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UL Standard for Safety for Electrical Wires, Cables, and Flexible Cords, UL 1581

Fourth Edition, Dated October 31, 2001

Revisions: This Standard contains revisions through and including May 6, 2003

Summary of Topics:

These revisions of UL 1581 are being issued to add conductor insulation and jacket materials, to refine existing wire test procedures, and to add test methods and construction details for conductors not previously covered.

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Text that has been changed in any manner is marked with a vertical line in the margin. Changes in requirements are marked with a vertical line in the margin and are followed by an effective date note indicating the date of publication or the date on which the changed requirement becomes effective.

The new and/or revised requirements are substantially in accordance with UL's Bulletin(s) on this subject dated December 18, 2002. The bulletin(s) is now obsolete and may be discarded.

The revisions dated May 6, 2003 include a reprinted title page (page 1) for this Standard.

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The requirements in this Standard are now in effect, except for those paragraphs, sections, tables, figures, and/or other elements of the Standard having future effective dates as indicated in the note following the affected item. The prior text for requirements that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

New product submittals made prior to a specified future effective date will be judged under all of the requirements in this Standard including those requirements with a specified future effective date, unless the applicant specifically requests that the product be judged under the current requirements. However, if

the applicant elects this option, it should be noted that compliance with all the requirements in this Standard will be required as a condition of continued Listing, Recognition, and Follow-Up Services after the effective date, and understanding of this should be signified in writing.

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The most recent designation of ANSI/UL 1581 as an American National Standard (ANSI) occurred on March 26, 2003.

This ANSI/UL Standard for Safety, which consists of the Fourth Edition with revisions through May 6, 2003, is under continuous maintenance, whereby each revision is ANSI approved upon publication. Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Written comments are to be sent to UL-MEL Standards Department, 1285 Walt Whitman Road, Melville, NY 11747.

An effective date included as a note immediately following certain requirements is one established by Underwriters Laboratories Inc.

Revisions of this Standard will be made by issuing revised or additional pages bearing their date of issue. A UL Standard is current only if it incorporates the most recently adopted revisions, all of which are itemized on the transmittal notice that accompanies the latest set of revised requirements.

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FOREWORD

A. This Standard contains basic requirements for products covered by Underwriters Laboratories Inc. (UL) under its Follow-Up Service for this category within the limitations given below and in the Scope section of this Standard. These requirements are based upon sound engineering principles, research, records of tests and field experience, and an appreciation of the problems of manufacture, installation, and use derived from consultation with and information obtained from manufacturers, users, inspection authorities, and others having specialized experience. They are subject to revision as further experience and investigation may show is necessary or desirable.

B. The observance of the requirements of this Standard by a manufacturer is one of the conditions of the continued coverage of the manufacturer's product.

C. A product which complies with the text of this Standard will not necessarily be judged to comply with the Standard if, when examined and tested, it is found to have other features which impair the level of safety contemplated by these requirements.

D. A product that contains features, characteristics, components, materials, or systems new or different from those covered by the requirements in this Standard, and that involves a risk of fire or of electric shock or injury to persons shall be evaluated using appropriate additional component and end-product requirements to maintain the level of safety as originally anticipated by the intent of this Standard. A product whose features, characteristics, components, materials, or systems conflict with specific requirements or provisions of this Standard does not comply with this Standard. Revision of requirements shall be proposed and adopted in conformance with the methods employed for development, revision, and implementation of this Standard.

E. UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. The opinions and findings of UL represent its professional judgment given with due consideration to the necessary limitations of practical operation and state of the art at the time the Standard is processed. UL shall not be responsible to anyone for the use of or reliance upon this Standard by anyone. UL shall not incur any obligation or liability for damages, including consequential damages, arising out of or in connection with the use, interpretation of, or reliance upon this Standard.

F. Many tests required by the Standards of UL are inherently hazardous and adequate safeguards for personnel and property shall be employed in conducting such tests.

INTRODUCTION

1 Scope

1.1 This standard contains specific details of the conductors, of the insulation, of the jackets and other coverings, and of the methods of sample preparation, of specimen selection and conditioning, and of measurement and calculation that are required in the Standards for Thermoset-Insulated Wires and Cables (UL 44), Thermoplastic-Insulated Wires and Cables (UL 83), Flexible Cord and Fixture Wire (UL 62), and Service-Entrance Cables (UL 854). Elements of this standard are referenced in other requirements as well.

1.2 The requirements for the particular materials, construction, performance, and marking of an individual type of wire, cable, or flexible cord are stated in the standard covering the finished type. They are not part of this reference standard.

1.3 In each case in which an element of this standard does not apply, the standard covering the finished type so states and specifies what does apply.

2 Units of Measurement

2.1 In addition to being stated in the inch/pound units that are customary in the USA, each numerical requirement in this standard is also stated in units that make the requirement conveniently usable in countries employing the various metric systems (practical SI and customary). Equivalent— although not exactly identical — results are to be expected from applying a requirement in USA or metric terms. Equipment calibrated in metric units is to be used when a requirement is applied in metric terms.

3 References and Terms

3.1 The term "wire standard" as used in this standard means any standard that covers finished electrical wires, cables, or flexible cords and in which reference is made to this reference standard (UL 1581).

4 – 9 *Reserved for Future Use*

CONDUCTORS

10 Requirements for Aluminum Conductors of an 8000 Series Alloy

10.1 These requirements cover aluminum wire in annealed and intermediate tempers using 8000 series electrical-conductor-grade aluminum alloys. These alloys are for use in solid conductors in the 6 – 4/0 AWG sizes and in round-strand and compressed- and compact-stranded conductors in the 12 AWG – 2000 kcmil sizes.

10.2 The wire shall be of a registered 8000 series electrical-conductor-grade aluminum alloy complying with ASTM B 800-00. The conductor diameter and cross-sectional area shall comply with Conductor Diameter and Cross-Sectional Area, Section 20. The d-c resistance of the conductors shall comply with D-C Conductor Resistance, Section 30.

10.3 The temper of the wire of the finished conductor shall be annealed (-0) or intermediate (-H1X) or (-H2X). The tensile strength and elongation (see note ^b to Table 10.1) of the finished stranded conductor tested as a unit or of the individual strands removed from the finished conductor or of the finished solid conductor shall comply with Table 10.1 when specimens are tested at a speed of 1 in/min or 25 mm/min using the equipment and procedure described in ASTM B 557-94.

Table 10.1
Mechanical properties^a of solid and stranded conductors of an 8000 series aluminum alloy

Temper	Tensile strength	Elongation ^b in 10 inches or 250 mm
Annealed (-0)	All specimens: 11,250 ±2,750 lbf/in ² or 78 ±19 MPa (MN/m ²) or 7,757 ±1,896 N/cm ² or 7.91 ±1.93 kgf/mm ²	Solid conductor: 10.0 percent minimum Stranded conductor: 10.0 percent minimum
Semi-annealed: (-H1X) and (-H2X)	Wires (strands) removed from the finished stranded conductor: 18,675 ±4,425 lbf/in ² or 129 ±30 MPa (MN/m ²) or 12,876 ±3,050 N/cm ² or 13 ±3 kgf/mm ² All other specimens: 18,500 ±3,500 lbf/in ² or 128 ±24 MPa (MN/m ²) or 12,755 ±2,413 N/cm ² or 13.01 ±2.46 kgf/mm ²	Solid conductor: 10.0 percent minimum Stranded conductor: 10.0 percent minimum
		Solid conductor: 10.0 percent minimum Stranded conductor: 10.0 percent minimum

^a For the purpose of determining compliance with the tabulated limits, test results are to be rounded as follows after specimens are tested at a speed of 1 in/min or 25 mm/min using the equipment and procedure described in ASTM B 557-94:

- 1) Each calculated value of tensile strength is to be rounded to the nearest 100 lbf/in² or 1 MPa (MN/m²) or 69 N/cm² or 0.07 kgf/mm².
- 2) Each value of elongation is to be rounded to the nearest 0.5 percent as described in the rounding method in ASTM E 29-93a(R1999).

^b Compliance with the elongation requirement for stranded conductors is to be determined on wires taken prior to stranding into conductors, on wires taken from a stranded conductor, or on the stranded conductor as a whole.

11 Requirements for Copper-Clad Aluminum Conductors

11.1 The requirements in this section (11.1) cover copper-clad aluminum conductors. Copper-clad aluminum conductors shall be drawn from copper-clad aluminum rod. The copper shall be metallurgically bonded to the aluminum core, shall occupy 10 percent or more of the cross section of a solid conductor and of each wire (strand) of a stranded conductor, and shall be concentric with the aluminum. The thickness of the copper shall not be less than 2.56 percent of the diameter of the solid conductor or wire (strand) as determined by microscopic examination of a polished right cross section of the round strand or round solid conductor. The tensile strength of a finished copper-clad aluminum conductor tested as a unit or of the wires (strands) from a finished stranded copper-clad aluminum conductor and of a finished solid copper-clad aluminum conductor shall not exceed 20,000 lbf/in² or 138 MPa (MN/m²) or 13,800 N/cm² or 14 kgf/mm² when specimens are tested at the speed and using the equipment and procedure indicated in ASTM B 566-93(R1998). The elongation of the same specimens shall not be less than 15 percent in 10 inches or 250 mm.

12 – 19 Reserved for Future Use

20 Conductor Diameter and Cross-Sectional Area

**Table 20.1
Conductor dimensions**

Table 20.1 revised May 6, 2003

Size of conductor	Diameter of solid conductor								Cross-sectional area of conductor							
	Nominal				Minimum ^c				Maximum ^c				Minimum			
	Nominal		Minimum ^c		Maximum ^c		Minimum ^d		Nominal		0.98 × Nominal ^a		0.97 × Nominal ^b			
	mils	mm	mils (0.98 x nominal)	mm	mils (1.01 x nominal)	mm	mils (0.99 x nominal)	mm	cmil	mm ²	cmil	mm ²	cmil	mm ²		
AWG																
56	0.49	0.0124	0.48	0.0122	0.495	0.0126	0.485	0.0123	0.240	0.000122	0.235	0.000119	–	–		
55	0.55	0.0140	0.54	0.0137	0.556	0.0141	0.545	0.0138	0.302	0.000153	0.296	0.000150	–	–		
54	0.62	0.0157	0.61	0.0154	0.63	0.0159	0.614	0.0156	0.384	0.000195	0.376	0.000191	–	–		
53	0.70	0.0178	0.69	0.0174	0.71	0.0180	0.69	0.0176	0.490	0.000248	0.480	0.000243	–	–		
52	0.78	0.0198	0.76	0.0194	0.79	0.0200	0.77	0.0196	0.608	0.000308	0.596	0.000302	–	–		
51	0.88	0.0224	0.86	0.0219	0.89	0.0226	0.87	0.0221	0.774	0.000392	0.759	0.000384	–	–		
50	0.99	0.0251	0.97	0.0246	1.00	0.0254	0.98	0.0249	0.980	0.000497	0.960	0.000487	–	–		
49	1.11	0.0282	1.09	0.0276	1.12	0.0285	1.10	0.0279	1.23	0.000624	1.21	0.000611	–	–		
48	1.24	0.0315	1.22	0.0309	1.25	0.0318	1.23	0.0312	1.54	0.000779	1.51	0.000765	–	–		
47	1.40	0.0356	1.37	0.0348	1.41	0.0359	1.39	0.0352	1.96	0.000993	1.92	0.000973	–	–		
46	1.57	0.0399	1.54	0.0391	1.59	0.0403	1.55	0.0395	2.46	0.00125	2.41	0.00122	–	–		
45	1.76	0.0447	1.73	0.0438	1.78	0.0452	1.74	0.0443	3.10	0.00157	3.04	0.00154	–	–		
44	2.0	0.051	1.96	0.050	2.02	0.0513	1.98	0.050	4.00	0.00203	3.92	0.00199	–	–		
43	2.2	0.056	2.16	0.055	2.22	0.0564	2.18	0.055	4.84	0.00245	4.74	0.00240	–	–		
42	2.5	0.064	2.45	0.062	2.53	0.0641	2.48	0.063	6.25	0.00317	6.13	0.00310	–	–		

Table 20.1 Continued on Next Page

Table 20.1 Continued

Size of conductor	Diameter of solid conductor								Cross-sectional area of conductor					
									Nominal				Minimum	
	Nominal		Minimum ^c		Maximum ^c		Minimum ^d		Nominal		0.98 × Nominal ^a		0.97 × Nominal ^b	
	mils	mm	mils (0.98 x nominal)	mm	mils (1.01 x nominal)	mm	mils (0.99 x nominal)	mm	cmil	mm ²	cmil	mm ²	cmil	mm ²
AWG														
41	2.8	0.071	2.7	0.070	2.83	0.072	2.77	0.070	7.84	0.00397	7.68	0.00389	-	-
40	3.1	0.079	3.0	0.077	3.13	0.080	3.07	0.078	9.61	0.00487	9.42	0.00477	-	-
39	3.5	0.089	3.4	0.087	3.54	0.090	3.47	0.088	12.2	0.00621	12.0	0.00606	-	-
38	4.0	0.102	3.9	0.100	4.04	0.103	3.96	0.101	16.0	0.00811	15.7	0.00795	-	-
37	4.5	0.144	4.4	0.112	4.55	0.115	4.46	0.113	20.2	0.0103	19.8	0.0100	-	-
36	5.0	0.127	4.9	0.125	5.05	0.128	4.95	0.126	25.0	0.0127	24.5	0.0124	-	-
35	5.6	0.142	5.5	0.139	5.7	0.144	5.5	0.141	31.4	0.0159	30.8	0.0156	-	-
34	6.3	0.160	6.2	0.157	6.4	0.162	6.2	0.158	39.7	0.0201	38.9	0.0197	-	-
33	7.1	0.180	7.0	0.177	7.2	0.182	7.0	0.179	50.4	0.0255	49.4	0.0250	-	-
32	8.0	0.203	7.8	0.199	8.1	0.205	7.9	0.201	64.0	0.0324	62.7	0.0318	-	-
31	8.9	0.226	8.7	0.222	9.0	0.228	8.8	0.224	79.2	0.0401	77.6	0.0393	-	-
30	10.0	0.254	9.8	0.249	10.1	0.257	9.9	0.251	100	0.0507	98	0.0497	-	-
29	11.3	0.287	11.1	0.282	11.4	0.290	11.2	0.284	128	0.0647	125	0.0633	-	-
28	12.6	0.320	12.3	0.312	12.7	0.323	12.5	0.318	159	0.0804	156	0.0790	-	-
27	14.2	0.361	13.9	0.353	14.3	0.363	14.1	0.358	202	0.102	198	0.100	-	-
26	15.9	0.404	15.6	0.396	16.1	0.409	15.7	0.399	253	0.128	248	0.126	-	-
25	17.9	0.455	17.5	0.444	18.1	0.460	17.7	0.450	320	0.162	314	0.159	-	-
24	20.1	0.511	19.7	0.500	20.3	0.516	19.9	0.506	404	0.205	396	0.201	392	0.199
23	22.6	0.574	22.1	0.561	22.8	0.579	22.4	0.568	511	0.259	501	0.254	496	0.251
22	25.3	0.643	24.8	0.630	25.6	0.650	25.0	0.635	640	0.324	627	0.318	621	0.314
21	28.5	0.724	27.9	0.709	28.8	0.732	28.2	0.717	812	0.412	796	0.404	788	0.400
20	32.0	0.813	31.4	0.798	32.3	0.820	31.7	0.805	1020	0.519	1000	0.509	989	0.503
19	35.9	0.912	35.2	0.894	36.3	0.922	35.5	0.902	1290	0.653	1264	0.641	1251	0.633
18	40.3	1.02	39.5	1.00	40.7	1.03	39.9	1.01	1620	0.823	1588	0.807	1571	0.798
17	45.3	1.15	44.4	1.13	45.8	1.16	44.8	1.14	2050	1.04	2009	1.02	1989	1.01
16	50.8	1.29	49.8	1.26	51.3	1.30	50.3	1.28	2580	1.31	2528	1.28	2503	1.27
15	57.1	1.45	56.0	1.42	57.7	1.47	56.5	1.44	3260	1.65	3195	1.62	3162	1.60
14	64.1	1.63	62.8	1.60	64.7	1.64	63.5	1.61	4110	2.08	4028	2.04	3987	2.02
13	72.0	1.83	70.6	1.79	72.7	1.85	71.3	1.81	5180	2.63	5076	2.58	5025	2.55
12	80.8	2.05	79.2	2.01	81.6	2.07	80.0	2.03	6530	3.31	6399	3.24	6334	3.21
11	90.7	2.30	88.9	2.26	91.6	2.33	89.8	2.28	8230	4.17	8065	4.09	7983	4.04

Table 20.1 Continued

Size of conductor	Diameter of solid conductor								Cross-sectional area of conductor					
									Nominal					
	Nominal		Minimum ^c		Maximum ^c		Minimum ^d		Nominal		0.98 × Nominal ^a		0.97 × Nominal ^b	
	mils	mm	mils (0.98 x nominal)	mm	mils (1.01 x nominal)	mm	mils (0.99 x nominal)	mm	cmil	mm ²	cmil	mm ²	cmil	mm ²
AWG														
10	101.9	2.588	99.9	2.537	102.9	2.614	100.9	2.563	10380	5.261	10172	5.16	10069	5.103
9	114.4	2.906	112.1	2.847	115.5	2.934	113.3	2.878	13090	6.631	12828	6.50	-	-
8	128.5	3.264	125.9	3.198	129.8	3.297	127.2	3.231	16510	8.367	16180	8.20	-	-
7	144.3	3.665	141.4	3.592	145.7	3.701	142.9	3.630	20820	10.55	20404	10.34	-	-
6	162.0	4.115	158.8	4.034	163.6	4.155	160.4	4.074	26240	13.30	25715	13.03	-	-
5	181.9	4.620	178.3	4.529	183.7	4.666	180.1	4.575	33090	16.77	32428	16.43	-	-
4	204.3	5.189	200.2	5.085	206.3	5.240	202.3	5.138	41740	21.15	40905	20.73	-	-
3	229.4	5.827	224.8	5.710	231.7	5.885	227.1	5.768	52620	26.67	51568	26.14	-	-
2	257.6	6.543	252.4	6.411	260.2	6.609	255.0	6.477	66360	33.62	65033	32.95	-	-
1	289.3	7.348	283.5	7.201	292.2	7.422	286.4	7.275	83690	42.41	82016	41.56	-	-
1/0	324.9	8.252	318.4	8.087	328.1	8.334	321.7	8.171	105600	53.49	103488	52.42	-	-
2/0	364.8	9.266	357.5	9.080	368.4	9.357	361.2	9.174	133100	67.43	130438	66.08	-	-
3/0	409.6	10.40	401.4	10.20	413.7	10.51	405.5	10.30	167800	85.01	164444	83.31	-	-
4/0	460.0	11.68	450.8	11.45	464.6	11.80	455.4	11.57	211600	107.2	207368	105.1	-	-
kcmil									kcmil		kcmil			
250	-	-	-	-	-	-	-	-	250	127	245	124.1	-	-
300	-	-	-	-	-	-	-	-	300	152	294	149.0	-	-
350	-	-	-	-	-	-	-	-	350	177	343	173.8	-	-
400	-	-	-	-	-	-	-	-	400	203	392	198.6	-	-
450	-	-	-	-	-	-	-	-	450	228	441	223.5	-	-
500	-	-	-	-	-	-	-	-	500	253	490	248.3	-	-
550	-	-	-	-	-	-	-	-	550	279	539	273.1	-	-
600	-	-	-	-	-	-	-	-	600	304	588	297.9	-	-
650	-	-	-	-	-	-	-	-	650	329	637	322.8	-	-
700	-	-	-	-	-	-	-	-	700	355	686	347.6	-	-
750	-	-	-	-	-	-	-	-	750	380	735	372.4	-	-
800	-	-	-	-	-	-	-	-	800	405	784	397.2	-	-
900	-	-	-	-	-	-	-	-	900	456	882	446.9	-	-
1000	-	-	-	-	-	-	-	-	1000	507	980	496.6	-	-
1100	-	-	-	-	-	-	-	-	1100	557	1078	546.2	-	-
1200	-	-	-	-	-	-	-	-	1200	608	1176	595.9	-	-

Table 20.1 Continued

Size of conductor	Diameter of solid conductor								Cross-sectional area of conductor								
									Minimum								
	Nominal		Minimum ^c		Maximum ^c		Minimum ^d		Nominal		0.98 × Nominal ^a		0.97 × Nominal ^b				
	mils	mm	mils (0.98 x nominal)	mm	mils (1.01 x nominal)	mm	mils (0.99 x nominal)	mm	cmil	mm ²	cmil	mm ²	cmil	mm ²			
kcmil									kcmil			kcmil					
1250	-	-	-	-	-	-	-	-	1250	633		1225	620.7	-	-		
1300	-	-	-	-	-	-	-	-	1300	659		1274	645.5	-	-		
1400	-	-	-	-	-	-	-	-	1400	709		1372	695.2	-	-		
1500	-	-	-	-	-	-	-	-	1500	760		1470	744.9	-	-		
1600	-	-	-	-	-	-	-	-	1600	811		1568	794.5	-	-		
1700	-	-	-	-	-	-	-	-	1700	861		1666	844.2	-	-		
1750	-	-	-	-	-	-	-	-	1750	887		1715	869.0	-	-		
1800	-	-	-	-	-	-	-	-	1800	912		1764	893.8	-	-		
1900	-	-	-	-	-	-	-	-	1900	963		1862	943.5	-	-		
2000	-	-	-	-	-	-	-	-	2000	1013		1960	993.1	-	-		

^a The minimums in this column apply to flexible cord and fixture wire conductors composed of 29 – 20 AWG strands. Except where specified otherwise in the wire standard, the minimums in this column also apply to solid and stranded wires and cables (regardless of strand size).

^b For conductors in flexible cords and fixture wires in which the conductors are composed of 36 – 30 AWG strands, the minimums in this column apply.

^c The values in these two columns apply where the wire standard (power cables principally) specifies maximum and minimum diameters for the conductor.

^d The values in this column apply where the wire standard specifies only a minimum diameter for the conductor.

Table 20.2
Diameters over round compact-stranded conductors

Conductor size	Nominal		Minimum ^a		Maximum ^a	
	inch	mm	inches (0.98 x nominal)	mm	inches (1.01 x nominal)	mm
12 AWG	0.085	2.16	0.083	2.11	0.086	2.18
11	0.095	2.41	0.093	2.36	0.096	2.44
10	0.107	2.72	0.105	2.67	0.108	2.74
9	0.120	3.05	0.118	3.00	0.121	3.07
8	0.134	3.40	0.131	3.23	0.135	3.43
7	0.152	3.86	0.149	3.78	0.154	3.91
6	0.169	4.29	0.166	4.22	0.171	4.34
5	0.191	4.85	0.187	4.75	0.193	4.90
4	0.213	5.41	0.209	5.31	0.215	5.46

Table 20.2 Continued on Next Page

Table 20.2 Continued

Conductor size	Nominal		Minimum ^a		Maximum ^a	
	inch	mm	inches (0.98 x nominal)	mm	inches (1.01 x nominal)	mm
3 AWG	0.238	6.02	0.233	5.92	0.240	6.10
2	0.268	6.81	0.263	6.68	0.271	6.88
1	0.299	7.59	0.293	7.44	0.302	7.67
1/0	0.336	8.53	0.329	8.36	0.339	8.61
2/0	0.376	9.55	0.368	9.35	0.380	9.65
3/0	0.423	10.74	0.415	10.54	0.415	10.54
4/0	0.475	12.07	0.466	11.84	0.480	12.19
250 kcmil	0.520	13.21	0.510	12.95	0.525	13.34
300	0.570	14.48	0.559	14.20	0.576	14.63
350	0.616	15.65	0.604	15.34	0.622	15.80
400	0.659	16.74	0.646	16.41	0.666	16.92
450	0.700	17.78	0.686	17.42	0.707	17.96
500	0.736	18.69	0.721	18.31	0.743	18.87
550	0.775	19.69	0.760	19.30	0.783	19.89
600	0.813	20.65	0.797	20.24	0.821	20.85
650	0.845	21.46	0.828	21.03	0.853	21.67
700	0.877	22.28	0.859	21.82	0.886	22.50
750	0.908	23.06	0.890	22.61	0.917	23.29
800	0.938	23.83	0.919	23.34	0.947	24.05
900	0.999	25.37	0.979	24.87	1.009	25.63
1000	1.060	26.92	1.039	26.39	1.071	27.20

^a The values in these two columns apply where the wire standard (power cables principally) specifies maximum and minimum diameters for the conductor.

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Table 20.3
Diameters over round compressed concentric-lay-stranded ASTM Classes B, C, and D aluminum, uncoated copper, and coated copper conductors

Conductor size	Nominal ^b		Minimum ^c		Maximum ^c	
	inch	mm	inches (0.98 x nominal)	mm	inches (1.01 x nominal)	mm
14 AWG	0.071 ^a	1.80 ^a	0.070	1.79	0.072	1.83
13	0.080 ^a	2.03 ^a	0.078	1.98	0.081	2.06
12	0.089	2.26	0.087	2.21	0.090	2.29
11	0.100	2.54	0.098	2.49	0.101	2.57
10	0.113	2.87	0.111	2.82	0.114	2.90
9	0.126	3.20	0.123	3.12	0.127	3.23
8	0.142	3.61	0.139	3.53	0.143	3.63
7	0.159	4.04	0.156	3.96	0.161	4.09
6	0.178	4.52	0.174	4.42	0.180	4.57
5	0.200	5.08	0.196	4.98	0.202	5.13
4	0.225	5.72	0.221	5.61	0.227	5.77
3	0.252	6.40	0.247	6.27	0.255	6.48
2	0.283	7.19	0.277	7.04	0.286	7.26
1	0.322	8.18	0.316	8.03	0.325	8.26
1/0	0.362	9.19	0.355	9.02	0.366	9.30
2/0	0.405	10.3	0.397	10.08	0.409	10.39
3/0	0.456	11.6	0.447	11.35	0.461	11.71
4/0	0.512	13.0	0.502	12.75	0.517	13.13
250 kcmil	0.558	14.2	0.547	13.89	0.564	14.33
300	0.611	15.5	0.599	15.21	0.617	15.67
350	0.661	16.8	0.648	16.46	0.668	19.97
400	0.706	17.9	0.692	17.58	0.713	18.11
450	0.749	19.0	0.734	18.64	0.756	19.20
500	0.789	20.0	0.773	19.63	0.797	20.24
550	0.829	21.1	0.812	20.62	0.837	21.26
600	0.866	22.0	0.849	21.56	0.875	22.23
650	0.901	22.9	0.883	22.43	0.910	23.11
700	0.935	23.7	0.916	23.27	0.944	23.98
750	0.968	24.6	0.949	24.10	0.978	24.84
800	1.000	25.4	0.980	24.89	1.010	25.65
900	1.060	26.9	1.039	26.39	1.071	27.20
1000	1.117	28.4	1.095	27.81	1.128	28.65
1100	1.173	29.8	1.150	29.21	1.185	30.10

Table 20.3 Continued on Next Page

Table 20.3 Continued

Conductor size	Nominal ^b		Minimum ^c		Maximum ^c	
	inch	mm	inches (0.98 x nominal)	mm	inches (1.01 x nominal)	mm
1200 kcmil	1.225	31.1	1.200	30.48	1.237	31.42
1250	1.250	31.8	1.225	31.12	1.262	32.05
1300	1.275	32.4	1.250	31.75	1.288	32.72
1400	1.323	33.6	1.297	32.94	1.336	33.93
1500	1.370	34.8	1.343	34.11	1.384	35.15
1600	1.415	35.9	1.387	35.23	1.429	36.30
1700	1.459	37.1	1.430	36.32	1.474	37.44
1750	1.480	37.6	1.450	36.83	1.495	37.97
1800	1.502	38.2	1.472	37.39	1.517	38.53
1900	1.542	39.2	1.511	38.38	1.557	39.55
2000	1.583	40.2	1.551	39.40	1.599	40.61

^a Aluminum is for use in the 12 AWG – 2000 kcmil sizes, not in the 14 and 13 AWG sizes.

^b In no case is the diameter of a compressed-stranded conductor to be more than 3 percent smaller than the diameter of the conductor determined after the conductor is assembled and before it is compressed.

^c The values in these two columns apply where the wire standard (power principally) specifies maximum and minimum diameters for the conductor.

Table 20.3.1
Diameters over round compressed unilay-stranded ASTM Class B aluminum, uncoated copper,
and coated copper conductors

Conductor size	Nominal		Minimum ^a		Maximum ^a	
	inches	mm	inches (0.98 x nominal)	mm	inches (1.01 x nominal)	mm
1 AWG	0.313	7.95	0.307	7.80	0.316	8.03
1/0	0.352	8.94	0.345	8.76	0.356	9.04
2/0	0.395	10.03	0.387	9.83	0.399	10.13
3/0	0.443	11.25	0.434	11.02	0.447	11.35
4/0	0.498	12.65	0.488	12.40	0.503	12.78
250 kcmil	0.542	13.77	0.531	13.49	0.547	13.89
300	0.594	15.09	0.582	14.78	0.600	15.24
350	0.641	16.28	0.628	15.95	0.647	16.43
400	0.685	17.40	0.671	17.04	0.692	17.58
450	0.727	18.47	0.712	18.08	0.734	18.64
500	0.766	19.46	0.751	19.08	0.774	19.66
550	0.804	20.42	0.788	20.02	0.812	20.62
600	0.840	21.34	0.823	20.90	0.848	21.54

Table 20.3.1 Continued on Next Page

Table 20.3.1 Continued

Conductor size	Nominal		Minimum ^a		Maximum ^a	
	inches	mm	inches (0.98 x nominal)	mm	inches (1.01 x nominal)	mm
650 kcmil	0.874	22.20	0.857	21.77	0.883	22.43
700	0.907	23.04	0.889	22.58	0.916	23.27
750	0.939	23.85	0.920	23.37	0.948	24.08
800	0.969	24.61	0.950	24.13	0.979	24.87
900	1.028	26.11	1.007	25.58	1.038	26.37
1000	1.084	27.53	1.062	26.97	1.095	27.81
1100	1.137	28.88	1.114	28.30	1.148	29.16
1200	1.187	30.15	1.163	29.54	1.199	30.45
1250	1.212	30.78	1.188	30.18	1.224	31.09
1300	1.236	31.39	1.211	30.76	1.248	31.70
1400	1.282	32.56	1.256	31.90	1.295	32.89
1500	1.327	33.71	1.300	33.02	1.340	34.04
1600	1.371	34.82	1.344	34.14	1.385	35.18
1700	1.413	35.89	1.385	35.18	1.427	36.25
1750	1.434	36.42	1.405	35.69	1.448	36.78
1800	1.454	36.93	1.425	36.20	1.469	37.31
1900	1.494	37.95	1.464	37.19	1.509	38.33
2000	1.533	38.94	1.502	38.15	1.548	39.32

^a The values in these two columns apply where the wire standard (power cables principally) specifies maximum and minimum diameters for the conductor. Otherwise, in no case is the diameter of a compressed-stranded conductor to be more than 3 percent smaller than the diameter of the conductor determined after the conductor is assembled and before it is compressed.

**Table 20.4
Diameters over ASTM Class B round concentric-lay-stranded conductors**

Conductor size	Nominal		Minimum ^a		Maximum ^a	
	inches	mm	inches (0.98 x nominal)	mm	inches (1.01 x nominal)	mm
30 AWG	0.0113	0.287	0.0111	0.282	0.0114	0.290
29	0.0128	0.325	0.0125	0.318	0.0129	0.328
28	0.0143	0.363	0.0140	0.356	0.0144	0.356
27	0.0161	0.409	0.0158	0.401	0.0163	0.414
26	0.0180	0.457	0.0176	0.447	0.0182	0.462
25	0.0203	0.516	0.0199	0.505	0.0205	0.521
24	0.0228	0.579	0.0223	0.566	0.0230	0.584
23	0.0256	0.650	0.0251	0.638	0.0259	0.658

Table 20.4 Continued on Next Page