Designation: B911/B911M – 12 (Reapproved 2016)

Standard Specification for ACSR Twisted Pair Conductor (ACSR/TP)[1]

This standard is issued under the fixed designation B911/B911M; 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 ACSR Twisted Pair Conductor (ACSR/TP) for use as overhead electric conductors (see Notes 1 and 2).

NOTE 1—The conductor is fabricated from two component ACSR conductors of the same size twisted helically around each other. This conductor is identified by the code name of the component ACSR conductor followed by /TP or the size and type of the component ACSR conductor followed by /TP.

NOTE 2—There are registered trademark symbols that are also used to identify the twisted pair notation. Consult cable manufacturers for additional details.

1.2 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.

1.2.1 For conductor sizes designated 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 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

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

2.2 *ASTM Standards:*[2]

B232/B232M Specification for Concentric-Lay-Stranded Aluminum Conductors, Coated-Steel Reinforced (ACSR)

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *component conductors*—the two conductors twisted to fabricate the finished ACSR/TP.

4. Ordering Information

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

4.1.1 Quantity of each size,

4.1.1.1 *Conductor Size*—kcmil area of the fabricated ACSR/TP (2 × kcmil area of one of the component conductors),

4.1.2 Conductor type and the number of wires of the component conductors,

4.1.3 The type of steel core wire and type of coating,

4.1.4 Place of inspection,

4.1.5 Package size and type,

4.1.6 Special package markings, if required, and

4.1.7 Heavy wood lagging, if required.

5. Requirements for Component Conductors

5.1 Before twisting, the component conductors shall conform to the requirements of Specification B232/B232M.

6. Twist

6.1 The component conductors shall be twisted about themselves with a complete twist every 9 ft ± 1 ft. This twist length shall be measured between the twisting machine and the take-up reel with normal take-up tension on the ACSR/TP.

NOTE 3—The twist length can be altered as the ACSR/TP is wound up onto the take-up reel. It may not have the same twist length as when the TP is removed from the reel.

6.2 The direction of the twist shall be left hand.

[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.

TABLE 1 Construction Requirements for TP Type Conductor Using Aluminum Conductor, Steel Reinforced (ACSR)

Code Word[A]	Equivalent Size AWG or kcmil	Component Composition			Outer Dimensions in.		Nominal Mass[B] lb/1000ft	Rated Strg. lb[C]	Resistance[D] Ohms/1000ft dc at 20°C
		AWG or kcmil	Aluminum	Steel	minor	major			
Swan / TP	1	4	6 × 0.0834	1 × 0.0834	0.250	0.500	115	3700	0.2016
Swanate / TP	1	4	7 × 0.0772	1 × 0.1029	0.257	0.514	115	4720	0.1994
Swallow / TP	1/0	3	6 × 0.0937	1 × 0.0937	0.281	0.562	145	4600	0.1601
Sparrow / TP	2/0	2	6 × 0.1052	1 × 0.1052	0.316	0.632	182	5660	0.1267
Sparate / TP	2/0	2	7 × 0.0974	1 × 0.1299	0.325	0.650	213	7260	0.1253
Robin / TP	3/0	1	6 × 0.1181	1 × 0.1181	0.354	0.708	230	7120	0.1005
Raven / TP	4/0	1/0	6 × 0.1327	1 × 0.1327	0.398	0.796	290	8760	0.0796
Quail / TP	266.2	2/0	6 × 0.1489	1 × 0.1489	0.447	0.894	336	10600	0.0633
Pigeon / TP	335.6	3/0	6 × 0.1672	1 × 0.1672	0.502	1.004	461	13200	0.0502
Penguin / TP	423.2	4/0	6 × 0.1878	1 × 0.1878	0.563	1.126	582	16700	0.0398
Jaeger / TP	456.4	228.2	18 × 0.1126	1 × 0.1126	0.563	1.126	495	12100	0.0376
Waxwing / TP	533.6	266.8	18 × 0.1217	1 × 0.1217	0.609	1.218	579	13700	0.0322
Spoonbill / TP	533.6	266.8	22 × 0.1101	7 × 0.0612	0.624	1.248	642	17400	0.0321
Scaup / TP	533.6	266.8	24 × 0.1054	7 × 0.0703	0.633	1.266	687	20000	0.0320
Partridge / TP	533.6	266.8	26 × 0.1013	7 × 0.0788	0.642	1.284	734	22600	0.0319
Junco / TP	533.6	266.8	30 × 0.0943	7 × 0.0943	0.660	1.320	835	27800	0.0316
Ostrich / TP	600.0	300.0	26 × 0.1074	7 × 0.0835	0.680	1.360	825	25400	0.0283
Merlin / TP	672.8	336.4	18 × 0.1367	1 × 0.1367	0.683	1.366	730	17400	0.0255
Trogon / TP	672.8	336.4	20 × 0.1297	7 × 0.0576	0.692	1.384	757	19000	0.0256
Woodcock / TP	672.8	336.4	22 × 0.1237	7 × 0.0687	0.701	1.402	809	21800	0.0255
Widgeon / TP	672.8	336.4	24 × 0.1184	7 × 0.0789	0.710	1.420	866	25000	0.0254
Linnet / TP	672.8	336.4	26 × 0.1137	7 × 0.0884	0.720	1.440	925	28200	0.0253
Oriole / TP	672.8	336.4	30 × 0.1059	7 × 0.1059	0.741	1.482	1053	34600	0.0251
Chickadee / TP	795.0	397.5	18 × 0.1486	1 × 0.1486	0.743	1.486	862	19900	0.0216
Ptarmigan / TP	795.0	397.5	20 × 0.1410	7 × 0.0627	0.752	1.504	895	22200	0.0216
Stork / TP	795.0	397.5	22 × 0.1344	7 × 0.0747	0.762	1.524	956	25800	0.0216
Brant / TP	795.0	397.5	24 × 0.1287	7 × 0.0858	0.772	1.544	1023	29200	0.0215
Ibis / TP	795.0	397.5	26 × 0.1236	7 × 0.0961	0.783	1.566	1093	32600	0.0214
Lark / TP	795.0	397.5	30 × 0.1151	7 × 0.1151	0.806	1.612	1244	40600	0.0212
Pelican / TP	954.0	477.0	18 × 0.1628	1 × 0.1628	0.814	1.628	1035	23600	0.0180
Tailorbird / TP	954.0	477.0	20 × 0.1544	7 × 0.0686	0.823	1.646	1074	26200	0.0180
Toucan / TP	954.0	477.0	22 × 0.1472	7 × 0.0818	0.834	1.668	1148	30400	0.0180
Flicker / TP	954.0	477.0	24 × 0.1410	7 × 0.0940	0.846	1.692	1227	34400	0.0179
Hawk / TP	954.0	477.0	26 × 0.1354	7 × 0.1053	0.858	1.716	1312	39000	0.0178
Hen / TP	954.0	477.0	30 × 0.1261	7 × 0.1261	0.883	1.766	1493	47600	0.0177
Heron / TP	1000.0	500.0	30 × 0.1291	7 × 0.1291	0.904	1.808	1565	50000	0.0169
Nightingale/TP	1034.0	517.0	18 × 0.1694	1 × 0.1694	0.848	1.696	1121	25400	0.0166
Creeper / TP	1034.0	517.0	20 × 0.1607	7 × 0.0714	0.858	1.716	1164	28400	0.0166
Osprey / TP	1113.0	556.5	18 × 0.1758	1 × 0.1758	0.879	1.758	1207	27400	0.0154
Tody / TP	1113.0	556.5	20 × 0.1668	7 × 0.0741	0.890	1.780	1253	30600	0.0155
Sapsucker / TP	1113.0	556.5	22 × 0.1590	7 × 0.0883	0.901	1.802	1339	35200	0.0154
Parakeet / TP	1113.0	556.5	24 × 0.1523	7 × 0.1015	0.914	1.828	1432	39600	0.0153
Dove / TP	1113.0	556.5	26 × 0.1463	7 × 0.1138	0.927	1.854	1530	45200	0.0153
Eagle / TP	1113.0	556.5	30 × 0.1362	7 × 0.1362	0.953	1.906	1741	55600	0.0152
Kittiwake / TP	1192.0	596.0	18 × 0.1820	1 × 0.1820	0.910	1.820	1293	29400	0.0144
Skua / TP	1210.0	605.0	20 × 0.1739	7 × 0.0773	0.928	1.856	1362	33200	0.0142
Peacock / TP	1210.0	605.0	24 × 0.1588	7 × 0.1059	0.953	1.906	1557	43200	0.0141
Squab / TP	1210.0	605.0	26 × 0.1525	7 × 0.1186	0.966	1.932	1664	48600	0.0141
Wood Duck/ TP	1210.0	605.0	30 × 0.1420	7 × 0.1420	0.994	1.988	1893	57800	0.0140
Teal / TP	1210.0	605.0	30 × 0.1420	19 × 0.0852	0.994	1.988	1877	60000	0.0140
Swift / TP	1272.0	636.0	36 × 0.1329	1 × 0.1329	0.930	1.860	1286	27600	0.0135
Kingbird / TP	1272.0	636.0	18 × 0.1880	1 × 0.1880	0.940	1.880	1379	31400	0.0135
Turacos / TP	1272.0	636.0	20 × 0.1783	7 × 0.0792	0.951	1.902	1432	34800	0.0135
Rook / TP	1272.0	636.0	24 × 0.1628	7 × 0.1085	0.977	1.954	1530	45200	0.0134
Grosbeak / TP	1272.0	636.0	26 × 0.1564	7 × 0.1216	0.990	1.980	1637	50400	0.0134
Scoter / TP	1272.0	636.0	30 × 0.1456	7 × 0.1456	1.019	2.038	1749	60800	0.0133
Egret / TP	1272.0	636.0	30 × 0.1456	19 × 0.0874	1.019	2.038	1974	63000	0.0133
Siskin / TP	1333.2	666.6	20 × 0.1826	7 × 0.0812	0.974	1.948	1501	36600	0.0129
Flamingo / TP	1333.2	666.6	24 × 0.1667	7 × 0.1111	1.000	2.000	1715	47600	0.0128
Gannet / TP	1333.2	666.6	26 × 0.1601	7 × 0.1245	1.014	2.028	1833	52800	0.0128
Dunlin / TP	1431.0	715.5	20 × 0.1891	7 × 0.0840	1.008	2.016	1611	39200	0.0120
Stilt / TP	1431.0	715.5	24 × 0.1727	7 × 0.1151	1.036	2.072	1841	51000	0.0119
Starling / TP	1431.0	715.5	26 × 0.1659	7 × 0.1290	1.051	2.102	1968	56800	0.0119
Redwing / TP	1431.0	715.5	30 × 0.1544	19 × 0.0926	1.081	2.162	2220	69200	0.0118
Coot / TP	1590.0	795.0	36 × 0.1486	1 × 0.1486	1.040	2.080	1607	33400	0.0108
Macaw / TP	1590.0	795.0	42 × 0.1376	7 × 0.0764	1.055	2.110	1715	40200	0.0108
Turbit / TP	1590.0	795.0	20 × 0.1994	7 × 0.0886	1.063	2.126	1790	43600	0.0108
Tern / TP	1590.0	795.0	45 × 0.1329	7 × 0.0886	1.063	2.126	1790	44200	0.0108
Puffin / TP	1590.0	795.0	22 × 0.1901	7 × 0.1056	1.077	2.154	1913	49600	0.0108
Cuckoo / TP	1590.0	795.0	24 × 0.1820	7 × 0.1213	1.092	2.184	2046	55800	0.0107
Condor / TP	1590.0	795.0	54 × 0.1213	7 × 0.1213	1.092	2.184	2046	56400	0.0107
Drake / TP	1590.0	795.0	26 × 0.1749	7 × 0.1360	1.108	2.216	2186	63000	0.0107
Mallard / TP	1590.0	795.0	30 × 0.1628	19 × 0.0977	1.140	2.280	2467	76800	0.0106

TABLE 1 *Continued*

Code Word[A]	Equivalent Size AWG or kcmil	Component Composition			Outer Dimensions in.		Nominal Mass[B] lb/1000ft	Rated Strg. lb[C]	Resistance[D] Ohms/1000ft dc at 20°C
		AWG or kcmil	Aluminum	Steel	minor	major			
Surfbird / TP	1749.0	874.5	20 × 0.2091	7 × 0.0929	1.115	2.230	1969	47400	0.0098
Turnstone / TP	1800.0	900.0	20 × 0.2121	7 × 0.0943	1.131	2.262	2026	48200	0.0096
Ruddy / TP	1800.0	900.0	45 × 0.1414	7 × 0.0943	1.131	2.262	2026	48800	0.0096
Canary / TP	1800.0	900.0	54 × 0.1291	7 × 0.1291	1.162	2.324	2316	63800	0.0095
Catbird / TP	1908.0	954.0	36 × 0.1628	1 × 0.1628	1.140	2.280	1929	39600	0.0090
Phoenix / TP	1908.0	954.0	42 × 0.1507	7 × 0.0387	1.155	2.310	2058	46800	0.0090
Corncrake/ TP	1908.0	954.0	20 × 0.2184	7 × 0.0971	1.165	2.330	2148	51200	0.0090
Rail / TP	1908.0	954.0	45 × 0.1456	7 × 0.0971	1.165	2.330	2148	51800	0.0090
Towhee / TP	1908.0	954.0	48 × 0.1410	7 × 0.1097	1.175	2.350	2245	57000	0.0090
Redbird / TP	1908.0	954.0	24 × 0.1994	7 × 0.1329	1.196	2.392	2455	67000	0.0089
Cardinal / TP	1908.0	954.0	54 × 0.1329	7 × 0.1329	1.196	2.392	2455	67600	0.0090
Canvasback /TP	1908.0	954.0	30 × 0.1783	19 × 0.1070	1.248	2.497	2961	92200	0.0089
Snowbird / TP	2067.0	1033.5	42 × 0.1569	7 × 0.0872	1.203	2.406	2230	50800	0.0083
Ortolan / TP	2067.0	1033.5	45 × 0.1515	7 × 0.1010	1.212	2.424	2327	55400	0.0083
Whooper / TP	2067.0	1033.5	48 × 0.1467	7 × 0.1141	1.223	2.446	2432	61600	0.0083
Curlew / TP	2067.0	1033.5	54 × 0.1383	7 × 0.1383	1.245	2.490	2659	73300	0.0083
Avocet / TP	2226.0	1113.0	42 × 0.1628	7 × 0.0904	1.248	2.496	2401	54200	0.0077
Bluejay / TP	2226.0	1113.0	45 × 0.1573	7 × 0.1049	1.259	2.518	2506	59600	0.0077
Bullfinch / TP	2226.0	1113.0	48 × 0.1523	7 × 0.1185	1.269	2.538	2619	65600	0.0077
Finch / TP	2226.0	1113.0	54 × 0.1436	19 × 0.0862	1.293	2.586	2858	78200	0.0077

[A] Code words as shown denote ACSR/TP with Class A galvanized core. Add suffix as specified by B232/B232M to denote strength and coating type of steel core.
[B] Mass based on relative density at 20°C of 0.0875 lb/in^3 for aluminum and 0.281 lb/in^3 for steel. To convert to kg/km multiply value × 1.488.
[C] Rated strengths shown are applicable to GA2 cores. Other core types may provide different strengths.
[D] Based on conductivity of 61.2 % IACS at 20°C for aluminum and 8 % IACS at 20C for steel core. To convert to Ω/km multiply value × 3.281.

7. Construction Requirements

7.1 Construction requirements are given in Table 1 for ACSR/TP.

7.2 The twisted pair components shall be continuous throughout the reel. No joints in the finished component conductors are allowed.

7.3 The major and minor dimensions of the conductor shall be defined as indicated in Fig. 1.

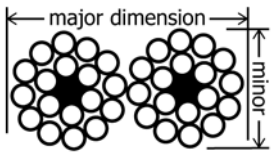

FIG. 1 Dimensions

8. Rated Strength of TP Conductor

8.1 The rated strength of a completed ACSR/TP conductor shall be two times the rated strength of one of the component stranded conductors as given in Specification B232/B232M.

9. Mass Per Unit Length

9.1 The mass per unit length of a completed ACSR/TP conductor shall be two times the mass per unit length of one of the component conductors as given in Specification B232/B232M.

10. Workmanship, Finish, and Appearance

10.1 The conductor shall be free of all imperfections not consistent with good commercial practice.

11. Mechanical and Electrical Tests

11.1 Tests for the electrical and mechanical properties shall be made on the component conductors as required in the appropriate ASTM Specifications.

11.2 Tests for the demonstration of rated strength of the completed ACSR/TP 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 ACSR/TP shall be determined by performing a breaking test of each of the component conductors before twisting as given in the appropriate component conductor's ASTM Specification. The rated strength of the completed ACSR/TP shall be two times the breaking strength of the component conductor that had the lowest breaking strength.

11.3 The critical aspect of ACSR/TP conductor is that the component conductors be of equal length and tension in the completed ACSR/TP. To test for this condition during the twisting process a mark (using felt tip pin or spray paint) is to be made at the same longitudinal location on each of the component conductors before the component conductors have passed through the twisting process. These two marks shall be observed and followed visually during the twisting and to the take-up reel. If the marks move back and forth relative to each other less than 1.5 in. (3.8 cm) the component tensions and lengths shall be considered equal and the ACSR/TP is acceptable. If one mark moves steadily away from the other mark the component tensions and lengths shall be considered unequal and twisting machine adjustments must be made and another marking test made. This marking test is to be made in the first 100 ft (30 m) of each reel of ACSR/TP produced. If component tensions cannot be adjusted equally after three tries, 300 ft (90

m), the completed ACSR/TP is to be scrapped, tension adjustments made, and the production started over.

12. Inspection

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

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

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

13. Packaging and Package Marking

13.1 Package sizes and kind of package, reels or coils, shall be agreed upon between the manufacturer and the purchaser.

13.2 There shall be only one length of conductor on a reel.

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

13.4 The net mass, length, size, kind of conductor, stranding, type of core coating, if any, 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 the package.

14. Keywords

14.1 aeolian vibration; aluminum; aluminum conductor; ASCR; electrical conductors; galloping; overhead conductors; steel-reinforced conductors; stranded aluminum conductors; TP; twisted pair