



Standard Practice for Selection of Wire and Cable Size in AWG or Metric Units¹

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1. Scope—Scope*

1.1 This practice is intended as a guide to shipbuilders, shipowners, and design agents for use in the selection of conductor size for single conductor or multiple conductor cable sizes either in American Wire Gauge (AWG) or metric designations for commercial ship design and construction.

1.2 The comparison chart of electrical conductor sizes shown in **Table 1** presents a combined listing of ~~international standard sizes of Class 2 stranded~~ stranded uncoated (plain) copper conductors in accordance with AWG Class B stranding (Specification B8) English-inch-pound units or IEC (~~IEC international standard sizes of Class 2 IEC (Specification IEC 60228)~~ metric units.

1.3 As a precautionary caveat, some conductor sizes listed in **Table 1** may exceed minimal size requirements of the U.S. Coast Guard, the American Bureau of Shipping, and IEEE STD 45 for specific applications.

1.4 The values stated for ampacity and dc resistance are presented as maximum values and are provided for information only.

1.5 *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 Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

B8 Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

B193 Test Method for Resistivity of Electrical Conductor Materials

2.2 *IEC Standards:*³

IEC 60092-350 Electrical Installations in Ships—Part 350: Shipboard Power: Cables—General Construction and Test Requirements

IEC 60228 Conductors of Insulated Cables

2.3 *IEEE Standard:*⁴

IEEE STD 45 Recommended Practice for Electric Installations on Shipboard

2.4 *NFPA Documents:*⁵

NFPA 70 National Electrical Code (NEC)

3. Significance and Use

3.1 The selection criteria is to be applied for uses of (1) new cable and (2) replacement cable.

3.2 For the selection of new cable or the selection of replacement cable, this practice defines the choice criteria for conductor selection for cables in AWG (ASTM) or metric (IEC) sizes.

¹ This specification practice is under the jurisdiction of ASTM Committee F25 on Ships and Marine Technology and is the direct responsibility of Subcommittee F25.10 on Electrical.

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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.

³ Available from International Electrotechnical Commission (IEC), 3, rue de Varembe, Case postale—1st floor, P.O. Box 131, CH-1211, Geneva 20, Switzerland, <http://www.iec.ch>—<https://www.iec.ch>.

⁴ Available from Institute of Electrical and Electronics Engineers, Inc. (IEEE), 445 Hoes Ln., P.O. Box 1331, Piscataway, NJ 08854-1331, 08854-4141, <http://www.ieee.org>.

⁵ Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169-7471, <http://www.nfpa.org>.

*A Summary of Changes section appears at the end of this standard

TABLE 1 Conversion Table—AWG/Metric Preferred Sizes of Conductors

Size Metric, mm ²	Size AWG/MCM	Area in Circ Mils (Nominal)	Ampacity ^A	dc Resistances at 20°C ^B	
				Ohms per 1000 ft	Ohms per km
1000 [±]	2000 ^{±C}	2 000 000	1155	-0.0053	-0.0177
		1 970 000	1145	-0.0054	-0.0176
800 [±]	1750 [±]	1 750 000	1070	-0.0063	-0.0199
		1 580 000	1009	-0.0067	-0.0224
630 [±]	1500 [±]	1 500 000	980	-0.0071	-0.0232
	1250 [±]	1 250 000	890	-0.0085	-0.0278
500 [±]	1000 [±]	1 240 000	886	-0.0096	-0.0286
		1 000 000	780	-0.0106	-0.0347
400 [±]		987 000	772	-0.0105	-0.0369
		789 000	675	-0.0133	-0.0475
300 [±]	750 [±]	750 000	655	-0.0141	-0.0463
	600 [±]	600 000	575	-0.0176	-0.0578
240 [±]	500 [±]	592 000	570	-0.0211	-0.0607
		500 000	515	-0.0211	-0.0694
185 [±]	400 [±]	474 000	499	-0.0219	-0.0762
		400 000	455	-0.0264	-0.0867
150 [±]	350 [±]	365 000	431	-0.0286	-0.1000
	300 [±]	350 000	420	-0.0302	-0.0990
120 [±]	250 [±]	300 000	375	-0.0353	-0.1157
		296 000	372	-0.0353	-0.1260
95 [±]	200 [±]	250 000	340	-0.0423	-0.1388
		237 000	327	-0.0436	-0.1540
70 [±]	150 [±]	211 600	300	-0.0500	-0.1639
		187 000	265	-0.0551	-0.1950
50 [±]	100 [±]	167 000	260	-0.0631	-0.2065
		138 000	230	-0.0752	-0.2700
35 [±]	75 [±]	133 100	225	-0.0794	-0.2605
	60 [±]	105 600	195	-0.1002	-0.3288
25 [±]	40 [±]	98 700	185	-0.1044	-0.3910
		83 690	165	-0.1261	-0.4139
16 [±]	30 [±]	69 100	144	-0.1495	-0.5290
		66 360	140	-0.1588	-0.5211
10 [±]	20 [±]	52 620	120	-0.2005	-0.6577
		49 300	115	-0.2057	-0.7340
6.0 [±]	14 [±]	41 740	105	-0.2528	-0.8295
		31 600	89	-0.3259	-1.160
4.0 [±]	10 [±]	26 240	80	-0.4023	-1.320
		19 700	63	-0.5167	-1.840
2.5 [±]	8 [±]	16 510	55	-0.6380	-2.093
		11 800	43	-0.8543	-3.110
1.5 [±]	6 [±]	10 380	40	-1.017	-3.335
		7 890	30	-1.304	-4.700
0.90	4 [±]	6 530	25	-1.620	-5.315
		4 930	22	-2.067	-7.560
0.80	3 [±]	4 110	20	-2.573	-8.442
		2 960	...	-3.417	-12.20
0.75 [±]	2 [±]	2 580	...	-4.020	-13.19
		1 970	...	-5.213	-18.20
0.60 [±]	18 [±]	1 773	...	-6.45	-21.10
		1 620	...	-6.82	-20.95
0.50 [±]		1 576	...	-6.52	-21.40
		1 480	...	-6.82	-24.80
0.20 [±]		1 182	...	-9.5	-31.16
		1 020	...	10.5	-34.45
	22 [±]	987	...	11.4	-36.70
	24 [±]	640	...	16.9	-55.44
	26 [±]	404	...	26.7	-87.60
		253	...	43.6	143.04

TABLE 1 Conversion Table—AWG/Metric Preferred Sizes of Conductors

Size Metric, mm ²	Size AWG/MCM	Area in Circ Mils (Nominal)	Ampacity ^A	dc Resistances at 20°C ^B	
				Ohms per 1000 ft	Ohms per km
1000*	2000 ^{±C}	2 000 000	1155	0.00529	0.0174
		1 970 000	1145	0.00537	0.0176
800*	1750*	1 750 000	1070	0.00604	0.0198
		1 580 000	1009	0.00674	0.0221
630*	1500*	1 500 000	980	0.00705	0.0231
	1250*	1 250 000	890	0.00846	0.0278
500*	1000*	1 240 000	886	0.00863	0.0283
		1 000 000	780	0.0106	0.0348
		987 000	772	0.0112	0.0366

Size Metric, mm ²	Size AWG/MCM	Area in Circ Mils (Nominal)	Ampacity ^A	dc Resistances at 20°C ^B	
				Ohms per 1000 ft	Ohms per km
400*		789 000	675	0.0143	0.0470
	750*	750 000	655	0.0141	0.0462
	600*	600 000	575	0.0176	0.0578
300*		592 000	570	0.0183	0.0601
	500*	500 000	515	0.0212	0.0695
240*		474 000	499	0.0223	0.0754
	400*	400 000	455	0.0264	0.0866
185*		365 000	431	0.0302	0.0991
	350*	350 000	420	0.0302	0.0991
	300*	300 000	375	0.0353	0.116
150*		296 000	372	0.0378	0.124
	250*	250 000	340	0.0423	0.139
120*		237 000	327	0.0466	0.153
	4/0*	211 600	300	0.0500	0.164
95*		187 000	265	0.0588	0.193
	3/0*	167 000	260	0.0630	0.207
70*		138 000	230	0.0817	0.268
	2/0*	133 100	225	0.0795	0.261
	1/0*	105 600	195	0.100	0.328
50*		98 700	185	0.118	0.387
	1	83 690	165	0.126	0.413
35*		69 100	144	0.160	0.524
	2*	66 360	140	0.159	0.522
	3	52 620	120	0.201	0.659
25*		49 300	115	0.222	0.727
	4*	41 740	105	0.253	0.823
16*		31 600	89	0.321	1.15
	6*	26 240	80	0.403	1.32
10*		19 700	63	0.558	1.83
	8*	16 510	60	0.640	2.10
6.0*		11 800	43	0.939	3.08
	10*	10 380	40	1.02	3.35
4.0*		7 890	30	1.41	4.61
	12*	6 530	25	1.63	5.35
2.5*		4 930	22	2.26	7.41
	14*	4 110	20	2.58	8.46
1.5*		2 960	...	3.69	12.18
	16*	2 580	...	4.10	13.45
1.0*		1 970	...	5.52	18.10
0.90		1 773	...	6.45	21.10
	18*	1 620	...	6.54	21.46
0.80		1 576	...	6.52	21.40
0.75*		1 480	...	7.47	24.50
0.60*		1 182	...	9.5	31.16
	20*	1 020	...	10.3	33.80
0.50*		987	...	11.0	36.00
	22*	640	...	16.4	53.80
	24*	404	...	26.1	85.60
	26*	253	...	43.6	143.04

^A Ampacity of single-conductor cable in air at ambient temperature of 30°C and maximum conductor temperature not exceeding 60°C. Also shown in NFPA 70, NEC Table 310.15 (B) (17).

^B Temperature correction: the conductor resistance may be corrected for moderate temperature differences from the noted reference temperature by the following equation. The parameter, α_T , varies with conductivity and temperature. For a list of common temperature coefficients see Test Methods Method B193.

$$R_T = R_t [1 + \alpha_T (t - T)] \quad (1)$$

where:

R_T = resistance at reference temperature T ,

R_t = resistance as measured at temperature t ,

α_T = known or given temperature coefficient of resistance of the conductor being measured at reference temperature T . At 20°C, the value is 0.003 93,

α_t = known or given temperature coefficient of resistance of the conductor being measured at reference temperature T . At 20°C, the value is 0.00393,

T = reference temperature, and

t = temperature at which measurement is made.

^C An asterisk (*) indicates preferred sizes for wires of American Wire Gauge or per AWG or in accordance with IEC 60228 (metric) as appropriate.

4. Selection Criteria

4.1 When selecting cable for any application, AWG or metric sizing should be selected according to preferred sizes. The sizes of conductors that have been marked with an asterisk in Table 1 designate preferred sizes per in accordance with Specification B8 and IEC 60228. Those sizes not marked are given for reference, and it is recommended that their use be discouraged.