2. CONDUCTORS

CONDUCTORS

The conductor is the metallic component of cables through which electrical power or electrical signals are transmitted. Conductor size is usually specified by American Wire Gauge (AWG), circular mil area or in square millimeters.

AWG

The American Wire Gauge (sometimes called Brown and Sharpe or B. and S.) is used almost exclusively in the USA for copper and aluminum wire. The Birmingham Wire Gauge (BWG) is used for steel armor wire.

The diameters according to the AWG are defined as follows: The diameter of size 4/0 (sometimes written 0000) equals 0.4600 inch and that of size #36 equals 0.0050 inch; the intermediate sizes are found by geometric progression. That is, the ratio of the diameter of one size to that of the next smaller size (larger gauge number) is:

$$\sqrt[39]{\frac{0.4600}{0.0050}} = 1.122932$$

Circular Mil

Sizes larger than 4/0 are specified in terms of the total area of a cross-section of the copper in circular mils (cmil). A circular mil is a unit of area equal to the area of a circle one mil in diameter. It is $\pi/4$ (equal to 0.7854) of a square mil (one mil = 0.001 inch). The area of a circle in circular mils is therefore equal to the square of its diameter in mils. A solid wire one inch in diameter has an area of 1,000,000 cmils, whereas one square inch equals $4/\pi \times 1{,}000{,}000$ cmils (equal to 1,273,200 cmils).

Square Millimeters

Metric sizes are given in terms of square millimeters (mm^2).

Conductor Characteristics

Relative electrical and thermal conductivities of common metal conductors are as follows:

Table 2.1–Relative Electrical and Thermal Conductivities of Common Conductor Materials

Metal	Relative Electrical Conductivity at 20°C	Relative Thermal Conductivity at 20°C
Silver	106	108
Copper (annealed)	100	100
Copper (hard drawn)	97	–
Gold	72	76
Aluminum	62	56
Magnesium	39	41
Zinc	29	29
Nickel	25	15
Cadmium	23	24

Continued on next page >>

Table 2.1–Relative Electrical and Thermal Conductivities of Common Conductors (Continued)

Metal	Relative Electrical Conductivity at 20°C	Relative Thermal Conductivity at 20°C
Cobalt	18	17
Iron	17	17
Platinum	16	18
Tin	15	17
Steel	12	–
Lead	8	9

Additional electrical properties can be found in Section 7 of this handbook.

2.1 STRAND TYPES

2.1.1 Concentric Strand

A concentric stranded conductor consists of a central wire or core surrounded by one or more layers of helically laid wires. Each layer after the first has six more wires than the preceding layer. Except in compact stranding, each layer is usually applied in a direction opposite to that of the layer under it.

If the core is a single wire and if it and all of the outer strands have the same diameter, the first layer will contain six wires; the second, twelve; the third, eighteen; etc.

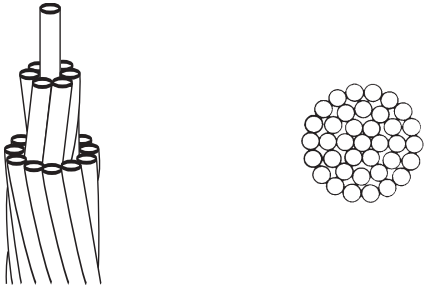

Figure 2.1–Concentric Strand

2.1.2 Bunch Strand

The term bunch stranding is applied to a collection of strands twisted together in the same direction without regard to the geometric arrangement.

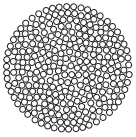

Figure 2.2–Bunch Strand

2.1.3 Rope Strand

A rope stranded conductor is a concentric stranded conductor each of whose component strands is itself stranded. A rope stranded conductor is described by giving the number of groups laid together to form the rope and the number of wires in each group.

Figure 2.3–Rope Strand

2.1.4 Sector Conductor

A sector conductor is a stranded conductor whose cross-section is approximately the shape of a sector of a circle. A multiple conductor insulated cable with sector conductors has a smaller diameter than the corresponding cable with round conductors.

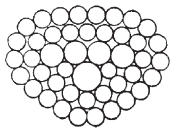

Figure 2.4–Sector Conductor

2.1.5 Segmental Conductor

A segmental conductor is a round, stranded conductor composed of three or four sectors slightly insulated from one another. This construction has the advantage of lower AC resistance (less skin effect).

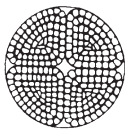

Figure 2.5–Segmental Conductor

2.1.6 Annular Conductor

An annular conductor is a round, stranded conductor whose strands are laid around a suitable core. The core is usually made wholly or mostly of nonconducting material. This construction has the advantage of lower total AC resistance for a given cross-sectional area of conducting material by eliminating the greater skin effect at the center.

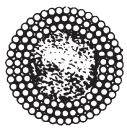

Figure 2.6–Annular Conductor

2.1.7 Compact Strand

A compact stranded conductor is a round or sector conductor having all layers stranded in the same direction and rolled to a predetermined ideal shape. The finished conductor is smooth on the surface and contains practically no interstices or air spaces. This results in a smaller diameter.

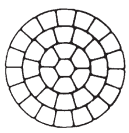

Figure 2.7–Compact Strand

2.1.8 Compressed Strand

Compressed conductors are intermediate in size between standard concentric conductors and compact conductors. A comparison is shown below:

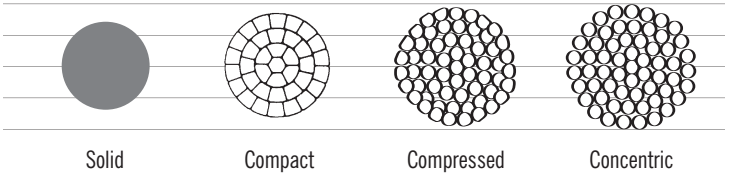

Figure 2.8–Comparative Sizes and Shapes of 1,000 kcmil Conductors

In a concentric stranded conductor, each individual wire is round and considerable space exists between wires. In a compressed conductor, the conductor has been put through a die that "squeezes out" some of the space between wires. In a compact conductor each wire is preformed into a trapezoidal shape before the wires are stranded together into a finished conductor. This results in even less space between wires. A compact conductor is, therefore, the smallest in diameter (except for a solid conductor, of course). Diameters for common conductor sizes are given in the table below.

Table 2.2–Diameters for Copper and Aluminum Conductors

Conductor Size		Nominal Diameters (in.)			
(AWG)	(kcmil)	Solid	Class B Compact	Class B Compressed	Class B Concentric
8	16.51	0.1285	0.134	0.141	0.146
6	26.24	0.1620	0.169	0.178	0.184
4	41.74	0.2043	0.213	0.225	0.232
3	52.62	0.2294	0.238	0.252	0.260
2	66.36	0.2576	0.268	0.283	0.292
1	83.69	0.2893	0.299	0.322	0.332
1/0	105.6	0.3249	0.336	0.361	0.373
2/0	133.1	0.3648	0.376	0.406	0.419
3/0	167.8	0.4096	0.423	0.456	0.470
4/0	211.6	0.4600	0.475	0.512	0.528
–	250	0.5000	0.520	0.558	0.575
–	300	0.5477	0.570	0.611	0.630
–	350	0.5916	0.616	0.661	0.681
–	400	0.6325	0.659	0.706	0.728
–	450	0.6708	0.700	0.749	0.772

Continued on next page >>

Table 2.2–Diameters for Copper and Aluminum Conductors (Continued)

Conductor Size		Nominal Diameters (in.)			
(AWG)	(kcmil)	Solid	Class B Compact	Class B Compressed	Class B Concentric
–	500	0.7071	0.736	0.789	0.813
–	550	0.7416	0.775	0.829	0.855
–	600	0.7746	0.813	0.866	0.893
–	650	0.8062	0.845	0.901	0.929
–	700	0.8367	0.877	0.935	0.964
–	750	0.8660	0.908	0.968	0.998
–	800	0.8944	0.938	1.000	1.031
–	900	0.9487	0.999	1.061	1.093
–	1,000	1.0000	1.060	1.117	1.152

Sources: ASTM B8 and B496
ICEA S-95-658 (NEMA WC-70)

2.2 COATINGS

There are three materials commonly used for coating a copper conductor. These are tin, silver and nickel.

Tin is the most common and is used for improved corrosion resistance and solderability.

Silver plated conductors are used in high-temperature environments (150°C–200°C). It is also used for high-frequency applications where silver's high conductivity (better than copper) and the "skin effect" work together to reduce attenuation at high frequencies.

Nickel coatings are used for conductors that operate between 200°C and 450°C. At these high temperatures, copper oxidizes rapidly if not nickel plated. One drawback of nickel, however, is its poor solderability.

2.3 TENSILE STRENGTH OF COPPER WIRE

Table 2.3–Tensile Strength of Copper Wire

Size	Soft or Annealed	Medium Hard Drawn	Hard Drawn
(AWG)	Max. Breaking Load (lb.)	Min. Breaking Load (lb.)	Min. Breaking Load (lb.)
4/0	6,000	6,970	8,140
3/0	4,750	5,660	6,720
2/0	3,765	4,600	5,530
1/0	2,985	3,730	4,520
1	2,435	3,020	3,690
2	1,930	2,450	3,010
3	1,535	1,990	2,440
4	1,215	1,580	1,970
6	765	1,010	1,280
8	480	645	825
10	315	410	530
12	200	262	335
14	125	167	215
16	78.5	106	135
18	49.5	67.6	85.5
20	31.0	43.2	54.2
22	19.4	27.3	34.1
24	12.7	17.5	21.7
26	7.94	11.1	13.7
28	4.99	7.02	8.64
30	3.14	4.48	5.47
32	2.01	2.90	3.53
34	1.25	1.82	2.20
36	0.79	1.16	1.40

2.4 COPPER STRAND PROPERTIES

2.4.1 Strand Classes

Table 2.4–Strand Classes

ASTM Standard	Construction	Class	Application
B8	Concentric lay	AA	For bare conductors – usually used in overhead lines.
		A	For bare conductors where greater flexibility than is afforded by Class AA is required.
		B	For conductors insulated with various materials such as EP, XLP, PVC, etc. This is the most common class.
		C	For conductors where greater flexibility is required than is provided by Class B.
		D	N/A
B173	Rope lay with concentric stranded members	G	Conductor constructions having a range of areas from 5,000,000 circular mils and employing 61 stranded members of 19 wires each down to No. 14 AWG containing seven stranded members stranded members of seven wires each. Typical uses are for portable (flexible) conductors and similar applications.
		H	Conductor constructions having a range of areas from 5,000,000 circular mils and employing 91 stranded members of 19 wires each down to No. 9 AWG containing 19 stranded members of seven wires each. Typical uses are for rubber-jacketed cords and conductors where flexibility is required, such as for use on take-up reels, over sheaves and apparatus conductors.

Continued on next page >>

Table 2.4–Strand Classes (Continued)

ASTM Standard	Construction	Class	Conductor Size	Individual Wire Size		Application
			(kcmil/AWG)	Diameter (in.)	(AWG)	
B172	Rope lay with with bunch stranded members	I	Up to 2,000	0.0201	24	Typical use is for special apparatus cable.
		K	Up to 2,000	0.0100	30	Typical use is for portable cord.
		M	Up to 1,000	0.0063	34	Typical use is for welding cable.
B174	Bunch stranded	I	7, 8, 9, 10	0.0201	24	Rubber-covered conductors.
		J	10, 12, 14, 16, 18, 20	0.0126	28	Fixture wire.
		K	10, 12, 14, 16, 18, 20	0.0100	30	Fixture wire, flexible cord and portable cord.
		L	10, 12, 14, 16, 18, 20	0.0080	32	Fixture wire and portable cord with greater flexibility than Class K.
		M	14, 16, 18, 20	0.0063	34	Heater cord and light portable cord.
		0	16, 18, 20	0.0050	36	Heater cord with greater flexibility than Class M.
		P	16, 18, 20	0.0040	38	More flexible conductors than provided in preceding classes.
		Q	18, 20	0.0031	40	Oscillating fan cord. Very good flexibility.

Source: Compiled from ASTM standards listed

2.4.2 Solid Copper

Table 2.5–Standard Nominal Diameters and Cross-sectional Areas of Solid Copper Wire

Size (AWG)	Diameter (mils)	Cross-sectional Area (kcmils)	Weight (lb./1,000 ft.)	Breaking Strength Soft or Annealed (lb.)
4/0	460.0	211.600	–	–
3/0	409.6	167.800	–	–
2/0	364.8	133.100	–	–
1/0	324.9	105.600	–	–
1	289.3	83.690	–	–
2	257.6	66.360	–	–
3	229.4	52.620	–	–
4	204.3	41.740	–	–
5	181.9	33.090	–	–
6	162.0	26.240	–	–
7	144.3	20.820	–	–
8	128.5	16.510	–	–
9	114.4	13.090	–	–
10	101.9	10.380	31.43	314.0
11	90.7	8.230	24.92	249.0
12	80.8	6.530	19.77	197.5
13	72.0	5.180	15.68	156.6
14	64.1	4.110	12.43	142.2
15	57.1	3.260	9.86	98.5
16	50.8	2.580	7.82	78.1
17	45.3	2.050	6.20	61.9
18	40.3	1.620	4.92	49.2
19	35.9	1.290	3.90	39.0
20	32.0	1.020	3.09	30.9
21	28.5	0.812	2.452	24.5
22	25.3	0.640	1.945	19.4
23	22.6	0.511	1.542	15.4
24	20.1	0.404	1.223	12.7
25	17.9	0.320	0.970	10.1
26	15.9	0.253	0.770	7.98
27	14.2	0.202	0.610	6.33
28	12.6	0.159	0.484	5.02
29	11.3	0.128	0.384	3.98

Continued on next page >>

Table 2.5–Standard Nominal Diameters and Cross-sectional Areas of Solid Copper Wire (Continued)

Size (AWG)	Diameter (mils)	Cross-sectional Area (kcmils)	Weight (lb./1,000 ft.)	Breaking Strength Soft or Annealed (lb.)
30	10.0	0.100	0.303	3.16
31	8.9	0.0792	0.241	2.50
32	8.0	0.0640	0.191	1.99
33	7.1	0.0504	0.152	1.58
34	6.3	0.0397	0.120	1.25
35	5.6	0.0314	0.095	0.990
36	5.0	0.0250	0.076	0.785
37	4.5	0.0202	0.060	0.623
38	4.0	0.0160	0.048	0.494
39	3.5	0.0122	–	–
40	3.1	0.00961	–	–
41	2.8	0.00784	–	–
42	2.5	0.00625	–	–
43	2.2	0.00484	–	–
44	2.0	0.00400	–	–
45	1.76	0.00310	–	–
46	1.57	0.00246	–	–

Source: ASTM B258, Specification for Standard Nominal Diameters and Cross-Sectional Areas of AWG Sizes of Solid Round Wires Used as Electrical Conductors

2.4.3 Class B, C and D Copper Strand

Table 2.6–Class B Concentric-Lay-Stranded Copper Conductors

Size	Number of Wires	Diameter of Each Strand	Weight	Nominal Overall Diameter
(AWG or kcmil)		(mils)	(lb./1,000 ft.)	(in.)
5,000	217	151.8	15,890	2.58
4,500	217	144	14,300	2.45
4,000	217	135.8	12,590	2.31
3,500	169	143.9	11,020	2.16
3,000	169	133.2	9,353	2.00
2,500	127	140.3	7,794	1.82
2,000	127	125.5	6,175	1.63
1,900	127	122.3	5,866	1.59
1,800	127	119.1	5,558	1.55
1,750	127	117.4	5,402	1.53
1,700	127	115.7	5,249	1.50
1,600	127	112.2	4,940	1.46
1,500	91	128.4	4,631	1.41
1,400	91	124.0	4,323	1.36
1,300	91	119.5	4,014	1.32
1,250	91	117.2	3,859	1.30
1,200	91	114.8	3,705	1.26
1,100	91	109.9	3,396	1.21
1,000	61	128.0	3,088	1.15
900	61	121.5	2,779	1.09
800	61	114.5	2,470	1.03
750	61	110.9	2,316	1.00
700	61	107.1	2,161	0.964
650	61	103.2	2,007	0.929
600	61	99.2	1,853	0.893
550	61	95.0	1,698	0.855
500	37	116.2	1,544	0.813
450	37	110.3	1,389	0.772
400	37	104.0	1,235	0.728
350	37	97.3	1,081	0.681
300	37	90.0	926.3	0.630
250	37	82.2	711.9	0.575
4/0	19	105.5	653.3	0.528

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Table 2.6–Class B Concentric-Lay-Stranded Copper Conductors (Continued)

Size (AWG or kcmil)	Number of Wires	Diameter of Each Strand (mils)	Weight (lb./1,000 ft.)	Nominal Overall Diameter (in.)
3/0	19	94.0	518.1	0.470
2/0	19	83.7	410.9	0.419
1/0	19	74.5	325.8	0.373
1	19	66.4	258.4	0.332
2	7	97.4	204.9	0.292
3	7	86.7	162.5	0.260
4	7	77.2	128.9	0.232
5	7	68.8	102.2	0.206
6	7	61.2	81.05	0.184
7	7	54.5	64.28	0.164
8	7	48.6	50.97	0.146
9	7	43.2	40.42	0.130
10	7	38.5	32.06	0.116
12	7	30.5	20.16	0.0915
14	7	24.2	12.68	0.0726
16	7	19.2	7.974	0.0576
18	7	15.2	5.015	0.0456
20	7	12.1	3.154	0.0363

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

Table 2.7–Copper Strand Diameters

Conductor Size		Stranding				
(AWG)	(kcmil)	Class B Compact (in.)	Class B Compressed (in.)	Class B Concentric (in.)	Class C Concentric (in.)	Class D Concentric (in.)
14	4.11	–	0.0704	0.0727	0.0735	0.0735
13	5.18	–	0.0792	0.0816	0.0825	0.0826
12	6.53	–	0.0888	0.0915	0.0925	0.0931
11	8.23	–	0.0998	0.103	0.104	0.104
10	10.39	–	0.113	0.116	0.117	0.117
9	13.09	–	0.126	0.130	0.131	0.132
8	16.51	0.134	0.141	0.146	0.148	0.148
7	20.82	–	0.158	0.164	0.166	0.166
6	26.24	0.169	0.178	0.184	0.186	0.186
5	33.09	–	0.200	0.206	0.208	0.209
4	41.74	0.213	0.225	0.232	0.234	0.235
3	52.62	0.238	0.252	0.260	0.263	0.264
2	66.36	0.268	0.283	0.292	0.296	0.297
1	83.69	0.299	0.322	0.332	0.333	0.333
1/0	105.6	0.336	0.362	0.372	0.374	0.374
2/0	133.1	0.376	0.406	0.418	0.420	0.420
3/0	167.8	0.423	0.456	0.470	0.471	0.472
4/0	211.6	0.475	0.512	0.528	0.529	0.530
–	250	0.520	0.558	0.575	0.576	0.576
–	300	0.570	0.611	0.630	0.631	0.631
–	350	0.616	0.661	0.681	0.681	0.682
–	400	0.659	0.706	0.728	0.729	0.729
–	450	0.700	0.749	0.772	0.773	0.773
–	500	0.736	0.789	0.813	0.814	0.815
–	550	0.775	0.829	0.855	0.855	0.855
–	600	0.813	0.866	0.893	0.893	0.893
–	650	0.845	0.901	0.929	0.930	0.930
–	700	0.877	0.935	0.964	0.965	0.965
–	750	0.908	0.968	0.999	0.999	0.998
–	800	0.938	1.000	1.030	1.032	1.032
–	900	0.999	1.061	1.094	1.093	1.095
–	1,000	1.060	1.117	1.152	1.153	1.153
–	1,100	–	1.173	1.209	1.210	1.211
–	1,200	–	1.225	1.263	1.264	1.264
–	1,250	–	1.251	1.289	1.290	1.290
–	1,300	–	1.275	1.314	1.316	1.316
–	1,400	–	1.323	1.365	1.365	1.365
–	1,500	–	1.370	1.412	1.413	1.413
–	1,600	–	1.415	1.459	1.460	1.460

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Table 2.7–Copper Strand Diameters (Continued)

Conductor Size		Stranding				
(AWG)	(kcmil)	Class B Compact (in.)	Class B Compressed (in.)	Class B Concentric (in.)	Class C Concentric (in.)	Class D Concentric (in.)
–	1,700	–	1.459	1.504	1.504	1.504
–	1,750	–	1.480	1.526	1.527	1.527
–	1,800	–	1.502	1.548	1.548	1.549
–	1,900	–	1.542	1.590	1.590	1.591
–	2,000	–	1.583	1.632	1.632	1.632
–	2,500	–	1.769	1.824	1.824	1.824
–	3,000	–	1.938	1.998	1.998	1.998

2.4.4 Class H Copper

Table 2.8–Class H Rope-Lay-Stranded Copper Conductors

Size (AWG or kcmil)	Number of Strands	Construction	Nominal Diameter of Each Strand (in.)	Nominal O.D. (in.)	Nominal Weight (lb./1,000 ft.)
8	133	19x7	0.0111	0.167	52
7	133	19x7	0.0125	0.188	65
6	133	19x7	0.0140	0.210	82
5	133	19x7	0.0158	0.237	105
4	133	19x7	0.0177	0.266	132
3	133	19x7	0.0199	0.299	167
2	133	19x7	0.0223	0.335	208
2	259	37x7	0.0160	0.336	210
1	259	37x7	0.0180	0.378	266
1/0	259	37x7	0.0202	0.424	334
2/0	259	37x7	0.0227	0.477	422
3/0	259	37x7	0.0255	0.536	533
3/0	427	61x7	0.0198	0.535	532
4/0	259	37x7	0.0286	0.601	670
4/0	427	61x7	0.0223	0.602	675
250	427	61x7	0.0242	0.653	795
300	427	61x7	0.0265	0.716	953
350	427	61x7	0.0286	0.772	1,110

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Table 2.8–Class H Rope-Lay-Stranded Copper Conductors (Continued)

Size (AWG or kcmil)	Number of Strands	Construction	Nominal Diameter of Each Strand (in.)	Nominal O.D. (in.)	Nominal Weight (lb./1,000 ft.)
400	427	61x7	0.0306	0.826	1,270
450	427	61x7	0.0325	0.878	1,435
500	427	61x7	0.0342	0.923	1,590
550	703	37x19	0.0280	0.980	1,770
600	703	37x19	0.0292	1.022	1,920
650	703	37x19	0.0304	1.064	2,085
700	703	37x19	0.0316	1.106	2,255
750	703	37x19	0.0327	1.145	2,410
800	703	37x19	0.0337	1.180	2,560
900	703	37x19	0.0358	1.253	2,895
1,000	703	37x19	0.0377	1.320	3,205
1,100	703	37x19	0.0396	1.386	3,535
1,200	703	37x19	0.0413	1.446	3,845
1,250	703	37x19	0.0422	1.477	4,015
1,300	703	37x19	0.0430	1.505	4,170
1,400	703	37x19	0.0446	1.561	4,485
1,500	703	37x19	0.0462	1.617	4,815
1,600	1,159	61x19	0.0372	1.674	5,145
1,700	1,159	61x19	0.0383	1.724	5,455
1,750	1,159	61x19	0.0389	1.751	5,625
1,800	1,159	61x19	0.0394	1.773	5,770
1,900	1,159	61x19	0.0405	1.823	6,100
2,000	1,159	61x19	0.0415	1.868	6,400

Source: ICEA S-95-658 (NEMA 70) Appendix K

2.4.5 Class I Copper

Table 2.9–Class I (24 AWG Strands) Rope-Lay-Stranded Copper Conductors

Size (AWG or kcmil)	Construction	Nominal Number of Strands	Nominal O.D. (in.)	Nominal Weight (lb./1,000 ft.)
10	1x26	26	0.125	32.5
9	1x33	33	0.138	41
8	1x41	41	0.156	51
7	1x52	52	0.185	65
6	7x9	63	0.207	80
5	7x12	84	0.235	105
4	7x15	105	0.263	134
3	7x19	133	0.291	169
2	7x23	161	0.319	205
1	7x30	210	0.367	267
1/0	19x14	266	0.441	342
2/0	19x18	342	0.500	439
3/0	19x22	418	0.549	537
4/0	19x28	532	0.613	683
250	7x7x13	637	0.682	825
300	7x7x15	735	0.737	955
350	7x7x18	882	0.800	1,145
400	7x7x20	980	0.831	1,270
450	7x7x23	1,127	0.894	1,460
500	7x7x25	1,225	0.941	1,590
550	7x7x28	1,372	0.980	1,780
600	7x7x30	1,470	1.027	1,905
650	19x7x12	1,596	1.152	2,090
700	19x7x13	1,729	1.194	2,260
750	19x7x14	1,862	1.235	2,435
800	19x7x15	1,995	1.290	2,610
900	19x7x17	2,261	1.372	2,965
1,000	19x7x19	2,527	1.427	3,305
1,100	19x7x21	2,793	1.495	3,655
1,200	19x7x22	2,926	1.537	3,830
1,250	19x7x23	3,059	1.564	4,000
1,300	19x7x24	3,192	1.605	4,175
1,400	19x7x26	3,458	1.674	4,560

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Table 2.9–Class I (24 AWG Strands) Rope-Lay-Stranded Copper Conductors (Continued)

Size (AWG or kcmil)	Construction	Nominal Number of Strands	Nominal O.D. (in.)	Nominal Weight (lb./1,000 ft.)
1,500	19x7x28	3,724	1.715	4,875
1,600	19x7x30	3,990	1.797	5,220
1,700	19x7x32	4,256	1.852	5,570
1,750	19x7x33	4.389	1.880	5,745
1,800	19x7x34	4,522	1.921	5,920
1,900	19x7x36	4,788	1.976	6,265
2,000	19x7x37	4,921	2.003	6,440

Source: ICEA S-75-381 (NEMA WC 58) Appendix K

2.4.6 Class K Copper

Table 2.10–Class K (30 AWG Strands) Rope-Lay-Stranded Copper Conductors

Size	Rope-Lay with Bunch Stranding		Bunch Stranding		Weight
(AWG or kcmil)	Nominal Number of Strands	Strand Construction	Nominal Number of Strands	Approx. O.D. (in.)	(lb./1,000 ft.)
1,000	10,101	37x7x39	10,101	1.419	3,270
900	9,065	37x7x35	9,065	1.323	2,935
800	7,980	19x7x60	7,980	1.305	2,585
750	7,581	19x7x57	7,581	1.276	2,455
700	6,916	19x7x52	6,916	1.207	2,240
650	6,517	19x7x49	6,517	1.166	2,110
600	5,985	19x7x45	5,985	1.125	1,940
550	5,453	19x7x41	5,453	1.056	1,765
500	5,054	19x7x38	5,054	0.988	1,635
450	4,522	19x7x34	4,522	0.933	1,465
400	3,990	1x7x30	3,990	0.878	1,290
350	3,458	19x7x26	3,458	0.809	1,120
300	2,989	7x7x61	2,989	0.768	960
250	2,499	7x7x51	2,499	0.682	802
4/0	2,107	7x7x43	2,107	0.627	676
3/0	1,666	7x7x34	1,666	0.533	535
2/0	1,323	7x7x27	1,323	0.470	425
1/0	1,064	19x56	1,064	0.451	338

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Table 2.10–Class K (30 AWG Strands) Rope-Lay-Stranded Copper Conductors (Continued)

Size	Rope-Lay with Bunch Stranding		Bunch Stranding		Weight
(AWG or kcmil)	Nominal Number of Strands	Strand Construction	Nominal Number of Strands	Approx. O.D. (in.)	(lb./1,000 ft.)
1	836	19x44	836	0.397	266
2	665	19x35	665	0.338	211
3	532	19x28	532	0.304	169
4	420	7x60	420	0.272	132
5	336	7x48	336	0.235	106
6	266	7x38	266	0.202	84
7	210	7x30	210	0.179	66
8	168	7x24	168	0.157	53
9	133	7x19	133	0.146	42
10	–	–	104	0.126	32.5
12	–	–	65	0.101	20.3
14	–	–	41	0.078	12.8
16	–	–	26	0.060	8.0
18	–	–	16	0.048	5.0
20	–	–	10	0.038	3.2

Sources: ASTM B172 Specification for Rope-Lay-Stranded Copper Conductors Having Bunch-Stranded Members and ICEA S-75-381 (NEMA WC58) Appendix K

2.4.7 Class M Copper

Table 2.11–Class M (34 AWG Strands) Rope-Lay-Stranded Copper Conductors

Size	Rope-Lay with Bunch Stranding		Bunch Stranding		Weight
(AWG or kcmil)	Nominal Number of Strands	Strand Construction	Nominal Number of Strands	Approx. O.D. (in.)	(lb./1,000 ft.)
1,000	25,193	61x7x59	25,193	1.404	3,240
900	22,631	61x7x53	22,631	1.331	2,910
800	20,069	61x7x47	20,069	1.256	2,580
750	18,788	61x7x44	18,788	1.207	2,415
700	17,507	61x7x41	17,507	1.183	2,250
650	16,226	61x7x38	16,226	1.133	2,085
600	14,945	61x7x35	14,945	1.084	1,920
550	13,664	61x7x32	13,664	1.035	1,755
500	12,691	37x7x49	12,691	0.997	1,630
450	11,396	37x7x44	11,396	0.940	1,465
400	10,101	37x7x39	10,101	0.901	1,300
350	8,806	37x7x34	8,806	0.825	1,130
300	7,581	19x7x57	7,581	0.768	975
250	6,384	19x7x48	6,384	0.713	821
4/0	5,320	19x7x40	5,320	0.645	684
3/0	4,256	19x7x32	4,256	0.576	547
2/0	3,325	19x7x25	3,325	0.508	427
1/0	2,646	7x7x54	2,646	0.423	337
1	2,107	7x7x43	2,107	0.376	268
2	1,666	7x7x34	1,666	0.337	212
3	1,323	7x7x27	1,323	0.305	169
4	1,064	19x56	1,064	0.269	134
5	836	19x44	836	0.240	105
6	665	19x35	665	0.215	84
7	532	19x28	532	0.196	67
8	420	7x60	420	0.162	53
9	336	7x48	336	0.146	42
10	259	7x37	259	0.126	32.5
12	168	7x24	168	0.101	21.0
14	–	–	104	0.078	12.8
16	–	–	65	0.060	8.0
18	–	–	41	0.048	5.0
20	–	–	26	0.038	3.2

Sources: ASTM B172 Specification for Rope-Lay-Stranded Copper Conductors Having Bunch-Stranded Members and ICEA S-75-381 (NEMA WC58)

2.5 ALUMINUM STRAND PROPERTIES

2.5.1 Solid Aluminum

Table 2.12–Aluminum 1350 Solid Round Wire

Size (AWG or kcmil)	Diameter (mils)	Cross-Sectional Area (kcmils)	Weight (lb./1,000 ft.)
4/0	460.0	211.600	194.4
3/0	409.6	167.800	154.2
2/0	364.8	133.100	122.3
1/0	324.9	105.600	97.0
1	289.3	83.690	76.91
2	257.6	66.360	60.98
3	229.4	52.620	48.36
4	204.3	41.740	38.35
5	181.9	33.090	30.40
6	162.0	26.240	24.12
7	144.3	20.820	19.13
8	128.5	16.510	15.17
9	114.4	13.090	12.03
10	101.9	10.380	9.542
11	90.7	8.230	7.559
12	80.8	6.530	5.999
13	72.0	5.180	4.764
14	64.1	4.110	3.776
15	57.1	3.260	2.996
16	50.8	2.580	2.371
17	45.3	2.050	1.886
18	40.3	1.620	1.492
19	35.9	1.290	1.184
20	32.0	1.020	0.9410
21	28.5	0.812	0.7464
22	25.3	0.640	0.5882
23	22.6	0.511	0.4693
24	20.1	0.404	0.3713
25	17.9	0.320	0.2944
26	15.9	0.253	0.2323

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Table 2.12–Aluminum 1350 Solid Round Wire (Continued)

Size (AWG or kcmil)	Diameter (mils)	Cross-Sectional Area (kcmils)	Weight (lb./1,000 ft.)
27	14.2	0.202	0.1853
28	12.6	0.159	0.1459
29	11.3	0.128	0.1173
30	10.0	0.100	0.09189

Source: ASTM B609 Specification for Aluminum 1350 Round Wire, Annealed and Intermediate Tempers

2.5.2 Class B Aluminum

Table 2.13–Class B Concentric-Lay-Stranded Compressed, Reverse-Lay Aluminum 1350 Conductors

Size (AWG or kcmil)	Number of Wires	Diameter of Each Wire (mils)	Nominal Overall Diameter (in.)
4,000	217	135.8	–
3,500	169	143.9	–
3,000	169	133.2	–
2,500	127	140.3	–
2,000	127	125.5	1.583
1,900	127	122.3	1.542
1,800	127	119.1	1.502
1,750	127	117.4	1.480
1,700	127	115.7	1.459
1,600	127	112.2	1.415
1,500	91	128.4	1.370
1,400	91	124.0	1.323
1,300	91	119.5	1.275
1,250	91	117.2	1.250
1,200	91	114.8	1.225
1,100	91	109.9	1.173
1,000	61	128.0	1.117
900	61	121.5	1.060
800	61	114.5	1.000
750	61	110.9	0.968
700	61	107.1	0.935

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Table 2.13–Class B Concentric-Lay-Stranded Compressed, Reverse-Lay Aluminum 1350 Conductors (Continued)

Size (AWG or kcmil)	Number of Wires	Diameter of Each Wire (mils)	Nominal Overall Diameter (in.)
650	61	103.2	0.901
600	61	99.2	0.866
550	61	95.0	0.829
500	37	116.2	0.789
450	37	110.3	0.749
400	37	104.0	0.706
350	37	97.3	0.661
300	37	90.0	0.611
250	37	82.2	0.558
4/0	19	105.5	0.512
3/0	19	94.0	0.456
2/0	19	83.7	0.405
1/0	19	74.5	0.362
1	19	66.4	0.322
2	7	97.4	0.283
3	7	86.7	0.252
4	7	77.2	0.225
5	7	68.8	0.200
6	7	61.2	0.178
7	7	54.5	0.159
8	7	48.6	0.142
9	7	43.2	0.126
10	7	38.5	0.113
12	7	30.5	0.089
14	7	24.2	0.071
16	7	19.2	–
18	7	15.2	–
20	7	12.1	–

Source: ASTM B231 Concentric-Lay-Stranded Aluminum 1350 Conductors

2.5.3 ACSR

Table 2.14–Concentric-Lay-Stranded Aluminum Conductors, Coated-Steel Reinforced (ACSR)

Size	Stranding		Weight
(AWG or kcmil)	Aluminum Number/Diameter (in.)	Steel Number/Diameter (in.)	(lb./1,000 ft.)
2,156	84/0.1602	19/0.0961	2,511
1,780	84/0.1456	19/0.0874	2,074
1,590	54/0.1716	19/0.1030	2,044
1,590	45/0.1880	7/0.1253	1,792
1,431	54/0.1628	19/0.0977	1,840
1,431	45/0.1783	7/0.1189	1,613
1,272	54/0.1535	19/0.0921	1,635
1,272	45/0.1681	7/0.1121	1,434
1,113	54/0.1436	19/0.0862	1,431
1,113	45/0.1573	7/0.1049	1,255
954.0	54/0.1329	7/0.1329	1,229
954.0	45/0.1456	7/0.0971	1,075
795.0	45/0.1329	7/0.0886	896
795.0	26/0.1749	7/0.1360	1,094
795.0	24/0.1820	7/0.1213	1,023
636.0	26/0.1564	7/0.1216	875
636.0	24/0.1628	7/0.1085	819
636.0	18/0.1880	1/0.1880	690
556.5	26/0.1463	7/0.1138	766
556.5	24/0.1523	7/0.1015	717
556.5	18/0.1758	1/0.1758	604
477.0	30/0.1261	7/0.1261	747
477.0	26/0.1354	7/0.1053	657
477.0	24/0.1410	7/0.0940	615
477.0	18/0.1628	1/0.1628	518
397.5	26/0.1236	7/0.0961	547
397.5	24/0.1287	7/0.0858	512
397.5	18/0.1486	1/0.1486	432
336.4	30/0.1059	7/0.1059	527
336.4	26/0.1137	7/0.0884	463
336.4	18/0.1367	1/0.1367	365
266.8	26/0.1013	7/0.0788	367
266.8	18/0.1217	1/0.1217	290

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Table 2.14–Concentric-Lay-Stranded Aluminum Conductors, Coated-Steel Reinforced (ACSR) (Continued)

Size	Stranding		Weight
(AWG or kcmil)	Aluminum Number/Diameter (in.)	Steel Number/Diameter (in.)	(lb./1,000 ft.)
4/0	6/0.1878	1/0.1878	291.1
211.3	12/0.1327	7/0.1327	527.5
203.2	16/0.1127	19/0.0977	676.8
190.8	12/0.1261	7/0.1261	476.3
176.9	12/0.1214	7/0.1214	441.4
3/0	6/0.1672	1/0.1672	230.8
159.0	12/0.1151	7/0.1151	396.8
134.6	12/0.1059	7/0.1059	336.0
2/0	6/0.1489	1/0.1489	183.1
110.8	12/0.0961	7/0.0961	276.6
1/0	6/0.1327	1/0.1327	145.2
101.8	12/0.0921	7/0.0921	254.1
80.0	8/0.1000	1/0.1670	149.0
2	7/0.0974	1/0.1299	106.7
2	6/0.1052	1/0.1052	91.3
4	7/0.0772	1/0.1029	67.0
4	6/0.0834	1/0.0834	57.4
6	6/0.0661	1/0.0661	36.1

Source: ASTM B232 Specification for Concentric-Lay-Stranded Aluminum Conductors, Coated-Steel Reinforced (ACSR)

2.6 ADDITIONAL CONDUCTOR PROPERTIES

2.6.1 Stranding, Diameter, Area and DC Resistance (32 Through 4/0 AWG)

Table 2.15–Stranding, Diameter, Area and DC Resistance

Size	Stranding	Diameter		Conductor Area		Copper DC Resistance at 20°C	
(AWG)	(No./AWG)	(in.)	(mm)	(cmils)	(mm^2)	(ohms/ft.)	(ohms/km)
32	Solid	0.008	0.203	63.0	0.032	176.1	577.8
	7/40	0.010	0.254	67.3	0.034	176.0	577.5
30	Solid	0.010	0.254	100.0	0.051	106.6	349.8
	7/38	0.012	0.305	112.0	0.057	96.2	315.6
28	Solid	0.013	0.320	159.0	0.081	70.8	232.3
	7/36	0.015	0.381	175.0	0.089	67.5	221.5
	19/40	0.016	0.406	182.6	0.093	58.9	193.3
26	Solid	0.016	0.406	253.0	0.128	44.5	146.0
	7/32	0.019	0.483	278.0	0.141	42.5	139.4
	19/38	0.021	0.533	304.0	0.154	38.9	127.6
24	Solid	0.020	0.511	404.0	0.205	27.2	89.2
	7/32	0.024	0.610	448.0	0.227	25.7	84.3
	10/34	0.023	0.584	397.0	0.201	28.8	94.5
	19/36	0.025	0.635	475.0	0.241	24.9	81.7
22	Solid	0.025	0.635	475.0	0.326	16.7	54.8
	7/30	0.031	0.787	700.0	0.355	16.6	54.5
	16/34	0.030	0.762	635.0	0.322	18.0	59.1
	19/34	0.032	0.813	754.0	0.382	15.5	50.9
20	Solid	0.032	0.813	1,020	0.517	10.5	34.5
	7/28	0.038	0.965	1,113	0.564	10.3	33.8
	10/30	0.036	0.914	1,000	0.507	11.4	37.4
	19/32	0.040	1.02	1,197	0.607	9.48	31.1
	26/34	0.037	0.940	1,032	0.523	11.3	37.1
18	Solid	0.040	1.02	1,620	0.821	6.77	22.2
	7/26	0.048	1.22	1,771	0.897	6.45	21.2
	16/30	0.046	1.17	1,600	0.811	6.15	23.5
	19/30	0.050	1.27	1,900	0.963	6.10	20.0
	41/34	0.047	1.19	1,627	0.824	7.08	23.2
16	Solid	0.051	1.29	2,580	1.31	4.47	14.7
	7/24	0.058	1.47	2,828	1.43	4.04	13.3
	19/29	0.057	1.45	2,426	1.23	4.82	15.8
	26/30	0.050	1.52	2,600	1.32	4.39	14.4
	65/34	0.060	1.52	2,580	1.32	4.47	14.7

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Table 2.15–Stranding, Diameter, Area and DC Resistance (Continued)

Size	Stranding	Diameter		Conductor Area		Copper DC Resistance at 20°C	
(AWG)	(No./AWG)	(in.)	(mm)	(cmils)	(mm^2)	(ohms/ft.)	(ohms/km)
14	Solid	0.064	1.63	4,110	2.08	2.68	8.79
	19/27	0.071	1.80	3,838	1.94	3.05	10.0
	41/30	0.077	1.96	4,100	2.08	2.81	9.22
12	Solid	0.081	2.05	6,530	3.31	1.65	5.41
	19/25	0.090	2.29	6,080	3.08	1.87	6.14
	65/30	0.091	2.31	6,500	3.29	1.82	5.97
10	Solid	0.102	2.59	10,380	5.26	1.11	3.64
	37/36	0.112	2.84	9,361	4.74	1.38	4.53
	105/30	0.130	3.30	10,500	5.32	1.10	3.61
8	Solid	0.129	3.28	16,500	8.36	0.718	2.36
	133/29	0.166	4.22	17,024	8.63	0.710	2.33
	168/30	0.174	4.42	16,800	8.51	0.700	2.30
6	Solid	0.162	4.12	26,240	13.3	0.440	1.44
	133/27	0.210	5.33	26,866	13.6	0.430	1.41
	266/30	0.204	5.18	26,600	13.5	0.440	1.44
4	Solid	0.204	5.18	41,740	21.1	0.275	0.902
	133/25	0.257	6.53	42,560	21.6	0.290	0.951
	420/30	0.257	6.53	42,000	21.3	0.280	0.919
2	Solid	0.258	6.54	66,360	33.6	0.172	0.564
	665/30	0.338	8.59	66,500	33.7	0.180	0.591
1	Solid	0.289	7.34	83,690	42.4	0.142	0.466
	817/30	0.328	8.33	81,700	41.4	0.140	0.459
1/0	Solid	0.325	8.26	105,600	53.5	0.111	0.364
	1,045/30	0.410	10.4	104,500	53.0	0.120	0.394
2/0	Solid	0.365	9.27	133,100	67.4	0.088	0.289
	1,330/30	0.496	12.6	133,000	67.4	0.099	0.325
3/0	Solid	0.410	10.4	167,800	85.0	0.070	0.230
	1,661/30	0.464	11.8	166,100	84.2	0.068	0.223
4/0	Solid	0.460	11.7	211,600	107	0.055	0.180
	2,104/30	0.608	15.4	210,400	107	0.060	0.197

2.6.2 Stranding, Diameter, Area, DC Resistance and Weight (20 AWG Through 2,000 kcmil)

Table 2.16–Copper Conductor Stranding, Diameter, Area, Weight and DC Resistance

Nominal Area		Size	Number/Diameter of Individual Wires		Overall Diameter		Nominal Weight		DC Resistance at 20°C (68°F)	
(mm^2)	(cmils)	(AWG)	(in.)	(mm)	(in.)	(mm)	(lb./1,000 ft.)	(kg/km)	(ohms/1,000 ft.)	(ohms/km)
0.50	987	–	1/0.032	1/0.613	0.032	0.81	3.100	4.613	10.13	32.33
–	1,020	20	7/0.0121	7/0.307	0.036	0.91	3.157	4.098	10.22	33.77
0.75	1,480	–	1/0.036	1/0.991	0.039	0.99	4.603	6.851	6.820	22.37
–	1,620	18	1/0.403	1/1.02	0.040	1.02	4.917	7.316	6.387	20.95
–	1,620	18	7/0.0152	7/0.386	0.046	1.16	4.980	7.410	6.523	21.40
1.0	1,970	–	1/0.045	1/1.14	0.045	1.14	6.130	9.122	5.127	16.80
1.0	1,970	–	7/0.017	7/0.432	0.051	1.30	6.293	9.266	5.213	17.11
–	2,580	16	1/0.0508	1/1.29	0.061	1.29	7.810	11.63	4.020	13.19
–	2,580	16	7/0.0192	7/0.488	0.058	1.46	7.877	11.82	4.087	13.41
1.5	2,960	–	1/0.055	1/1.40	0.055	1.40	9.157	13.63	3.430	11.25
1.5	2,960	–	7/0.021	7/0.533	0.063	1.60	8.837	14.14	3.417	11.21
–	4,110	14	1/0.641	1/1.63	0.064	1.63	12.44	18.51	2.524	8.281
–	4,110	14	7/0.0242	7/0.615	0.073	1.84	12.62	18.78	2.573	8.442
2.5	4,930	–	1/0.071	1/1.80	0.071	1.80	15.26	22.71	2.057	6.750
2.5	4,930	–	7/0.027	7/0.686	0.081	2.06	15.71	23.38	2.067	6.782
–	6,530	12	1/0.0808	1/2.05	0.081	2.05	19.76	29.41	1.589	5.212
–	6,530	12	7/0.0305	7/0.755	0.092	2.32	20.05	29.84	1.620	5.315
4	7,890	–	1/0.089	1/2.26	0.089	2.26	23.98	35.68	1.309	4.296
4	7,890	–	7/0.034	7/0.864	0.102	2.59	24.91	37.08	1.304	4.277
–	10,380	10	1/0.1019	1/2.59	0.102	2.59	31.43	46.77	0.999	3.277
–	10,380	10	7/0.0385	7/0.978	0.116	2.93	31.94	47.54	1.017	3.335
6	11,800	–	1/0.109	1/2.77	0.109	2.77	35.97	53.52	0.8730	2.864
6	11,800	–	7/0.042	7/0.107	0.126	3.21	38.00	56.55	0.8543	2.803
–	13,090	9	1/0.1144	7/2.91	0.1144	2.91	39.60	58.93	0.7923	2.600
–	13,090	9	7/0.0432	7/1.10	0.130	3.30	40.23	59.86	0.8073	2.649
–	16,510	8	1/0.1285	1/3.26	0.128	3.26	50.17	74.36	0.6147	2.061
–	16,510	8	7/0.0486	7/1.23	0.146	3.70	50.90	75.75	0.6380	2.093
10	19,700	–	1/0.141	1/3.58	0.141	3.58	60.17	89.54	0.5217	1.711
10	19,700	–	7/0.054	7/1.37	0.162	4.12	62.83	93.51	0.5167	1.695
–	20,820	7	1/0.1443	1/3.67	0.144	3.67	63.03	93.80	0.4980	1.634
–	20,820	7	7/0.0545	7/1.38	0.164	4.15	64.00	95.24	0.5073	1.664

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Table 2.16–Copper Conductor Stranding, Diameter, Area, Weight and DC Resistance (Continued)

Nominal Area		Size	Number/Diameter of Individual Wires		Overall Diameter		Nominal Weight		DC Resistance at 20°C (68°F)	
(mm^2)	(cmils)	(AWG)	(in.)	(mm)	(in.)	(mm)	(lb./1,000 ft.)	(kg/km)	(ohms/1,000 ft.)	(ohms/km)
–	26,240	6	1/0.162	1/4.11	0.162	4.11	79.43	118.2	0.3950	1.296
–	26,240	6	7/0.0612	7/1.55	0.184	4.66	80.73	120.1	0.4023	1.320
16	31,600	–	7/0.068	7/1.73	0.204	5.18	99.67	148.3	0.3259	1.069
–	33,090	6	7/0.0688	7/1.75	0.206	5.24	102.0	151.8	0.3183	1.044
–	41,740	4	7/0.0772	7/1.96	0.232	5.88	128.4	191.1	0.2528	0.8295
25	49,300	–	7/0.065	7/2.16	0.255	6.48	155.7	231.7	0.2176	0.6843
–	52,620	3	7/0.0867	7/2.20	0.260	6.61	162.0	241.1	0.2005	0.6577
35	69,100	–	7/0.100	7/2.54	0.300	7.62	215.5	320.7	0.1507	0.4944
35	69,100	–	19/0.061	19/1.55	0.305	7.75	218.1	324.5	0.1495	0.4909
–	83,690	1	19/0.0664	19/1.63	0.332	8.43	258.4	384.5	0.1261	0.4139
50	98,700	–	19/0.073	19/1.85	0.365	9.27	312.3	464.8	0.1044	0.3424
–	105,400	1/0	19/0.0745	19/1.89	0.373	9.46	325.3	484.1	0.10020	0.3288
–	133,100	2/0	19/0.0837	19/2.13	0.419	10.6	410.7	611.1	0.07940	0.2605
70	138,000	–	19/0.086	19/2.18	0.430	10.9	433.3	645.0	0.07520	0.2467
–	167,800	3/0	19/0.094	19/2.39	0.470	11.9	517.7	770.4	0.06293	0.2065
–	167,800	3/0	37/0.0673	37/1.71	0.471	12.0	517.0	769.4	0.06310	0.2070
95	187,000	–	19/0.101	19/2.57	0.505	12.8	597.7	889.4	0.05453	0.1789
–	211,600	4/0	19/0.1055	19/2.68	0.528	13.4	652.3	970.8	0.04997	0.1639
120	237,000	–	37/0.0811	37/0.0811	0.567	14.4	749.0	1,115	0.04357	0.1429
–	250,000	–	37/0.0822	37/0.0822	0.575	14.6	771.3	1,148	0.04230	0.1388
150	300,000	–	37/0.090	37/2.29	0.630	16.0	924.7	1,376	0.03527	0.1157
–	350,000	–	37/0.0973	37/2.47	0.681	17.3	1,081	1,609	0.03018	0.09903
185	365,000	–	37/0.100	37/2.54	0.700	17.8	1,142	1,699	0.02857	0.09375
–	400,000	–	37/0.104	37/2.64	0.728	18.5	1,235	1,838	0.02642	0.06668
240	474,000	–	37/0.114	37/2.90	0.798	20.3	1,484	2,206	0.02199	0.07214
240	474,000	–	61/0.089	61/2.26	0.801	20.3	1,491	2,219	0.02189	0.07181
–	500,000	–	37/0.1162	37/2.95	0.813	20.7	1,608	2,294	0.02116	0.06943
–	500,000	–	61/0.0905	61/2.30	0.814	20.7	1,549	2,295	0.02117	0.06944
300	592,000	–	61/0.099	61/2.51	0.891	22.6	1,842	2,746	0.02102	0.05803
–	600,000	–	61/0.0992	61/2.52	0.893	22.7	1,853	2,757	0.01762	0.05780
–	700,000	–	61/0.1071	61/2.72	0.964	24.5	2,160	3,214	0.01511	0.04959
–	750,000	–	61/0.1109	61/2.82	0.998	25.4	2,316	3,446	0.01410	0.04625
–	750,000	–	91/0.0908	91/2.31	0.999	25.4	2,316	3,447	0.01410	0.04625

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Table 2.16–Copper Conductor Stranding, Diameter, Area, Weight and DC Resistance (Continued)

Nominal Area		Size	Number/Diameter of Individual Wires		Overall Diameter		Nominal Weight		DC Resistance at 20°C (68°F)	
(mm^2)	(cmils)	(AWG)	(in.)	(mm)	(in.)	(mm)	(lb./1,000 ft.)	(kg/km)	(ohms/1,000 ft.)	(ohms/km)
400	789,000	–	61/0.114	61/2.90	1.026	26.1	2,447	3,642	0.01334	0.04377
–	800,000	–	61/0.1145	61/2.91	1.031	26.2	2,468	3,673	0.01322	0.04338
–	800,000	–	91/0.0938	91/2.38	1.032	26.2	2,471	3,678	0.01321	0.04334
500	1,000,000	–	61/0.1280	61/3.25	1.152	29.3	3,085	4,590	0.01058	0.03472
–	1,000,000	–	91/0.1048	91/2.66	1.153	29.3	3,085	4,591	0.01058	0.03472
625	1,234,000	–	91/0.117	91/2.97	1.287	32.7	3,845	5,722	0.00849	0.02786
–	1,250,000	–	91/0.1172	91/2.98	1.289	32.7	3,858	5,742	0.008460	0.02776
–	1,250,000	–	127/0.0992	127/2.52	1.290	32.8	3,858	6,741	0.008463	0.02777
–	1,500,000	–	91/0.1284	91/3.26	1.412	35.9	4,631	6,892	0.007050	0.02313
–	1,500,000	–	127/0.1087	127/2.76	1.413	35.9	4,632	6,894	0.007183	0.02312
800	1,580,000	–	91/0.132	91/3.35	1.452	36.9	4,894	7,284	0.006670	0.02188
1,000	1,970,000	–	91/0.147	91/3.73	1.617	41.1	6,070	9,033	0.005380	0.01765
–	2,000,000	–	127/0.1255	127/3.19	1.632	41.5	6,175	9,189	0.005287	0.01735
–	2,000,000	–	169/0.1088	169/2.76	1.632	41.5	6,176	9,191	0.005287	0.01735

Based on British (BSA), Canadian (CSA), American (ASTM and ICEA) and German (VDE) Standards

2.6.3 IEC Stranding

Table 2.17–Typical IEC Stranding

Cross Section	Ordinary Stranding (Class 2)	Multi-wire Stranding	Fine Wire Stranding (Class 5)	Extra-fine Wire Stranding (Class 6)			
(mm^2)	No./Dia. (mm)	No./Dia. (mm)	No./Dia. (mm)	No./Dia. (mm)			
0.05	–	–	–	–	–	–	25/0.05
0.08	–	–	–	–	–	–	41/0.05
0.14	–	–	–	18/0.10	18/0.1	36/0.07	72/0.05
0.25	–	–	14/0.16	32/0.10	32/0.1	65/0.07	128/0.05
0.34	–	7/0.25	19/0.16	42/0.10	42/0.1	88/0.07	174/0.05
0.38	–	7/0.27	12/0.21	21/0.16	48/0.1	100/0.07	194/0.05
0.5	7/0.30	7/0.30	16/0.21	28/0.16	64/0.1	131/0.07	256/0.05
0.75	7/0.37	7/0.37	24/0.21	42/0.16	69/0.1	195/0.07	384/0.05
1.0	7/0.43	7/0.43	32/0.21	56/0.16	128/0.1	260/0.07	512/0.05
1.5	7/0.52	7/0.52	30/0.26	84/0.16	192/0.1	392/0.07	768/0.05
2.5	7/0.67	19/0.41	50/0.26	140/0.16	320/0.1	651/0.07	1,280/0.05
4	7/0.85	19/0.52	56/0.31	224/0.16	512/0.1	1,040/0.07	–
6	7/1.05	19/0.64	84/0.31	192/0.21	768/0.1	1,560/0.07	–
10	7/1.35	49/0.51	80/0.41	320/0.21	1,280/0.1	2,600/0.07	–
16	7/1.70	49/0.65	128/0.41	512/0.21	2,048/0.1	–	–
25	7/2.13	84/0.62	200/0.41	800/0.21	3,200/0.1		–
35	7/2.52	133/0.58	280/0.41	1,120/0.21	–	–	–
50	19/1.83	133/0.69	400/0.41	705/0.31	–	–	–
70	19/2.17	189/0.69	356/0.51	990/0.31	–	–	–
95	19/2.52	259/0.69	485/0.51	1,340/0.31	–	–	–
120	37/2.03	336/0.67	614/0.51	1,690/0.31	–	–	–
150	37/2.27	392/0.69	765/0.51	2,123/0.31	–	–	–
185	37/2.52	494/0.69	944/0.51	1,470/0.41	–	–	–
240	61/2.24	627/0.70	1,225/0.51	1,905/0.41	–	–	–
300	61/2.50	790/0.70	1,530x0.51	2,385x0.41	–	–	–
400	61/2.89	–	2.035x0.51	–	–	–	–
500	61/3.23	–	1,768x0.61	–	–	–	–

Note: Additional information is available in IEC 60228.