397 500	...	18/1	...	...	...	66.32	9630	4150	48.28	4815	2080
...	42.28	3210	1380
336 400	...	30/7	...	...	...	66.32	9430	4960	...	...	...
336 400	...	26/7	84.36	16 390	7570	...	...	...	60.28	8195	3790
336 400	...	18/1	...	...	...	66.32	11 390	4150	48.28	5695	2080
...	42.28	3795	1380
300 000	...	26/7	...	...	...	...	...	...	60.28	9190	3790
266 800	...	26/7	...	...	...	...	...	...	60.28	10 330	3790
266 800	...	18/1	...	...	...	66.32	14 360	4150	48.28	7180	2080

**B232/B232M – 11****TABLE 7 Continued**

Size		Stranding Design Aluminum/ Steel	Reel Types								
cmil	AWG		RMT			RM			NR		
			Reel Size ^A	Length on Reel, ft	Net Mass, lb	Reel Size ^A	Length on Reel, ft	Net Mass, lb	Reel Size ^A	Length on Reel, ft	Net Mass, lb
211 600	0000	6/1	...	...	...	...	...	...	42.28	4785	1380
									42.28	6080	1770
									36.22	3044	890
									30.22	2025	590
211 300	...	12/7	...	...	...	...	...	...	48.28	6020	3170
203 200	...	16/19	...	...	...	66.32	7875	5310	...	...	...
190 800	...	12/7	...	...	...	...	...	...	48.28	6665	3170
176 900	...	12/7	...	...	...	...	...	...	48.28	7195	3170
167 800	000	6/1	...	...	...	...	...	...	42.28	7670	1770
									36.22	3835	880
									30.22	2560	590
159 000	...	12/7	...	...	...	...	...	...	48.28	8000	3170
134 600	...	12/7	...	...	...	...	...	...	48.28	9450	3170
133 100	00	6/1	...	...	...	...	...	...	42.28	9670	1770
									36.22	4835	880
									30.22	3220	590
110 800	...	12/7	...	...	...	...	...	...	48.28	11 480	3170
105 600	0	6/1	...	...	...	...	...	...	42.28	12 190	1770
									36.22	6095	880
									30.22	4060	590
101 800	...	12/7	...	...	...	...	...	...	48.28	12 500	3170
83 690	1	6/1	...	...	...	...	...	...	42.28	15 360	1770
									36.22	7680	880
									30.22	5120	590
80 000	...	8/1	...	...	...	...	...	...	36.22	7580	1130
66 360	2	7/1	...	...	...	...	...	...	38.22	11 250	1200
									30.22	5625	600
66 360	2	6/1	...	...	...	...	...	...	42.28	19 390	1770
									36.22	9695	880
									30.22	6465	590
41 740	4	7/1	...	...	...	...	...	...	38.22	17 910	1200
									30.22	8955	600
41 740	4	6/1	...	...	...	...	...	...	36.22	15 420	880
26 240	6	6/1	...	...	...	...	...	...	30.22	16 340	590

^A See Table 9 for dimensions of reels.



TABLE 8 Packaging Information: Recommended Reel Sizes, Shipping Lengths, and Net Masses

Size, mm ²	Class	Stranding Design	Reel Designation								
			Reel Designation RMT			Reel Designation RM			Reel Designation NR		
			Reel Size ^A	Length on Reel, m	Net Mass of Conductors, kg	Reel Size ^A	Length on Reel, m	Net Mass of Conductors, kg	Reel Size ^A	Length on Reel, m	Net Mass of Conductors, kg
1250	AA	84/19	96.60	2010	8590	...	...	...	...	...	...
1250	AA	76/19	96.60	1975	7945	...	...	...	...	...	...
1250	AA	72/7	96.60	1875	7315	...	...	...	...	...	...
1120	AA	84/19	96.60	2240	8585	...	...	...	...	...	...
1120	AA	76/19	96.60	2210	7945	...	...	...	...	...	...
1120	AA	72/7	96.60	2090	7310	...	...	...	...	...	...
1000	AA	84/19	96.60	2515	8590	...	...	...	...	...	...
1000	AA	72/7	96.60	2335	7310	...	...	...	...	...	...
900	AA	84/19	96.60	2795	8590	...	...	...	...	...	...
900	AA	72/7	96.60	2600	7310	...	...	...	...	...	...
800	AA	54/19	90.45	1655	4990	68.38	880	2655	...	...	...
800	AA	45/7	90.45	1840	4880	68.38	920	2440	60.28	615	1630
710	AA	54/19	90.45	1860	4980	68.38	995	2665	...	...	...
710	AA	45/7	90.45	2075	4880	68.38	1040	2445	60.28	690	1620
630	AA	54/19	90.45	2100	4985	68.38	1120	2660	...	...	...
630	AA	45/7	90.45	2340	4875	68.38	1170	2440	60.28	780	1625
560	AA	54/19	90.45	2360	4985	68.38	1260	2660	...	...	...
560	AA	45/7	90.45	2630	4875	68.38	1315	2440	60.28	875	1620
500	AA	54/19	90.45	2655	5015	68.38	1415	2670	...	...	...
500	AA	45/7	90.45	2945	4875	68.38	1475	2440	60.28	980	1625
450	AA	54/7	90.45	2940	5015	68.38	1570	2680	...	...	...
450	AA	45/7	90.45	3265	4870	68.38	1635	2440	60.28	1090	1625
400	AA	30/19	84.45	2450	4470	66.32	1225	2235	...	...	...
400	AA	26/7	84.36	2125	3445	...	...	...	60.28	1060	1720
400	AA	24/7	84.36	1960	2970	...	...	...	60.28	980	1485
355	AA	30/19	84.45	2760	4470	66.32	1380	2235	...	...	...
355	AA	26/7	84.36	2400	3445	...	...	...	60.28	1200	1720
355	AA	24/7	84.36	2210	2970	...	...	...	60.28	1105	1485
315	AA	30/19	84.45	3100	4470	66.32	1550	2235	...	...	...
315	AA	26/7	84.36	2700	3445	...	...	...	60.28	1345	1715
315	AA	24/7	84.36	2485	2970	...	...	...	60.28	1245	1485
315	AA	18/1	...	...	...	66.32	1875	1900	48.28 42.28	940 625	955 635
280	AA	30/7	...	...	...	66.32	1745	2250	...	...	...
280	AA	26/7	84.36	3045.0	3445	...	...	...	60.28	1520	1720
280	AA	24/7	84.36	2805.0	2970	...	...	...	60.28	1405	1485
280	AA	18/1	...	...	...	66.32	2110	1900	48.28 42.28	1060 705	955 635
250	AA	30/7	...	...	...	66.32	1955	2255	...	...	...
250	AA	26/7	84.36	3410.0	3450	...	...	...	60.28	1700	1720
250	AA	24/7	84.36	3140.0	2970	...	...	...	60.28	1570	1485
250	AA	18/1	...	...	...	66.32	2355	1900	48.28 42.28	1180 790	950 635
224	AA	30/7	...	...	...	66.32	2190	2255	...	...	...
224	AA	26/7	84.36	3810.0	3445	...	...	...	60.28	1905	1720
224	AA	24/7	84.36	3500.0	2970	...	...	...	60.28	1750	1485
224	AA	18/1	...	...	...	66.32	2635	1900	48.28 42.28	1320 880	950 635
200	AA	30/7	...	...	...	66.32	2455	2255	...	...	...
200	AA	26/7	84.36	4265.0	3445	...	...	...	60.28	2130	1720
200	AA	24/7	84.36	3920.0	2970	...	...	...	60.28	1960	1485
200	AA	18/1	...	...	...	66.32	2955	1900	48.28 42.28	1480 985	950 635
180	AA	30/7	...	...	...	66.32	2730	2255	...	...	...
180	AA	26/7	84.36	4725.0	3445	...	...	...	60.28	2360	1720
180	AA	24/7	84.36	4360.0	2970	...	...	...	60.28	2180	1485
180	AA	18/1	...	...	...	66.32	3280	1900	48.28 42.28	1645 1095	955 635

**B232/B232M – 11****TABLE 8** *Continued*

Size, mm ²	Class	Stranding Design	Reel Designation								
			Reel Designation RMT			Reel Designation RM			Reel Designation NR		
			Reel Size ^A	Length on Reel, m	Net Mass of Conductors, kg	Reel Size ^A	Length on Reel, m	Net Mass of Conductors, kg	Reel Size ^A	Length on Reel, m	Net Mass of Conductors, kg
160	AA	30/7	...	...	...	66.32	3050	2255	...	...	...
160	AA	26/7	84.36	5315.0	3445	...	...	...	60.28	2655	1720
160	AA	24/7	84.36	4915.0	2970	...	...	...	60.28	2460	1485
160	AA	18/1	...	...	...	66.32	3705	1905	48.28	1855	955
									42.28	1240	635
140	AA	26/7	...	...	...	...	...	...	60.28	3035	1720
140	AA	24/7	...	...	...	...	...	...	60.28	2790	1485
140	AA	18/1	...	...	...	66.32	4210	1900	48.28	2110	955
									42.28	1405	635
125	AA	26/7	...	...	...	...	...	...	60.28	3415	1720
125	AA	24/7	...	...	...	...	...	...	60.28	3125	1485
125	AA	18/1	...	...	...	66.32	4735	1900	48.28	2375	955
									42.28	1585	635
100	AA (HS)	16/19	...	...	...	66.32	2480	2410	...	...	...
100	AA (HS)	12/7	...	...	...	...	...	...	...	...	...
100	AA, A	6/1	...	...	...	...	...	...	42.28	1990	805
									36.22	990	400
									30.22	665	270
90	AA (HS)	12/7	...	...	...	...	...	...	...	...	...
80	AA (HS)	12/7	...	...	...	...	...	...	...	...	...
80	AA, A	6/1	...	...	...	...	...	...	42.28	2490	805
									36.22	1235	400
									30.22	835	270
71	AA (HS)	12/7	...	...	...	...	...	...	...	...	...
63	AA (HS)	12/7	...	...	...	...	...	...	...	...	...
63	AA, A	6/1	...	...	...	...	...	...	42.28	3155	805
									36.22	1565	400
									30.22	1060	270
56	AA (HS)	12/7	...	...	...	...	...	...	...	...	...
50	AA (HS)	12/7	...	...	...	...	...	...	...	...	...
50	AA, A	6/1	...	...	...	...	...	...	42.28	3975	805
									36.22	1975	400
									30.22	1335	270
40	AA (HS)	8/1	...	...	...	...	...	...	...	...	...
40	AA, A	6/1	...	...	...	...	...	...	42.28	4990	805
									36.22	2480	400
									30.22	1675	270
31.5	AA, A	7/1	...	...	...	...	...	...	38.22	3675	545
									30.22	1820	270
31.5	AA, A	6/1	...	...	...	...	...	...	42.28	6300	805
									36.22	3130	400
									30.22	2115	270
25	AA, A	7/1	...	...	...	...	...	...	38.22	4625	545
									30.22	2290	270
25	AA, A	6/1	...	...	...	...	...	...	36.22	3970	400
20	AA, A	7/1	...	...	...	...	...	...	38.22	5750	545
									30.22	2850	270
20	AA, A	6/1	...	...	...	...	...	...	36.22	4950	400
16	AA, A	6/1	...	...	...	...	...	...	30.22	4185	270
12.5	AA, A	6/1	...	...	...	...	...	...	30.22	5335	270

^ASee Table 9 for dimensions of reels.



TABLE 9 Dimensions of Standard Reels (For Information Only)

Reel Designation ^{A,B}	Reel Capacity, in. ³ (m ³)	Flange Diameter in. (m)	Drum Diameter in. (m)	Nominal Reel Dimensions		
				Width		Arbor Hole Diameter in. (m)
				Inside in. (m)	Outside ^C in. (m)	
NR 30.22	9 950 (0.182)	30 (0.76)	18 (0.41)	22 (0.56)	25 (0.64)	3 to 3¼ (76–83)
NR 36.22	16 800 (0.275)	36 (0.91)	18 (0.46)	22 (0.56)	25 (0.64)	3 to 3¼ (76–83)
NR 38.22	18 000 (0.295)	38 (0.97)	20 (0.51)	22 (0.56)	25 (0.64)	3 to 3¼ (76–83)
NR 42.28	29 100 (0.477)	42 (1.07)	21 (0.53)	28 (0.71)	32½ (0.83)	3 to 3¼ (76–83)
NR 48.28	38 000 (0.623)	48 (1.22)	24 (0.61)	28 (0.71)	32½ (0.83)	3 to 3¼ (76–83)
NR 60.28 ^D	61 900 (1.014)	60 (1.52)	28 (0.71)	28 (0.71)	32½ (0.83)	3 to 3¼ (76–83)
RM 66.32 ^E	76 900 (1.260)	66 (1.68)	36 (0.91)	32 (0.81)	38 (0.97)	3 to 3¼ (76–83)
RM 68.38 ^E	99 300 (1.627)	68 (1.73)	36 (0.91)	38 (0.97)	44 (1.12)	3 to 3¼ (76–83)
RMT 84.36 ^F	122 100 (2.001)	78 (84) (1.98 (2.13))	42 (1.07)	36 (0.91)	43 (1.09)	5 to 5¼ (127-133)
RMT 84.45 ^F	152 700 (2.502)	78 (84) (1.98 (2.13))	42 (1.07)	45 (1.14)	52 (1.32)	5 to 5¼ (127-133)
RMT 90.45 ^F	187 000 (3.064)	84 (90) (2.13 (2.29))	42 (1.07)	45 (1.14)	52 (1.32)	5 to 5¼ (127-133)
RMT 96.60 ^F	300 000 (4.893)	90 (96) (2.29 (2.44))	42 (1.07)	60 (1.52)	67 (1.70)	5 to 5¼ (127-133)

^A Prefix “NR” denotes wooden nonreturnable reel, “RM” metal returnable reel, and “RMT” metal returnable reel with one-beam tires.

^B Reels are not designed to withstand the forces required for braking during tension stringing operations.

^C Pay-off equipment for reels NR 48.28 and smaller should be a minimum of 2 in. (50 mm) wider than the nominal outside reel width to provide for extension of bolts and for possible flange distortion. For reels NR 60.28 and larger, either wood or metal, pay-off equipment should be not less than 4 in. (100 mm) wider than the reel width.

^D Hub reinforcements will be provided for reel NR 60.28.

^E Reels RM 66.32 and RM 68.38 have flat rims.

^F Reels RMT 84.36, RMT 84.45, RMT 90.45, and RMT 96.60 have 3-in. (76 mm) I-beam tires. Reels with similar dimensions except without I-beam tires are sometimes used.

EXPLANATORY NOTES

NOTE 1—In this specification only concentric-lay-stranded aluminum conductors, steel-reinforced, are specifically designated. Conductor constructions not included in this specification should be agreed upon between the manufacturer and the purchaser when placing the order.

NOTE 2—For definitions of terms relating to conductors, refer to Terminology B354.

NOTE 3—The behavior of properly spaced wire joints in stranded conductors is related to both their tensile strength and elongation. Because of its higher elongation properties, the lower-strength electric-butt weld gives equivalent overall performance to that of a cold-pressure weld or an electric-butt, cold-upset weld in stranded conductors.

NOTE 4—The preferred ratio of the lay with respect to the outside diameter of a layer of wires varies for different layers and for different diameters of the conductors, being larger for the inside layers than for the outside layer, and larger for conductors of small diameter than for those of large diameter.

NOTE 5—This density is based upon aluminum of 99.50 % purity. The inch-pound density of the aluminum wires is used for mass per unit length calculations and is based upon the standard SI density with the conversion rounded to the nearest 0.0005 lb/in.³

NOTE 6—The increment of mass or electrical resistance of a completed concentric-lay-stranded conductor (*k*) in percent is:

$$k = 100(m - 1)$$

where *m* is the stranding factor, and also the ratio of the mass or electrical resistance of a unit length of stranded conductor to that of a solid conductor of the same cross-sectional area or of a stranded conductor with infinite length of lay, that is, all wires parallel to the conductor axis. The stranding factor *m* for the completed stranded conductor is the numerical average of the stranding factors for each of the individual wires in the conductor, including the straight core wire, if any (for which the stranding factor is unity). The stranding factor (*m_{ind}*) for any given wire in a concentric-lay-stranded conductor is:

$$m_{ind} = \sqrt{1 + (9.8696/n^2)}$$

where *n* =

$$\frac{\text{length of lay}}{\text{diameter of helical path of the wire}}$$

The derivation of the above is given in *NBS Handbook, 100 Copper Wire Tables*.

The factors *k* and *m* are to be determined separately for the zinc-coated or Zn-5Al-MM coated steel (Section 8).

NOTE 7—Wires unlaidd from conductors may have different physical properties from those of the wire prior to stranding because of the deformation caused by stranding and straightening for test. If tests on galvanized or Zn-5Al-MM coated steel wires are to be made after stranding, the purchaser and the manufacturer at the time of placing the order should agree on the properties to be met.

NOTE 8—To test ACSR conductors for breaking strength successfully as a unit requires special devices for gripping the ends of the aluminum and steel wires without causing damage that may result in failure below the actual strength of the conductor. Various special dead-end devices are available such as compression sleeves, split sleeves, and preformed grips, but ordinary jaws or clamping devices usually are not suitable.

NOTE 9—For the convenience of the users of this specification, Tables 7 and 8 have been prepared giving recommended shipping lengths for the standard sizes of ACSR referred to in Tables 1 and 2 respectively. Values of net mass in this table are rounded to the nearest ten pound increment. Because of the variations in coil masses, etc., it is common practice to allow a permissible variation in length of ±5 % for sizes larger than No. 1 AWG [40 mm²] and a tolerance of ±10 % on sizes No. 1 AWG [40 mm²] and smaller. It is also common practice to allow an amount not exceeding 10 % of the total mass of any one order to be shipped in random lengths with no piece shorter than 50 % of the standard length ordered.



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