



# Standard Specification for Concentric-Lay-Stranded Aluminum Conductors, Aluminum-Alloy Reinforced (ACAR, 1350/6201)<sup>1</sup>

This standard is issued under the fixed designation B 524/B 524M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This specification covers concentric-lay-stranded conductors made from round aluminum 1350-H19 (extra hard) wires and round aluminum-alloy 6201-T81 (hard: solution heat treated, cold worked, and then artificially aged) core wires for use as overhead electrical conductors (Explanatory Note 1).

NOTE 1—The aluminum, alloy, and temper designations conform to ANSI H35.1/ANSI H35.1[M]. Aluminum 1350 and Alloy 6201 correspond to unified numbering system A91350 and A96201, respectively, in accordance with Practice E 527.

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

1.2.1 For density, resistivity and temperature, the values stated in SI units are to be regarded as standard.

## 2. Referenced Documents

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

### 2.2 ASTM Standards:

B 230/B 230M Specification for Aluminum 1350-H19 Wire for Electrical Purposes<sup>2</sup>

B 263 Test Method for Determination of Cross-Sectional Area of Stranded Conductors<sup>2</sup>

B 354 Terminology Relating to Uninsulated Metallic Electrical Conductors<sup>2</sup>

B 398/B 398M Specification for Aluminum-Alloy 6201-T81 Wire for Electrical Purposes<sup>2</sup>

B 682 Specification for Standard Metric Sizes of Electrical Conductors<sup>2</sup>

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee B-1 on Electrical Conductors and is the direct responsibility of Subcommittee B01.07 on Conductors of Light Metals.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 02.03.

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specification<sup>3</sup>

E 527 Practice for Numbering Metals and Alloys (UNS)<sup>4</sup>

### 2.3 ANSI Standard:

ANSI H35.1 American National Standard for Alloy and Temper Designation Systems for Aluminum<sup>5</sup>

ANSI H35.1[M] American National Standard for Alloy and Temper Designation Systems for Aluminum<sup>5</sup>

### 2.4 NIST Document:

NBS *Handbook 100—Copper Wire Tables*<sup>6</sup>

## 3. Ordering Information

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

3.1.1 Quantity of each size and stranding,

3.1.2 Conductor size (see 7.1),

3.1.3 Total number of wires, aluminum 1350 and aluminum alloy 6201 (Table 1 or Table 2),

3.1.4 Direction of lay of outer layer of wires if other than right-hand (see 6.2),

3.1.5 Special tension test, if required (see 8.2),

3.1.6 Place of inspection (see 14.1),

3.1.7 Package size and type (see 16.1),

3.1.8 Heavy wood lagging, if required (Section 16), and

3.1.9 Special package marking, if required (Section 15).

## 4. Requirement for Wires

4.1 Before stranding, the 1350-H19 wire used shall meet the requirements of Specification B 230/B 230M.

4.2 Before stranding, the 6201-T81 wire used shall meet the requirements of Specification B 398/B 398M.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 14.02.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 01.01.

<sup>5</sup> Available from the American National Standards Institute, 11 West 42nd St., 13th Floor, New York, NY 10036.

<sup>6</sup> Available from the National Institute of Standards and Technology (NIST), Gaithersburg, MD 20899.

**TABLE 1 Construction Requirements of Concentric-Lay-Stranded Aluminum Conductors, Aluminum Alloy Reinforced**

Conductor Size			Required Construction					Recommended Package Sizes <sup>A</sup>				
			Number of Wires <sup>B</sup>	Diameter of Wires		Nominal Outside Diameter		Reel Designation	Approximate Length of Each Piece		Approximate Mass of Each Length <sup>C</sup>	
cmil	AWG	mm <sup>2</sup>		in.	mm	in.	mm		ft	m	lb	kg
3 000 000		1520	91	0.1816	4.613	1.998	50.74	RMT 90.45	3 200	975	9 100	4130
2 750 000		1393	91	0.1738	4.415	1.912	48.56	RMT 90.45	3 490	1065	9 100	4130
2 500 000		1267	91	0.1657	4.209	1.823	46.30	RMT 90.45	3 840	1170	9 100	4130
2 493 000		1263	91	0.1655	4.204	1.8207	46.25	RMT 96.60	6 500	1981	15 400	6970
2 338 000		1185	61	0.1958	4.973	1.7620	44.75	RMT 96.60	7 500	2286	16 700	7540
2 250 000		1140	91	0.1572	3.993	1.729	43.92	RMT 90.45	4 270	1300	9 100	4130
2 000 000		1013	91	0.1482	3.764	1.630	41.40	RMT 90.45	4 850	1480	9 100	4130
2 000 000		1013	61	0.1811	4.600	1.630	41.40	RMT 90.45	5 200	1585	9 760	4425
1 933 000		979	61	0.1780	4.522	1.6021	40.69	RMT 96.60	9 200	2804	16 700	7570
1 900 000		963	61	0.1765	4.483	1.588	40.35	RMT 90.45	5 470	1665	9 760	4425
1 800 000		912	61	0.1718	4.364	1.546	39.28	RMT 90.45	5 780	1760	9 760	4425
1 798 000		911	61	0.1717	4.361	1.5452	39.25	RMT 96.60	9 200	2804	15 600	7040
1 750 000		887	61	0.1694	4.303	1.525	38.73	RMT 90.45	5 940	1810	9 760	4425
1 703 000		863	61	0.1671	4.244	1.8380	46.68	RMT 96.60	9 000	2743	14 400	6530
1 700 000		861	61	0.1669	4.239	1.502	38.15	RMT 90.45	6 120	1865	9 760	4425
1 600 000		811	61	0.1620	4.115	1.458	37.04	RMT 90.45	6 500	1980	9 760	4425
1 534 400		777	61	0.1586	4.028	1.4274	36.26	RMT 96.60	10 000	3048	14 400	6530
1 500 000		760	61	0.1568	3.983	1.411	35.85	RMT 90.45	6 930	2110	9 760	4425
1 400 000		709	61	0.1515	3.848	1.364	34.63	RMT 90.45	7 430	2265	9 760	4425
1 361 500		690	61	0.1494	3.795	1.3446	34.15	RMT 96.60	11 250	3429	14 400	6530
1 300 000		659	61	0.1460	3.708	1.314	33.37	RMT 90.45	8 000	2440	9 760	4425
1 300 000		659	37	0.1874	4.760	1.312	33.32	RMT 84.45	6 065	1850	7 400	3355
1 277 000		647	61	0.1447	3.675	1.3022	33.08	RMT 96.60	12 000	3658	14 400	6520
1 250 000		633	61	0.1431	3.635	1.288	32.72	RMT 90.45	8 320	2535	9 760	4425
1 250 000		633	37	0.1838	4.669	1.287	32.70	RMT 84.45	6 310	1920	7 400	3355
1 200 000		608	61	0.1403	3.564	1.263	32.08	RMT 90.45	8 660	2640	9 760	4425
1 200 000		608	37	0.1801	4.575	1.261	32.02	RMT 84.45	6 565	2000	7 400	3355
1 198 000		607	37	0.1799	4.570	1.2596	31.99	RMT 96.60	12 850	3917	14 500	6550
1 172 000		594	37	0.1780	4.521	1.2458	31.64	RMT 96.60	14 400	4389	15 900	7180
1 109 000		562	37	0.1731	4.397	1.2119	30.78	RMT 96.60	13 850	4221	14 500	6540
1 100 000		557	61	0.1343	3.411	1.209	30.70	RMT 90.45	9 450	2880	9 760	4425
1 100 000		557	37	0.1724	4.379	1.207	30.65	RMT 84.45	7 160	2180	7 400	3355
1 080 600		548	37	0.1709	4.341	1.1963	30.39	RMT 96.60	15 600	4755	15 800	7170
1 024 500		519	37	0.1664	4.227	1.1648	29.59	RMT 96.60	15 000	4572	14 500	6540
1 000 000		507	61	0.1280	3.251	1.152	29.26	RMT 90.45	10 400	3170	9 760	4425
1 000 000		507	37	0.1644	4.176	1.151	29.23	RMT 84.45	7 880	2400	7 400	3355
950 000		481	37	0.1602	4.069	1.121	28.48	RMT 84.45	8 300	2530	7 400	3355
927 200		470	37	0.1583	4.021	1.1081	28.15	RMT 90.45	10 400	3170	9 050	4110
900 000		456	37	0.1560	3.962	1.092	27.73	RMT 84.45	8 760	2670	7 400	3355
853 700		433	37	0.1519	3.858	1.0633	27.01	RMT 96.60	18 000	5486	14 500	6540
850 000		431	37	0.1516	3.851	1.061	26.96	RMT 84.45	9 270	2825	7 400	3355
800 000		405	37	0.1470	3.734	1.029	26.14	RMT 84.45	9 850	3000	7 400	3355
750 000		380	37	0.1424	3.617	0.997	25.32	RMT 84.45	10 510	3200	7 400	3355
739 800		375	37	0.1414	3.592	0.9898	25.14	RMT 90.45	13 010	3965	9 020	4090
700 000		355	37	0.1375	3.493	0.962	24.45	RMT 84.45	11 260	3430	7 400	3355
653 100		331	19	0.1854	4.709	0.9270	23.55	RMT 84.45	9 910	3021	6 070	2760
650 000		329	37	0.1325	3.366	0.928	23.56	RMT 84.45	12 130	3695	7 400	3355
649 500		329	37	0.1325	3.365	0.9274	23.56	NR 66.28	6 890	2100	4 200	1910
600 000		304	37	0.1273	3.233	0.891	22.63†	RMT 84.45	13 140	4005	7 400	3355
600 000		304	19	0.1777	4.513	0.888	22.56	RM 66.32	6 750	2060	3 800	1725
								NR 66.28				
587 200		298	19	0.1758	4.465	0.8790	22.33	NR 66.28	8 030	2448	4 430	2010
550 000		279	37	0.1219	3.096	0.853	21.67	RMT 84.45	14 330	4365	7 400	3355
550 000		279	19	0.1701	4.321	0.850	21.60	RM 66.32	7 360	2245	3 800	1725
								NR 66.28				
503 600		255	19	0.1628	4.135	0.8140	20.68	NR 66.28	8 030	2448	3 800	1730
500 000		253	37	0.1162	2.951	0.813	20.66	RMT 84.45	15 765	4805	7 400	3355
500 000		253	19	0.1622	4.120	0.811	20.60	RM 66.32	8 100	2470	3 800	1725
								NR 66.28				
450 000		228	19	0.1539	3.909	0.770	19.54	RM 66.32	9 000	2745	3 800	1725
								NR 66.28				
400 000		203	19	0.1451	3.685	0.726	18.42	RM 66.32	10 120	3085	3 800	1725
								NR 66.28				
350 000		177	19	0.1357	3.447	0.678	17.24	RM 66.32	11 560	3530	3 800	1725
								NR 66.28				
300 000		152	19	0.1257	3.193	0.628	15.96	RM 66.32	13 490	4115	3 800	1725
								NR 66.28				
250 000		127	19	0.1147	2.913	0.574	14.56	RM 66.32	16 190	4940	3 800	1725
								NR 66.28				

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**TABLE 1** *Continued*

Conductor Size			Required Construction					Recommended Package Sizes <sup>A</sup>					
			Number of Wires <sup>B</sup>	Diameter of Wires		Nominal Outside Diameter		Reel Designation	Approximate Length of Each Piece		Approximate Mass of Each Length <sup>C</sup>		
cmil	AWG	mm <sup>2</sup>		in.	mm	in.	mm		ft	m	lb	kg	
246	900		125	7	0.1878	4.770	0.563	14.31	NR 36.22	3 020	920	700	318
211	600	4/0	107	7	0.1739	4.417	0.522	13.25	NR 36.22	3 525	1075	700	318
195	700		99.1	7	0.1672	4.247	0.502	12.74	NR 36.22	3 810	1165	700	318
167	800	3/0	85.0	7	0.1548	3.932	0.464	11.80	NR 36.22	4 445	1355	700	318
155	400		78.7	7	0.1490	3.785	0.447	11.35	NR 36.22	4 800	1465	700	318
133	100	2/0	67.4	7	0.1379	3.503	0.414	10.52	NR 36.22	5 605	1710	700	318
123	300		62.5	7	0.1327	3.371	0.398	10.11	NR 36.22	6 050	1845	700	318
105	600	1/0	53.5	7	0.1228	3.119	0.368	9.35	NR 36.22	7 065	2155	700	318
77	470		39.3	7	0.1052	2.672	0.316	8.03	NR 36.22	9 630	2940	700	318
66	360	2	33.6	7	0.0974	2.474	0.292	7.42	NR 36.22	11 235	3430	700	318
48	690		24.7	7	0.0834	2.118	0.250	6.35	NR 36.22	15 315	4675	700	318
41	740	4	21.2	7	0.0772	1.961	0.232	5.89	NR 36.22	17 855	5455	700	318
30	580		15.5	7	0.0661	1.679	0.198	5.03	NR 36.22	24 390	7445	700	318

<sup>A</sup> See Table 4 for dimensions of standard reels.

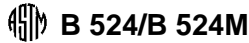
<sup>B</sup> Recommended standard stranding combinations are shown in Table 5.

<sup>C</sup> See Table 7 for mass per unit length for each stranding.

**TABLE 2 Construction Requirements, Mass, Mass Per Unit Length, Recommended Reel Sizes, and Shipping Lengths of Conductors**

NOTE 1—The sizes in boldface type indicate those preferred sizes from Specification B 682.

Conductor Size, mm <sup>2</sup>	Diameter of Wires, mm	Conductor Diameter, mm	Mass per Unit Length <sup>A</sup>			Related Strength kN	Recommended Package Sizes <sup>B</sup>		
			1350, kg/km	6201, kg/km	Total, kg/km		Reel Designation <sup>C</sup>	Nominal Length of Each Piece, m	Nominal Mass of Each Length, kg
Stranding 72/19									
<b>1600</b>	4.73	52.03	3559	934	4493	283	RMT 90.45	960	4315
1400	4.43	48.73	3092	812	3904	248	RMT 90.45	1060	4140
<b>1250</b>	4.18	45.98	2753	723	3476	221	RMT 90.45	1185	4120
1120	3.96	43.56	2471	648	3119	198	RMT 90.45	1320	4120
<b>1000</b>	3.74	41.14	2204	578	2782	180	RMT 90.45	1495	4160
Stranding 63/28									
<b>1600</b>	4.73	52.03	3114	1377	4491	300	RMT 90.45	960	4310
1400	4.43	48.73	2705	1196	3901	263	RMT 90.45	1060	4135
<b>1250</b>	4.18	45.98	2409	1065	3474	234	RMT 90.45	1185	4115
1120	3.96	43.56	2162	956	3118	210	RMT 90.45	1320	4115
<b>1000</b>	3.74	41.14	1928	852	2780	190	RMT 90.45	1495	4155
Stranding 54/37									
<b>1600</b>	4.73	52.03	2669	1819	4488	323	RMT 90.45	960	4310
1400	4.43	48.73	2319	1580	3899	283	RMT 90.45	1060	4135
<b>1250</b>	4.18	45.98	2065	1407	3472	253	RMT 90.45	1185	4115
1120	3.96	43.56	1853	1263	3116	226	RMT 90.45	1320	4115
<b>1000</b>	3.74	41.14	1653	1126	2779	204	RMT 90.45	1495	4155
Stranding 54/7									
<b>1000</b>	4.57	41.13	2468	318	2786	166	RMT 90.45	1495	4165
900	4.33	38.97	2194	214	2478	148	RMT 90.45	1785	4425
<b>800</b>	4.09	36.81	1957	252	2209	133	RMT 90.45	2000	4420
710	3.85	34.64	1734	224	1958	118	RMT 90.45	2260	4425
<b>630</b>	3.63	32.67	1542	199	1741	107	RMT 90.45	2540	4420
560	3.42	30.78	1369	176	1545	96.1	RMT 90.45	2860	4420
<b>500</b>	3.23	29.07	1221	157	1378	86.5	RMT 90.45	3210	4425
Stranding 48/13									
<b>1000</b>	4.57	41.13	2194	591	2786	178	RMT 90.45	1495	4165
900	4.33	38.97	1950	525	2475	159	RMT 90.45	1785	4420
<b>800</b>	4.09	36.81	1740	469	2209	142	RMT 90.45	2000	4420
710	3.85	34.65	1542	415	1957	126	RMT 90.45	2260	4425
<b>630</b>	3.63	32.67	1371	369	1740	114	RMT 90.45	2540	4420
560	3.42	30.78	1217	328	1545	102	RMT 90.45	2860	4420
<b>500</b>	3.23	29.07	1085	292	1377	93.6	RMT 90.45	3210	4420


**TABLE 2** *Continued*

Conductor Size, mm <sup>2</sup>	Diameter of Wires, mm	Conductor Diameter, mm	Mass per Unit Length <sup>A</sup>			Related Strength kN	Recommended Package Sizes <sup>B</sup>		
			1350, kg/km	6201, kg/km	Total, kg/km		Reel Designation <sup>C</sup>	Nominal Length of Each Piece, m	Nominal Mass of Each Length, kg
Stranding 42/19									
<b>1000</b>	4.57	41.13	1919	864	2783	192	RMT 90.45	1495	4160
900	4.33	38.97	1706	768	2474	773	RMT 90.45	1785	4415
<b>800</b>	4.09	36.81	1522	685	2207	154	RMT 90.45	2000	4415
710	3.85	34.65	1349	607	1956	137	RMT 90.45	2260	4420
<b>630</b>	3.63	32.67	1199	540	1739	123	RMT 90.45	2540	4415
560	3.42	30.78	1065	479	1544	110	RMT 90.45	2860	4415
<b>500</b>	3.23	29.07	950	427	1377	100	RMT 90.45	3210	4420
Stranding 33/28									
<b>1000</b>	4.57	41.13	1508	1273	2781	206	RMT 90.45	1495	4160
900	4.33	38.97	1341	1131	2472	187	RMT 90.45	1785	4415
<b>800</b>	4.09	36.81	1196	1009	2205	167	RMT 90.45	2000	4410
710	3.85	34.65	1060	894	1954	148	RMT 90.45	2260	4415
<b>630</b>	3.63	32.67	942	795	1737	133	RMT 90.45	2540	4410
560	3.42	30.78	836	706	1542	119	RMT 90.45	2860	4410
<b>500</b>	3.23	29.07	746	630	1376	109	RMT 90.45	3210	4415
Stranding 33/4									
<b>630</b>	4.66	32.62	1553	187	1740	104	RMT 90.45	2540	4420
560	4.39	30.73	1378	166	1544	92.4	RMT 90.45	3860	4415
<b>500</b>	4.15	29.05	1232	148	1380	82.6	RMT 84.45	2430	3355
450	3.94	27.58	1110	134	1244	74.4	RMT 84.45	2695	3355
<b>400</b>	3.71	25.97	984	119	1103	67.3	RMT 84.45	3040	3355
355	3.50	24.50	876	106	982	60.8	RMT 84.45	3415	3355
<b>315</b>	3.29	23.03	774	93	867	53.7	RMT 84.45	3865	3350
280	3.10	21.70	687	83	770	48.1	RMT 84.45	4350	3350
<b>250</b>	2.93	20.51	614	74	688	42.9	RMT 84.45	4875	3355
Stranding 30/7									
<b>630</b>	4.66	32.62	1412	328	1740	113	RMT 90.45	2540	4420
560	4.39	30.73	1253	291	1544	100	RMT 90.45	2860	4415
<b>500</b>	4.15	29.05	1119	260	1379	89.5	RMT 84.45	2430	3350
450	3.94	27.58	1009	234	1243	80.6	RMT 84.45	3415	3350
<b>400</b>	3.71	25.97	895	208	1103	72.7	RMT 84.45	3040	3355
355	3.50	24.50	796	185	981	65.5	RMT 84.45	3415	3350
<b>315</b>	3.29	23.03	704	163	867	57.9	RMT 84.45	3865	3350
280	3.10	21.70	625	145	770	52.1	RMT 84.45	4350	3350
<b>250</b>	2.93	20.51	558	130	688	46.6	RMT 84.45	4875	3355
Stranding 24/13									
<b>630</b>	4.66	32.62	1129	608	1737	125	RMT 90.45	2540	4410
560	4.39	30.73	1002	540	1542	111	RMT 90.45	2860	4410
<b>500</b>	4.15	29.05	896	483	1379	98.8	RMT 84.45	2430	3350
450	3.94	27.58	807	435	1242	89.0	RMT 84.45	2695	3345
<b>400</b>	3.71	25.97	716	386	1102	79.9	RMT 84.45	3040	3350
355	3.50	24.50	637	343	980	71.7	RMT 84.45	3415	3345
<b>315</b>	3.29	23.03	563	303	866	63.4	RMT 84.45	3865	3345
280	3.10	21.70	500	269	769	57.6	RMT 84.45	4350	3345
<b>250</b>	2.93	20.51	446	240	686	51.4	RMT 84.45	4875	3360
Stranding 18/19									
<b>630</b>	4.66	32.62	847	889	1736	139	RMT 90.45	2540	4410
560	4.39	30.73	752	789	1541	123	RMT 90.45	2860	4410
<b>500</b>	4.15	29.05	672	705	1377	110	RMT 84.45	2430	3345
450	3.94	27.58	606	636	1242	99.2	RMT 84.45	2695	3345
<b>400</b>	3.71	25.97	537	563	1100	88.7	RMT 84.45	3040	3345
355	3.50	24.50	478	501	979	79.5	RMT 84.45	3415	3345
<b>315</b>	3.29	23.03	422	443	865	70.2	RMT 84.45	3865	3345
280	3.10	21.70	375	393	768	64.2	RMT 84.45	4350	3340
<b>250</b>	2.93	20.51	335	352	687	57.4	RMT 84.45	4875	3350
Stranding 12/7									
280	4.33	21.65	488	283	771	57.6	RM 66.32	2235	1725
							NR 66.28	2235	1725
<b>250</b>	4.09	20.45	435	252	687	51.4	RM 66.32	2505	1720
							NR 66.28	2505	1720
224	3.87	19.35	389	226	615	46.0	RM 66.32	2795	1720
							NR 66.28	2795	1720
<b>200</b>	3.66	18.30	348	202	550	41.6	RM 66.32	3125	1720
							NR 66.28	3125	1720

**TABLE 2** *Continued*

Conductor Size, mm <sup>2</sup>	Diameter of Wires, mm	Conductor Diameter, mm	Mass per Unit Length <sup>A</sup>			Related Strength kN	Recommended Package Sizes <sup>B</sup>		
			1350, kg/km	6201, kg/km	Total, kg/km		Reel Designation <sup>C</sup>	Nominal Length of Each Piece, m	Nominal Mass of Each Length, kg
180	3.47	17.35	313	182	495	37.8	RM 66.32	3480	1725
<b>160</b>	3.27	16.35	278	161	439	33.5	NR 66.28	3480	1725
							RM 66.32	3920	1720
140	3.06	15.30	242	141	384	30.1	NR 66.28	3920	1720
							RM 66.32	4470	1715
							NR 66.28	4470	1715
Stranding 15/4									
280	4.33	21.65	609	162	771	50.8	RM 66.32	2235	1725
<b>250</b>	4.09	20.45	544	144	688	45.3	NR 66.28	2235	1725
							RM 66.32	2505	1725
224	3.87	19.35	487	129	616	40.6	NR 66.28	2505	1725
							RM 66.32	2795	1720
<b>200</b>	3.66	18.30	435	115	550	36.9	NR 66.28	2795	1720
							RM 66.32	3125	1720
180	3.47	17.35	391	104	495	33.6	NR 66.28	3125	1720
							RM 66.32	3480	1725
<b>160</b>	3.27	16.35	348	92	440	29.8	NR 66.28	3480	1725
							RM 66.32	3920	1725
140	3.06	15.30	304	81	385	26.5	NR 66.28	3920	1725
							RM 66.32	4470	1720
							NR 66.28	4470	1720
Stranding 4/3									
<b>125</b>	4.77	14.31	197.2	147.1	344.3	26.7	NR 36.22	930	320
112	4.51	13.53	176.3	131.5	307.8	23.9	NR 36.22	1040	320
<b>100</b>	4.26	12.78	157.3	117.3	274.6	17.2	NR 36.22	1160	320
80.0	3.81	11.43	125.8	93.9	219.7	17.2	NR 36.22	1455	320
<b>63.0</b>	3.39	10.17	99.6	74.3	173.9	13.7	NR 36.22	1835	320
50.0	3.02	9.06	79.1	59.0	138.1	11.2	NR 36.22	2315	320
<b>40.0</b>	2.70	8.10	63.2	47.1	110.3	8.95	NR 36.22	2895	320
31.5	2.39	7.17	49.5	36.9	86.4	7.01	NR 36.22	3695	320
<b>25.0</b>	2.13	6.39	39.3	29.3	68.6	5.57	NR 36.22	4650	320
20.0	1.91	5.73	31.6	23.6	55.2	4.48	NR 36.22	5785	320
<b>16.0</b>	1.71	5.13	25.3	18.9	44.2	3.59	NR 36.22	7205	320

<sup>A</sup> Mass per Unit Length is based on a density of 2705 kg/m<sup>3</sup> for 1350 and 2690 kg/m<sup>3</sup> for 6201.

<sup>B</sup> For information only.

<sup>C</sup> Recommended standard stranding combination are shown in Table 4.

## 5. Joints

5.1 In conductors composed of seven wires, only cold-pressure welds and electric butt, cold-upset welds may be made in the six outer finished wires. No welds are permitted in the center core wire. In other conductors, cold-pressure welds, electric-butt, cold-upset welds, or electric-butt welds may be made in the finished wires. Such joints in the same wire or any other wire in the conductor shall be not closer than prescribed in Table 3. Following welding, electric-butt welds in 6201 wires shall be annealed for a distance of at least 6 in. (150 mm) on each side of the weld (Explanatory Note 2).

**TABLE 3** Minimum Distance Between Joints in the Completed Conductor

Number of Wires in Conductor <sup>A</sup>	Distance Between Joints, min. ft (m)
7	50 <sup>B</sup> (15)
19	50 (15)
37	25 (7.5)
61 and over	25 (7.5)

<sup>A</sup> Conductors of an intermediate number of wires shall conform to those having the next smaller number.

<sup>B</sup> Only cold-pressure welds and electric-butt, cold-upset welds are permitted in the six outer wires of conductors composed of seven wires.

## 6. Lay

6.1 The preferred lay of a layer of wires is 13.5 times the outside diameter of that layer, but the lay shall be not less than 10 nor more than 16 times this diameter.

6.2 The direction of lay of the outer layer shall be right-hand unless specified otherwise by the purchaser. The direction of lay shall be reversed in successive layers.

## 7. Construction

7.1 The number and diameter of wires and the areas of cross section of conductors shall conform to the requirements prescribed in Table 1 or Table 2.

7.2 Recommended standard strandings are as shown in Table 4.

**TABLE 4** Recommended Standard Strandings

Total No. of Wires	No. of 1350-H19 Wires/No. of 6201-T81 Wires			
7	4/3	...	...	...
19	15/4	12/7	...	...
37	33/4	30/7	24/13	18/19
61	54/7	48/13	42/19	33/28
91	...	72/19	63/28	54/37

**TABLE 5 Dimensions of Standard Reels  
(For Information Only)**

Reel Designation <sup>A,B</sup>	Reel Dimensions											
	Reel Capacity		Flange Diameter		Drum Diameter		Width				Arbor Hole Diameter	
	in. <sup>3</sup>	m <sup>3</sup>	in.	m	in.	m	Inside		Outside		in.	mm
NR 36.22	16 800	0.275	36	0.91	18	0.46	22	0.56	25	0.64	3 to 3¼	76 to 83
NR 66.28 <sup>C</sup>	76 000	1.245	66	1.68	30	0.76	28	0.71	32½	0.83	3 to 3¼	76 to 83
RM 66.32 <sup>D</sup>	76 900	1.260	66	1.68	36	0.91	32	0.81	38	0.97	3 to 3¼	76 to 83
RM 68.38 <sup>D</sup>	99 300	1.627	68	1.73	36	0.91	38	0.97	44	1.12	3 to 3¼	76 to 83
RMT 84.45 <sup>E</sup>	152 700	2.502	78	1.98	42	1.07	45	1.14	52	1.32	5 to 5¼	127 to 133
			(84)	(2.13)								
RMT 90.45 <sup>E</sup>	187 000	3.064	84	2.13	42	1.07	45	1.14	52	1.32	5 to 5¼	127 to 133
			(90)	(2.29)								

<sup>A</sup> Prefix "NR" denotes wooden nonreturnable reel, "RM" metal returnable reel, and "RMT" metal returnable reel with I-beam tires.

<sup>B</sup> Reels are not designed to withstand the forces required for breaking during tension stringing operations.

<sup>C</sup> Reel RM 66.32 has flat rims.

<sup>D</sup> Reels RM 66.32 and RM 68.38 have flat rims.

<sup>E</sup> Reels RMT 84.45 and RMT 90.45 have 3-in. (76 mm) I-beam tires. Reels with similar dimensions except without I-beam tires are sometimes used.

## 8. Strength of Conductor

8.1 The rated strength of completed conductors shall be taken as the aggregate strength of the aluminum 1350 and the aluminum-alloy 6201 components, calculated as follows. The strength contribution of the aluminum 1350 wires shall be taken as the percentage indicated in Table 6, of the sum of the

**TABLE 6 Rating Factors**

Stranding				Rating Factor, %	
Number of Wires		Number of Layers <sup>A</sup>		1350-H19	6201-T81
1350-H19	6201-T81	1350-H19	6201-T81		
4	3	1	1	96	96
15	4	2	1	93	96
12	7	1	1	96	96
33	4	3	1	91	96
30	7	2	1	93	96
24	13	2	2	93	93
18	19	1	2	96	93
54	7	3	1	91	96
48	13	3	2	91	93
42	19	2	2	93	93
33	28	2	3	93	91
72	19	3	2	91	93
63	28	3	3	91	91
54	37	2	3	93	91

<sup>A</sup> For purposes of determining strength rating factors, mixed layers are considered to be full layers for each material.

strengths of the aluminum 1350 wires, calculated from their specified nominal wire diameter and the appropriate specified minimum average tensile strength given in Specification B 230/B 230M. The strength contribution of the aluminum-alloy 6201 wires shall be taken as that percentage, according to the number of layers of aluminum-alloy 6201 wires, indicated in Table 6, of the sum of the strengths of the aluminum-alloy 6201 wires, calculated from their specified nominal wire diameter and the minimum stress at 1 % extension. This shall be considered to be 95 % of the minimum average tensile strength specified for the wire diameter in Specification B 398.

8.2 Tests for determining the rated strength of the completed conductor are not required by this specification but may be made if agreed upon by the manufacturer and the purchaser at the time of placing an order. If tested, the breaking strength of the completed conductor shall be not less than the rated strength if failure occurs in the free length at least 1 in. (25 mm) beyond the end of either gripping device, or shall be not less than 95 % of the rated strength if failure occurs inside, or within 1 in. (25 mm) of the end of, either gripping device (Explanatory Note 3).

8.3 Rated strength and breaking strength values shall be rounded to three significant figures, in the final value only, in accordance with the rounding method in Practice E 29.


8.4 Rated strength of conductors is given in Table 2 or Table 7.

**TABLE 7 Conductor Mass Per Unit Length and Rated Strength**

NOTE 1— Metric values represent a soft conversion and may not be the same as those metric masses that are calculated from the basic metric density.


Conductor Size			Mass Per Unit Length						Rated Strength	
			1350		6201		Total		kips	kN
cmil	AWG	mm <sup>2</sup>	lb/1000 ft	kg/km	lb/1000 ft	kg/km	lb/1000 ft	kg/km		
<i>Stranding 72/19</i>										
3 000 000		1520	2247	3343	590	878	2837	4221	60.7	270
2 750 000		1393	2058	3063	543	808	2601	3871	55.6	247
2 500 000		1267	1871	2784	491	731	2362	3515	50.6	225
2 493 000		1263	1871	2785	491	731	2362	3515	50.4	224
2 250 000		1140	1640	2506	442	658	2126	3164	45.5	202
2 000 000		1013	1482	2206	389	579	1871	2785	41.0	182
<i>Stranding 63/28</i>										
3 000 000		1520	1966	2926	869	1290	2835	4216	64.5	287
2 750 000		1393	1801	2680	796	1180	2597	3860	59.1	263
2 500 000		1267	1637	2436	724	1080	2361	3516	53.7	239
2 250 000		1140	1474	2193	652	970	2126	3163	48.3	215
2 000 000		1013	1297	1930	573	853	1870	2783	43.4	193
<i>Stranding 54/37</i>										
3 000 000		1520	1686	2508	1150	1710	2836	4218	69.3	308
2 750 000		1393	1544	2297	1050	1570	2594	3867	63.5	282
2 500 000		1267	1403	2088	957	1420	2360	3508	57.7	257
2 493 000		1263	1403	2089	956	1423	2360	3512	57.6	256
2 250 000		1140	1263	1879	861	1280	2124	3159	52.0	231
2 000 000		1013	1112	1654	758	1130	1870	2784	46.6	207
<i>Stranding 54/7</i>										
2 000 000		1013	1660	2470	214	318	1874	2788	37.9	169
1 900 000		963	1577	2346	203	303	1781	2649	36.0	160
1 800 000		912	1494	2223	193	287	1687	2510	34.1	152
1 750 000		887	1452	2161	187	288	1639	2439	33.2	148
1 700 000		861	1410	2098	182	271	1592	2369	32.2	143
1 600 000		811	1328	1976	171	255	1499	2231	30.4	135
1 500 000		760	1244	1852	161	239	1405	2090	28.4	127
1 400 000		709	1162	1729	150	223	1312	1952	26.6	118
1 361 500		690	1132	1685	146	217	1278	1902	26.3	117
1 300 000		659	1079	1605	139	207	1218	1812	25.5	112
1 277 000		647	1062	1580	137	204	1199	1784	24.6	110
1 250 000		633	1036	1542	134	199	1170	1741	24.1	107
1 200 000		608	996	1482	128	191	1124	1673	23.2	104
1 100 000		557	913	1358	118	176	1031	1534	21.6	95.9
1 000 000		507	829	1234	107	159	936	1393	19.8	87.9
<i>Stranding 48/13</i>										
2 338 000		1185	1745	2597	470	700	2215	3297	47.5	211
2 000 000		1013	1476	2196	398	592	1874	2788	4.6	181
1 900 000		963	1402	2086	378	562	1780	2648	38.6	172
1 800 000		912	1328	1976	358	532	1686	2508	36.5	163
1 750 000		887	1291	1921	347	516	1638	2437	35.5	158
1 703 000		863	1259	1873	339	505	1598	2378	34.6	154
1 700 000		861	1253	1865	338	502	1591	2367	34.5	153
1 600 000		811	1181	1757	318	473	1499	2230	32.5	145
1 500 000		760	1106	1646	298	443	1404	2089	30.4	135
1 400 000		709	1033	1536	278	414	1311	1950	28.4	126
1 300 000		659	959	1427	258	384	1217	1811	26.8	119
1 250 000		633	921	1371	248	369	1169	1740	25.7	114
1 200 000		608	886	1318	239	355	1125	1673	24.7	110
1 100 000		557	811	1207	219	326	1030	1533	23.0	102
1 000 000		507	737	1097	199	296	936	1393	21.1	94.1
<i>Stranding 42/19</i>										
2 338 000		1185	1527	2273	687	1022	2214	3295	51.5	229
2 000 000		1013	1291	1921	581	865	1872	2786	44.0	196
1 933 000		979	1250	1861	562	837	1813	2698	42.5	189
1 900 000		963	1226	1825	552	821	1778	2646	41.8	186
1 800 000		912	1162	1729	523	778	1685	2507	39.6	176
1 798 000		911	1163	1731	523	779	1686	2509	39.6	176
1 750 000		887	1130	1681	508	757	1638	2438	38.5	171




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**TABLE 7** *Continued*

Conductor Size			Mass Per Unit Length						Rated Strength	
cmil	AWG	mm <sup>2</sup>	1350		6201		Total		kips	kN
			lb/1000 ft	kg/km	lb/1000 ft	kg/km	lb/1000 ft	kg/km		
1 700 000		861	1097	1632	494	735	1591	2367	37.4	166
1 600 000		811	1033	1537	465	692	1498	2229	35.2	157
1 534 400		777	993	1477	446	664	1439	2141	33.8	150
1 500 000		760	968	1440	436	649	1404	2089	33.0	147
1 400 000		709	904	1344	407	605	1311	1950	30.8	137
1 300 000		659	839	1249	378	562	1217	1811	29.0	129
1 277 000		647	826	1229	372	553	1198	1782	28.4	126
1 250 000		633	806	1199	363	540	1169	1739	27.8	124
1 200 000		608	775	1153	349	519	1124	1672	26.7	119
1 100 000		557	710	1056	319	475	1029	1531	24.8	110
1 000 000		507	645	960	290	431	935	1391	22.9	102
<i>Stranding 33/28</i>										
2 000 000		1013	1014	1509	856	1274	1870	2783	47.7	212
1 900 000		963	964	1434	813	1210	1777	2644	45.3	201
1 800 000		912	913	1358	771	1147	1684	2505	42.9	191
1 750 000		887	888	1321	749	1115	1637	2436	41.7	186
1 700 000		861	862	1282	727	1082	1589	2364	40.5	180
1 600 000		811	812	1208	685	1020	1497	2228	38.1	160
1 500 000		760	760	1131	642	955	1402	2086	35.7	159
1 400 000		709	710	1056	599	892	1309	1948	33.4	148
1 300 000		659	659	981	557	828	1216	1809	31.2	139
1 250 000		633	633	942	535	796	1168	1738	30.0	133
1 200 000		608	609	906	514	765	1123	1671	28.8	128
1 100 000		557	558	830	471	701	1029	1531	26.6	119
1 000 000		507	507	754	428	657	935	1391	24.8	110
<i>Stranding 33/4</i>										
1 300 000		659	1086	1616	131	195	1217	1811	24.5	109
1 250 000		633	1045	1555	126	187	1171	1742	23.6	105
1 200 000		608	1003	1493	121	180	1124	1673	22.6	101
1 100 000		557	919	1367	111	165	1030	1532	20.7	92.3
1 000 000		507	836	1244	101	150	937	1394	18.9	83.9
950 000		481	794	1181	95.7	142	890	1323	17.5	79.7
900 000		456	753	1120	90.8	135	844	1255	17.0	75.5
850 000		431	711	1058	85.7	127	796	1185	16.0	71.3
800 000		405	668	994	80.6	120	749	1114	15.3	68.2
750 000		380	627	933	75.6	112	703	1045	14.5	64.0
700 000		355	585	870	70.5	105	656	975	13.6	60.7
650 000		329	543	808	65.5	97.4	608	905	12.7	56.3
600 000		304	501	746	60.4	89.9	561	835	11.8	52.4
550 000		279	460	684	55.4	82.6	515	767	10.8	48.1
500 000		253	418	621	50.4	74.9	468	696	10.0	44.4
<i>Stranding 30/7</i>										
1 300 000		659	988	1469	229	341	1217	1810	26.6	118
1 250 000		633	950	1413	220	328	1170	1741	25.6	114
1 200 000		608	912	1357	212	315	1124	1672	24.5	109
1 198 000		607	913	1358	212	315	1124	1673	24.5	109
1 172 000		594	893	1329	207	308	1100	1637	24.0	107
1 109 000		562	845	1257	196	292	1041	1549	22.7	101
1 100 000		557	836	1244	194	289	1030	1533	22.5	100
1 024 500		519	780	1161	181	269	961	1431	20.9	93.2
1 000 000		507	760	1131	176	262	936	1393	20.4	91.0
950 000		481	722	1074	167	249	889	1323	19.4	86.4
900 000		456	684	1018	159	236	843	1254	18.4	81.9
853 700		433	650	968	151	225	801	1192	17.5	77.6
850 000		431	646	962	150	223	796	1185	17.4	77.3
800 000		405	608	904	141	210	749	1114	16.6	73.8
750 000		380	570	848	132	197	702	1045	15.6	69.2
700 000		355	532	791	123	184	655	975	14.7	65.5
650 000		329	494	735	115	171	609	906	13.7	60.8
600 000		304	456	678	106	158	562	836	12.8	56.8
550 000		279	418	622	97.0	144	515	766	11.7	52.1
500 000		253	380	565	88.1	131	468	696	10.8	48.0
<i>Stranding 24/13</i>										
1 300 000		659	790	1176	426	633	1216	1809	29.3	131
1 250 000		633	760	1131	410	610	1170	1741	28.2	126
1 200 000		608	730	1086	393	585	1123	1671	27.1	121
1 198 000		607	730	1086	393	585	1123	1672	27.1	120




**B 524/B 524M**
**TABLE 7** *Continued*

Conductor Size			Mass Per Unit Length						Rated Strength	
cmil	AWG	mm <sup>2</sup>	1350		6201		Total		kips	kN
			lb/1000 ft	kg/km	lb/1000 ft	kg/km	lb/1000 ft	kg/km		
1 109 000		562	676	1006	364	542	1040	1547	25.0	111
1 100 000		557	669	995	360	536	1029	1531	24.8	111
1 080 600		548	658	980	355	528	1013	1508	24.4	109
1 024 500		519	624	929	336	500	961	1430	23.1	103
1 000 000		507	608	905	328	488	936	1393	22.6	101
950 000		481	577	858	311	463	888	1321	21.4	95.4
927 200		470	565	841	304	453	869	1294	20.9	93.2
900 000		456	547	814	295	439	842	1253	20.3	90.5
853 700		433	520	774	280	417	800	1191	19.3	85.8
850 000		431	517	769	279	415	796	1184	19.2	85.4
800 000		405	486	723	262	390	748	1113	18.2	81.2
750 000		380	456	679	246	366	702	1045	17.1	76.2
700 000		355	425	632	229	341	654	973	16.1	71.8
650 000		329	395	588	213	317	608	905	15.0	66.6
600 000		304	365	542	196	292	561	834	14.1	62.8
550 000		279	334	497	180	268	514	765	12.9	57.6
500 000		253	304	452	164	244	468	696	11.7	52.9
<i>Stranding 18/19</i>										
1 300 000		659	593	882	622	926	1215	1808	32.7	146
1 250 000		633	570	848	598	890	1168	1738	31.5	140
1 200 000		608	547	814	575	855	1122	1669	30.3	135
1 172 000		594	536	797	562	837	1098	1634	29.5	131
1 100 000		557	501	746	547	784	1028	1530	27.7	123
1 080 600		548	494	735	518	771	1012	1506	27.2	121
1 000 000		507	456	678	479	713	935	1391	25.2	112
950 000		481	433	644	455	677	888	1321	23.9	106
900 000		456	411	611	431	642	842	1253	22.7	101
850 000		431	388	577	407	606	795	1183	21.4	95.3
800 000		405	365	543	383	570	748	1113	20.3	90.3
750 000		380	342	509	359	534	701	1043	19.0	84.7
739 800		375	338	503	355	528	693	1031	18.8	83.5
700 000		355	319	475	335	498	654	973	17.9	79.5
650 000		329	296	440	311	463	607	903	16.6	73.8
649 500		329	297	442	312	464	608	905	16.6	73.8
600 000		304	273	406	287	427	560	833	15.8	70.1
550 000		279	251	373	263	392	514	765	14.4	64.3
500 000		253	228	339	239	356	467	695	13.2	58.8
<i>Stranding 15/4</i>										
600 000		304	444	661	118	175	562	836	12.5	55.4
587 200		298	436	648	115	172	551	820	12.2	54.3
550 000		279	407	606	108	161	515	767	11.4	50.8
503 600		255	374	556	99	147	473	703	10.5	46.5
500 000		263	370	550	98.1	146	468	696	10.4	46.2
450 000		228	333	496	88.3	131	421	627	9.35	41.6
400 000		203	296	440	78.5	117	375	557	8.43	37.5
350 000		177	359	385	68.7	102	328	487	7.47	33.2
300 000		152	222	331	58.9	87.7	281	418	6.50	28.9
250 000		127	185	225	49.1	73.0	234	348	5.49	24.4
<i>Stranding 12/7</i>										
653 100		331	388	577	225	335	612	911	15.4	68.5
600 000		304	355	528	206	307	561	835	14.1	62.9
550 000		279	325	483	189	281	514	764	13.0	57.6
500 000		253	296	440	172	256	468	696	11.8	52.4
450 000		228	266	396	155	230	421	626	10.6	47.2
400 000		203	237	352	137	204	374	556	9.52	42.4
350 000		177	207	308	120	179	327	487	8.41	37.4
300 000		152	178	265	103	153	281	418	7.38	32.8
250 000		127	148	220	85.9	128	234	348	6.20	27.6
<i>Stranding 4/3</i>										
246 900		125	132	197	98.7	147	231	344	6.04	26.9
211 600	4/0	107	113	168	84.6	126	198	294	5.18	23.0
195 700		99.1	105	156	78.2	116	183	272	4.79	21.3
167 800	3/0	85.0	89.8	134	67.0	99.7	157	234	4.11	18.3
155 400		78.7	83.2	124	62.1	92.4	145	216	3.84	17.1
133 100	2/0	67.4	71.3	106	53.2	79.1	124	185	3.31	14.7
123 300		62.5	66.0	98.2	49.3	73.3	115	171	3.07	13.65
105 600	1/0	53.5	56.5	84.1	42.2	62.8	98.7	147	2.69	12.0

**TABLE 7** *Continued*

Conductor Size			Mass Per Unit Length						Rated Strength	
cmil	AWG	mm <sup>2</sup>	1350		6201		Total		kips	kN
			lb/1000 ft	kg/km	lb/1000 ft	kg/km	lb/1000 ft	kg/km		
77 470		39.3	41.5	61.7	31.0	46.1	72.5	108	2.01	8.94
66 360	2	33.6	35.6	52.9	26.5	39.5	62.1	92.4	1.75	7.79
48 690		24.7	26.1	38.8	19.5	29.0	45.6	67.8	1.29	5.76
41 740	4	21.2	22.3	33.2	16.7	24.8	39.0	58.0	1.12	4.97
30 580		15.5	16.4	24.4	12.2	18.2	28.6	42.6	0.826	3.67

Conversion Factors:  
1 cmil = 5.067 E - 04 mm<sup>2</sup>  
1 mil = 2.54 E - 02 mm  
1 lb/1000 ft = 1.488 E + 00 kg/km  
1 ft = 3.048 E - 01 m  
1 lb = 4.536 E - 01 kg  
1 lbf = 4.448 E - 03 kN

## 9. Density

9.1 For the purpose of calculating mass, mass per unit length, cross sections, and so forth, the density of 1350-H19 is 2705 kg/m<sup>3</sup> (0.0975 lb/in.<sup>3</sup>) at 20°C and the density of 6201-T81 is 2690 kg/m<sup>3</sup> (0.097 lb/in.<sup>3</sup>) at 20°C.

## 10. Mass Electrical Resistance

10.1 The mass and electrical resistance of a unit length of stranded conductor are a function of the length of lay. The approximate mass per unit length and electrical resistance may be determined using the standard increments shown in Table 8. When standard accuracy is desired, the increment based on the specific lay of the conductor may be calculated (Explanatory Note 4).

10.2 In the calculation of the electrical resistance of a completed conductor, the resistance of both the aluminum 1350 and the aluminum-alloy 6201 wires must be taken into consideration.

## 11. Variation in Area

11.1 The total area of cross section of the conductor shall be not less than 98 % of the area specified in Table 1 or Table 2. Unless otherwise specified by the purchaser, the manufacturer may have the option of determining the cross-sectional area by either of the following methods, except that in case of question regarding area compliance, the method given in 11.1.2 shall be used.

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

11.1.2 The area of cross section of the wires of a conductor may be determined by Test Method B 263. In applying that method, the increment in mass per unit length resulting from

stranding may be the applicable value specified in 10.1 or may be calculated from the measured component dimensions of the sample under test. In case of question regarding area compliance, the actual mass increment due to stranding shall be calculated.

## 12. Finish

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

## 13. Mechanical and Electrical Tests

13.1 Tests for mechanical and electrical properties of component wires shall be made before stranding (Explanatory Note 1).

13.2 Routine testing after stranding is not required. When requested by the purchaser at the time of placing the order, tension tests on wires before stranding may be waived and tests may be made of wires removed from the completed conductor. When so tested, the wires of aluminum 1350 and aluminum-alloy 6201 shall have tensile strengths not less than 95 % of the minimum tensile strengths prescribed for individual tests in Specification B 230/B 230M in the case of aluminum 1350 and in Specification B 398/B 398M in the case of aluminum-alloy 6201 (Explanatory Note 5).

13.2.1 The aluminum 1350 wires removed from a completed conductor shall be capable of meeting the bending properties stated in Specification B 230/B 230M.

13.2.2 The aluminum-alloy 6201 wires removed from a completed conductor shall be capable of meeting the bending properties stated in Specification B 398/B 398M.

## 14. Inspection

14.1 All tests and inspection shall be made at the place of final manufacture unless otherwise agreed upon between the manufacturer and the purchaser at the time of purchase. The manufacturer shall afford the inspector representing the purchaser all reasonable facilities to satisfy him that the material is being manufactured in accordance with this specification.

## 15. Marking

15.1 The net mass, length, size, kind of conductor, stranding, and any other necessary identification shall be marked on a tag attached to the end of the conductor inside the package.

**TABLE 8** Standard Increments Due to Stranding

Size of Conductor, cmil (mm <sup>2</sup> )	Increment (Increase) of Linear Density and Electrical Resistance, %
4 000 000 to 3 000 001 (2027 to 1521), incl	4
3 000 000 to 2 000 001 (1520 to 1014), incl	3
2 000 000 (1013) and under	2

This same information, together with the purchaser's 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.

NOTE 2—Multiple lengths per package are allowable only when the bare conductor is intended for remanufacture, such as adding a covering or insulation. In such cases the position of each end of a length is to be clearly marked and the length of each portion shall be shown on the attached to the end of the conductor.

## 16. Packaging and Shipping

16.1 Package sizes and kind of package, reels or coils, shall be agreed upon between the manufacturer and the purchaser. Recommended package sizes are shown in Table 1 or Table 2.

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

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

## 17. Keywords

17.1 aluminum alloy electrical conductors; aluminum electrical conductors; concentric-lay stranded aluminum conductors; aluminum alloy reinforced (ACAR, 1350/6201); electrical conductors; electrical conductors - aluminum; electrical conductors - aluminum alloy; overhead electrical conductors; stranded conductors

## EXPLANATORY NOTES

NOTE 1—For definitions of terms relating to conductors, reference should be made to Terminology B 354.

NOTE 2—The behavior of properly spaced wire joints in stranded

conductors is related to both their tensile strength and elongation. Because of its higher elongation properties, the lower-strength electric-butt weld gives equivalent overall performance to that of a cold-pressure weld or an electric-butt, cold-upset weld in stranded conductors with more than seven wires.

NOTE 3—To test aluminum conductors, aluminum alloy reinforced, for breaking strength successfully as a unit requires special devices for gripping the ends of the wires without causing damage that may result in failure below the actual strength of the conductor. Various special dead-end devices are available, such as compression sleeves and split sleeves, but ordinary jaws or clamping devices usually are not suitable.

NOTE 4—The increment of mass per unit length or electrical resistance of a completed concentric-lay-stranded conductor ( $k$ ) in percent is as follows:

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

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

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

where:

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

The derivation of the above is given in *NBS Handbook 100*. The factors  $k$  and  $m$  are to be determined separately for the 1350-H19 wires and for the 6201-T81 wires.

NOTE 5—Wire unlaidd from conductor may have different physical properties from those of the wire before stranding. This may be caused by laying and straightening.

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