

REFERENCE STANDARD FOR ELECTRICAL
WIRES, CABLES AND FLEXIBLE CORDS
UL 1581-2011

A

UL

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1.1

UL44

UL83

UL62

UL854

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1k 1 8k44k 3k

6~4. kAWG 12AWG~2k44kcmil

3k

1k 2 ASTM B 8k4. 4 8k44k 3k

2k 3k

1k 3 -O -H1X -H2X 3k

1k1 b ASTM B 557- 4

1in min 25mm min 1k1

1k1 8k44k

		1in 25mm b
(-O)	1125k ¥275k 1bf in ² 78 ¥1 MN m ² 7757 ¥18. 6N cm ² 7. 1 ¥1. 3kgf mm ²	1k4k 1k4k
(-H1x)	() 18675 ¥4425 1bf in ² 12 ¥.3k MN m ² 12876 ¥3k5k N cm ² 13 ¥3 kgf F mm ²	1k4k 1k4k
(---H2x)	185k ¥35k 1bf in ² 128 ¥24MN m ² 12755 ¥2413N cm ² 13. k ¥2.46 kgf mm ²	1k4k 1k4k

a	ASTM B557- 4	1 in min
25mm min		
1	11bf in ² 1MN m ² 6 N cm ² 1.67kgf mm ²	
2	ASTM E 2- 3a	1.5
b		

11

11.1

11

11

11

	a		b		c		d				10.8 S	a	10.7 S	b
	mil mm		mil (10.8 S) mm		mil (11.1 S) mm		mil (10.8 S) mm		cmil mm ²		cmil mm ²		cmil mm ²	
31	11.1	10254	10.8	1024	11.1	10257	11.2	10251	11.1	10251.7	10.8	1024.7	---	---
2	11.3	10287	11.1	10282	11.4	10290	11.2	10284	128	102647	125	102633	---	---
28	12.6	10321	12.3	10321	12.7	10323	12.5	10318	15	10281.4	125	1027.1	---	---
27	14.2	10361	13.1	10353	14.3	10363	14.1	10358	212	10211.2	1.8	10211.1	---	---
26	15.1													

.2	257.6	6.543	252.4	6.411	261.2	6.61	255.1	6.477	66361	33.62	651.33	32.5	---	---
1	28.3	7.348	238.5	7.21	2.22	7.422	286.4	7.275	836.1	42.41	821.16	41.56	---	---
1.1	324.	8.252	318.4	8.187	328.1	8.334	321.7	8.171	11561	53.4	113488	52.42	---	---
2.1	364.8	.266	357.5	.181	368.4	.537	361.2	.174	13311	67.43	131438	66.18	---	---
3.1	41.6	1.41	41.4	1.21	413.7	1.51	415.5	1.3	16781	85.1	164444	83.31	---	---
4.1	46.1	11.68	451.8	11.45	464.6	11.81	455.4	11.57	21161	117.2	217368	115.1	---	---
251	kcmil	---	---	---	---	---	---	---	251	127	245	124.1	---	---
311	---	---	---	---	---	---	---	---	311	152	2.4	14.1	---	---
351	---	---	---	---	---	---	---	---	351	177	343	173.8	---	---
411	---	---	---	---	---	---	---	---	411	213	3.2	1.8.6	---	---
451	---	---	---	---	---	---	---	---	451	228	441	223.5	---	---
511	---	---	---	---	---	---	---	---	511	253	4.1	248.3	---	---
551	---	---	---	---	---	---	---	---	551	27	53	273.1	---	---
611	---	---	---	---	---	---	---	---	611	314	588	2.7	---	---
651	---	---	---	---	---	---	---	---	651	32	637	322.8	---	---
711	---	---	---	---	---	---	---	---	711	355	686	347.6	---	---
751	---	---	---	---	---	---	---	---	751	381	735	372.4	---	---
811	---	---	---	---	---	---	---	---	811	415	784	3.7.2	---	---
.11	---	---	---	---	---	---	---	---	.11	456	882	446.	---	---
1111	---	---	---	---	---	---	---	---	1111	517	.81	4.6.6	---	---
1111	---	---	---	---	---	---	---	---	1111	557	1178	546.2	---	---
1211	---	---	---	---	---	---	---	---	1211	618	1176	5.5.	---	---
1251	---	---	---	---	---	---	---	---	1251	633	1225	621.7	---	---
1311	---	---	---	---	---	---	---	---	1311	65	1274	645.5	---	---
1411	---	---	---	---	---	---	---	---	1411	71	1372	6.5.2	---	---
1511	---	---	---	---	---	---	---	---	1511	761	1471	744.	---	---
1611	---	---	---	---	---	---	---	---	1611	811	1568	7.4.5	---	---
1711	---	---	---	---	---	---	---	---	1711	861	1666	844.2	---	---
1751	---	---	---	---	---	---	---	---	1751	887	1715	86.1	---	---
1811	---	---	---	---	---	---	---	---	1811	.12	1764	8.3.8	---	---
1.11	---	---	---	---	---	---	---	---	1.11	.63	1862	.43.5	---	---
2111	---	---	---	---	---	---	---	---	2111	11.3	1.61	.3.1	---	---
a) 2. -21AWG , ()														
b) 36-31AWG														
C) () ,														
d)														

/

	a	b	c

mil	mil
(1.8)	(1.8)
mm	mm

A C

	a		b		c	
	mil	mm	mil (10.8 S)	mm	mil (1.11 S)	mm
14AWG	1.671	1.81	1.671	1.7	1.672	1.83
13	1.681	2.13	1.678	1.8	1.681	2.16
12	1.68	2.13	1.678	1.8	1.681	2.16
11	1.111	2.54	1.68	2.4	1.111	2.57
10	1.113	2.87	1.111	2.82	1.114	2.9
9	1.126	3.21	1.123	3.12	1.127	3.23
8	1.142	3.61	1.13	3.53	1.143	3.63
7	1.15	4.15	1.156	3.6	1.161	4.1
6	1.178	4.52	1.174	4.42	1.181	4.57
5	1.211	5.18	1.16	4.8	1.212	5.13
4	1.225	5.72	1.221	5.31	1.227	5.77
3	1.252	6.41	1.247	6.27	1.255	6.48
2	1.283	7.1	1.277	7.14	1.286	7.26
1	1.322	8.18	1.316	8.13	1.325	8.26
10	1.362	9.1	1.355	9.12	1.366	9.31
20	1.415	11.3	1.37	11.18	1.41	11.3
30	1.456	11.6	1.447	11.35	1.461	11.71
40	1.512	13.1	1.512	12.75	1.517	13.13
25kcmil	1.558	14.2	1.547	13.8	1.564	14.33
31	1.611	15.5	1.5	15.21	1.617	15.67
35	1.661	16.8	1.648	16.46	1.668	17.7
41	1.716	17.1	1.62	17.58	1.713	18.11
45	1.74	19.1	1.734	18.64	1.756	19.21
51	1.78	21.1	1.773	19.63	1.777	21.24
55	1.82	21.1	1.812	21.62	1.837	21.26
61	1.866	22.1	1.84	21.56	1.875	22.23
65	1.91	22.1	1.883	22.43	1.911	23.11
71	1.935	23.7	1.916	23.27	1.944	23.8
75	1.968	24.6	1.94	24.11	1.978	24.84
81	1.991	25.4	1.981	24.8	1.991	25.65

10	1.161	26.1	1.163	26.3	1.171	27.21
11	1.117	28.4	1.115	27.81	1.128	28.65
11	1.173	28.8	1.151	27.21	1.185	31.11
12	1.225	31.1	1.211	31.48	1.237	31.42
125	1.251	31.8	1.225	31.12	1.262	32.15
13	1.275	32.4	1.251	31.75	1.288	32.72
14	1.323	33.6	1.277	32.4	1.336	33.3
15	1.371	34.8	1.343	34.11	1.384	35.15
16	1.415	35.1	1.387	35.23	1.421	36.31
17	1.451	37.1	1.431	36.32	1.474	37.44
175	1.481	37.6	1.451	36.83	1.475	37.7
18	1.512	38.2	1.472	37.3	1.517	38.53
1	1.542	39.2	1.511	38.38	1.557	39.55
2	1.583	40.5	1.551	39.41	1.571	40.61
a)	12AWG-214cmil 14 13AWG					
b)	3					
C)	()					

A

	a		b c			
	mil	mm	mil (1.8 S)	m	mil (1.8 S)	mm
1AWG	1313	7.5	1317	7.81	1316	8.13
1	1352	8.4	1345	8.76	1356	11.14
2	135	11.13	1387	11.83	131	11.13
3	1443	11.25	1434	11.12	1447	11.35
4	148	12.65	1488	12.41	1513	12.78
25cmil	1542	13.77	1531	13.4	1547	13.8
31	154	15.1	1582	14.78	1611	15.24
35	1641	16.28	1628	15.5	1647	16.43
41	1685	17.41	1671	17.14	1672	17.58
45	1727	18.47	1712	18.18	1734	18.64
51	1766	19.46	1751	19.18	1744	19.66

55	1.814	21.42	1.788	21.12	1.812	21.66
60	1.841	21.34	1.823	21.11	1.848	21.54
65	1.874	22.21	1.857	21.77	1.883	22.43
70	1.917	23.14	1.881	22.58	1.916	23.27
75	1.931	23.85	1.921	23.37	1.948	24.18
80	1.961	24.61	1.951	24.13	1.971	24.87
90	1.928	26.11	1.917	25.58	1.938	26.37
100	1.984	27.53	1.962	26.17	1.995	27.81
110	1.137	28.88	1.114	28.31	1.148	29.16
120	1.187	31.15	1.163	29.54	1.191	31.45
125	1.212	31.78	1.188	31.18	1.224	31.91
130	1.236	31.31	1.211	31.76	1.248	31.71
140	1.282	32.56	1.256	31.11	1.295	32.81
150	1.327	33.71	1.311	33.12	1.341	34.11
160	1.371	34.82	1.344	34.14	1.385	35.18
170	1.413	35.81	1.385	35.18	1.427	36.25
175	1.434	36.42	1.411	35.61	1.448	36.78
180	1.454	36.13	1.425	36.21	1.461	37.31
190	1.494	37.15	1.464	37.11	1.511	38.33
200	1.533	38.14	1.512	38.15	1.548	39.32
a) ()						
b) 3						

A

	a		b		c	
	mil	mm	mil (1.8 S)	mm	mil (1.1 S)	mm
30AWG	1.113	1.287	1.111	1.282	1.114	1.291
28	1.128	1.325	1.125	1.318	1.121	1.328
27	1.143	1.363	1.141	1.356	1.144	1.356
26	1.161	1.411	1.158	1.411	1.163	1.414
25	1.181	1.457	1.176	1.447	1.182	1.462
24	1.213	1.516	1.191	1.511	1.211	1.521
23	1.228	1.571	1.223	1.566	1.251	1.658
22	1.256	1.651	1.251	1.638	1.251	1.658

22	1.1287	1.72	1.1281	1.714	1.12, 1	1.737
21	1.1323	1.821	1.1317	1.815	1.1326	1.828
21	1.1362	1.1	1.1355	1.12	1.1366	1.131
1	1.1417	1.13	1.143	1.113	1.1411	1.144
18	1.1456	1.16	1.1477	1.135	1.1461	1.171
17	1.1513	1.31	1.1512	1.275	1.1518	1.315
16	1.1576	1.46	1.1564	1.433	1.1582	1.478
15	1.1647	1.64	1.1635	1.613	1.1653	1.65
14	1.1727	1.85	1.1712	1.81	1.1734	1.86
13	1.1816	2.17	1.1811	2.13	1.1824	2.1
12	1.1915	2.32	1.198, 7	2.28	1.1924	2.35
11	1.1113	2.62	1.111	2.57	1.1114	2.64
11	1.116	2, 5	1.114	2, 1	1.117	2, 7
,	1.131	3.31	1.127	3.23	1.131	3.33
8	1.146	3.71	1.143	3.63	1.147	3.73
7	1.164	4.17	1.161	4.1	1.166	4.22
6	1.184	4.67	1.181	4.57	1.186	4.72
5	1.216	5.23	1.211	5.11	1.218	5.28
4	1.232	5.8	1.227	5.77	1.234	5, 4
3	1.261	6.61	1.255	6.48	1.263	6.68
2	1.22	7.42	1.286	7.26	1.25	7.4
1	1.332	8.43	1.325	8.26	1.335	8.51
1 1	1.372	, .45	1.365	, .27	1.376	, .55
2 1	1.418	11.62	1.411	11.41	1.422	11.72
3 1	1.471	11, 4	1.461	11.71	1.475	12.17
4 1	1.528	13.41	1.517	13.13	1.533	13.54
251ccmil	1.575	14.61	1.564	14.33	1.581	14.76
31	1.631	16.11	1.617	15.67	1.636	16.15
351	1.681	18.31	1.667	16, 4	1.688	17.48
41	1.728	18.4	1.713	18.11	1.735	18.67
451	1.772	1, .61	1.757	1, .23	1.781	1, .81
51	1.813	21.65	1.7, 7	21.24	1.821	21.85
551	1.855	21.72	1.838	21.2	1.864	21, 5
61	1.83	22.68	1.875	22.23	1, 12	22, 1
651	1, 2	23.61	1, 11	2.86	1, 38	23.83
71	1, 64	24.4	1, 45	24.11	1, 74	24.74
751	1, 8	25.35	1, 78	24.84	1.118	25.61
81	1.131	26.16	1.11	25.63	1.111	26.42
, 1	1.14	27.7	1.172	27.23	1.115	28.17
111	1.152	2, .26	1.12	28.68	1.164	2, .57
111	1.21	31.71	1.185	31.11	1.221	31.11

12	1.263	32.18	1.238	31.45	1.276	32.41
125	1.28	32.74	1.263	32.18	1.312	33.17
13	1.314	33.38	1.288	32.72	1.327	33.71
14	1.365	34.67	1.338	33.44	1.37	35.13
15	1.412	35.86	1.348	35.15	1.426	36.22
16	1.45	37.16	1.431	36.32	1.474	37.44
17	1.514	38.21	1.474	37.44	1.51	38.58
175	1.526	38.76	1.45	37.7	1.541	39.14
18	1.548	39.32	1.517	38.53	1.563	39.71
1	1.51	41.3	1.558	39.57	1.616	41.7
2	1.632	41.45	1.54	41.61	1.648	41.86
a) ()						

A C

	a		b		c	
	mil	mm	mil (1.8 S)	mm	mil (1.1 S)	mm
3AWG						

12	1.25	2.35	1.17	2.31	1.34	2.372
11-2	2.4					
a)	()					

AWG				
	mil	mm	cmil	mm ²
4	3.1	1.17	.61	1.1487
3	3.5	1.18	12.2	1.1621
38	4.1	1.12	16.1	1.1811
37	4.5	1.144	21.2	1.1113
36	5.1	1.127	25.1	1.1127
35	5.6	1.142	31.4	1.115
34	6.3	1.161	37.7	1.1211
33	7.1	1.181	51.4	1.1255
32	8.1	1.213	64.1	1.1324
31	8.7	1.226	77.2	1.1411
30	11.1	1.254	111	1.1517
29	11.3	1.287	128	1.1647
28	12.6	1.321	157	1.1814
27	14.2	1.361	212	1.1112
26	15.7	1.414	253	1.128
25	17.7	1.455	321	1.162
24	21.1	1.511	414	1.2115
23	22.6	1.574	511	1.257
22	25.3	1.643	641	1.324
21	28.5	1.724	812	1.412
20	32.1	1.813	1121	1.517

AWG														
									E=3A+2C		F=1.8xE		G=1.1xE	
	A		B		C		D							
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
14	1.15	1.4	253	1.128	1.117	1.3	137	1.16	1.171	1.81	1.71	1.78	1.72	1.83

12	1211	15	414	1215	11147	14	216	111	111	2.2	188	2.24	111	2.31
11	1253	16	641	1324	11185	15	342	1173	1113	2.87	1.11	2.87	1114	2.1
1	1284	17	817	1418	11218	15	433	121	1127	3.23	1127	3.14	1128	3.25
8	131	18	1118	1515	11234	16	548	1277	1143	3.63	1.41	3.56	1144	3.66

7

21	21.5	71.5	13.1	42.7	21.8	71.5	13.3	43.6
20	16.5	55.4	11.3	33.5	17.2	56.6	11.5	34.6
19	13.5	44.2	8.21	26.5	13.7	45.1	8.37	27.4
18	11.7	35.1	6.52	21.4	11.9	35.7	6.64	21.8
17	8.45	27.7	5.15	16.5	8.61	28.2	5.25	17.2
16	6.72	22.1	4.11	13.5	6.85	22.5	4.18	13.7
15	5.31	17.4	3.24	11.6	5.41	17.8	3.31	11.8
14	-----	-----	2.57	8.45	-----	-----	2.62	8.61
13	-----	-----	2.14	6.6	-----	-----	2.18	6.82
12	2.65	8.71	1.62	5.31	2.71	8.8	1.65	5.42
11	2.11	6.2	1.2	4.22	2.15	7.16	1.32	4.31
10	1.671	5.47	1.11	3.343	1.713	5.51	1.138	3.418
9	1.325	4.348	1.08184	2.652	1.352	4.435	1.08242	2.714
8	1.111	3.446	1.06417	2.112	1.111	3.515	1.06532	2.413
7	1.08328	2.733	1.05181	1.667	1.0847	2.788	1.05181	1.6
6	1.0661	2.168	1.04131	1.323	1.06741	2.211	1.04111	1.348
5	1.05242	1.721	1.0317	1.111	1.05361	1.754	1.03261	1.117
4	1.04155	1.363	1.02535	1.08315	1.0423	1.31	1.02585	1.08478
3	1.0326	1.111	1.02111	1.0655	1.03362	1.111	1.02111	1.06725
2	1.02613	1.08574	1.0154	1.05231	1.02666	1.08747	1.01626	1.05333
1	1.02173	1.0678	1.01264	1.04146	1.02113	1.0635	1.0128	1.04228
1.1	1.01643	1.0531	1.01112	1.03287	1.01676	1.054	1.01122	1.03353
2.1	1.01314	1.04275	1.01074	1.02618	1.0132	1.04362	1.010811	1.0265
3.1	1.01113	1.0332	1.010316	1.02116	1.01115	1.03461	1.01042	1.0211
4.1	1.010816	1.0268	1.0101	1.01641	1.010361	1.02743	1.01018	1.01673

312

AWG	21.5		25.5	
	á /1000ft	á /1000ft	á /1000ft	á /1000ft
31	111	361	112	368
29	86.1	282	87.8	28
28	6.3	227	71.6	232
27	54.5	17	55.6	182
26	43.5	143	44.3	145
25	34.4	112	35.1	115
24	27.3	8.3	27.8	1.1
23	21.5	71.6	22.1	72.1

22	17.2	56.4	17.5	57.5
21	13.6	44.4	13.8	45.3
20	11.7	35.2	11.9	36.1
19	8.54	28.1	8.71	28.6
18	6.77	22.2	6.91	22.7
17	5.37	17.6	5.47	17.9
16	4.26	14.1	4.35	14.2
15	3.38	11.1	3.44	11.2
14	2.68	8.78	2.72	8.96
13	2.12	6.97	2.16	7.11
12	1.68	5.53	1.71	5.64
11	1.34	4.39	1.37	4.48
10	1.061	3.476	1.081	3.545
9	0.831	2.731	0.8483	2.748
8	0.654	2.163	0.6724	2.216
7	0.522	1.716	0.5332	1.749
6	0.4148	1.361	0.4231	1.388
5	0.3291	1.079	0.3356	1.111
4	0.2618	0.855	0.2661	0.8727
3	0.2106	0.6788	0.2119	0.6922
2	0.1641	0.5384	0.1673	0.5489
1	0.1311	0.4268	0.1326	0.4352
1/2	0.1126	0.3367	0.1147	0.3433
2/3	0.08141	0.2671	0.08311	0.2723
3/4	0.06457	0.2119	0.06583	0.2161
4/5	0.05119	0.1681	0.05219	0.1713

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ASTM B113C D

AWG	20N				25N			
	á	á	á	á	á	á	á	á
	1144ft	1144ft	1144ft	1144ft	1144ft	1144ft	1144ft	1144ft
31	-----	-----	118	354	-----	-----	111	361
29	-----	-----	84.3	277	-----	-----	86.1	282

14	2.73	8.6	2.78	14
13	2.16	7.11	2.21	7.24
12	1.72	5.64	1.75	5.75
11	1.37	4.48	1.3	4.56
11	1.181	3.546	1.112	3.615
,	1.8574	2.813	1.8742	2.868
8	1.67.5	2.231	1.6.2	2.274
7	1.538	1.768	1.54.5	1.812
6	1.4276	1.413	1.435	1.431
5	1.33.2	1.113	1.3458	1.134
4	1.268	1.8821	1.2742	1.8.3
3	1.2132	1.6.6	1.2175	1.7133
2	1.16.1	1.5548	1.1724	1.5657
1	1.1341	1.43.8	1.1367	1.4485
1.1	1.1163	1.3487	1.1184	1.3556
2.1	1.18432	1.2766	1.185.8	1.2821
3.1	1.16688	1.21.4	1.16821	1.2238
4.1	1.15248	1.1722	1.15352	1.1755
251mil	1.14488	1.1473	1.14577	1.1511
311	1.13741	1.1227	1.13814	1.1252
351	1.13216	1.1152	1.13271	1.1172
411	1.12776	1.11.11	1.12831	1.11.288
451	1.12467	1.181.7	1.12516	1.18256
511	1.12222	1.17287	1.12264	1.17431
551	1.12141	1.166.3	1.12181	1.16825
611	1.11871	1.16135	1.11.17	1.16257
651	1.1171	1.15616	1.11742	1.15715
711	1.11586	1.15216	1.11618	1.15317
751	1.11481	1.14858	1.11511	1.14.53
811	1.11388	1.14554	1.11416	1.14644
,.11	1.11234	1.14148	1.1125	1.14128
1111	1.11111	1.13643	1.11132	1.13715
1111	1.11111	1.13643	1.11132	1.13715
1211	1.11.254	1.13137	1.11.436	1.131.6
1251	1.118884	1.12.15	1.11.15	1.12.72
1311	1.118543	1.12813	1.118711	1.12858
1411	1.117.33	1.12612	1.11818	1.12654
1511	1.117413	1.12612	1.11818	1.12654
1611	1.117413	1.1242	1.11754	1.12477
1711	1.116.41	1.12278	1.117178	1.12322
1751	1.116533	1.12143	1.116661	1.12186

6	l̥427	1.41	l̥436	1.43	l̥427	1.41	l̥436	1.43
5	l̥33̥	1.11	l̥346	1.13	l̥33̥	1.11	l̥346	1.13
4	l̥26̥	l̥882	l̥274	l̥, l̥	l̥26̥	l̥882	l̥274	l̥, l̥
3	l̥213	l̥71̥	l̥217	l̥713	l̥213	l̥71̥	l̥217	l̥713
2	l̥16̥	l̥555	l̥172	l̥566	l̥16̥	l̥555	l̥172	l̥566
1	l̥134	l̥44̥	l̥137	l̥44̥	l̥134	l̥44̥	l̥137	l̥44̥
1 l̥	l̥1̥6̥	l̥34̥	l̥1̥8̥	l̥355	l̥1̥6̥	l̥34̥	l̥1̥	l̥355
2 l̥	l̥l̥844	l̥276	l̥l̥86̥	l̥282	l̥l̥844	l̥276	l̥l̥86̥	l̥282
3 l̥	l̥l̥66̥	l̥21̥	l̥l̥681	l̥223	l̥l̥66̥	l̥21̥	l̥l̥681	l̥223
4 l̥	l̥l̥53̥	l̥174	l̥l̥541	l̥177	l̥l̥53̥	l̥l̥174	l̥l̥541	l̥177
25l̥mil	l̥l̥44̥	l̥147	l̥l̥58	l̥15̥	l̥l̥44̥	l̥147	l̥l̥58	l̥15̥
3l̥	l̥l̥374	l̥122	l̥l̥381	l̥125	l̥l̥374	l̥122	l̥l̥381	l̥125
35l̥	l̥l̥32̥	l̥1̥6̥	l̥l̥326	l̥1̥6̥7	l̥l̥32̥	l̥1̥6̥	l̥l̥326	l̥1̥6̥7
4l̥	l̥l̥28̥	l̥l̥, 2̥	l̥l̥286	l̥l̥, 38	l̥l̥28̥	l̥l̥, 2̥	l̥l̥286	l̥l̥, 38
45l̥	l̥l̥24̥	l̥l̥818	l̥l̥254	l̥l̥834	l̥l̥24̥	l̥l̥818	l̥l̥254	l̥l̥834
5l̥	l̥l̥224	l̥l̥736	l̥l̥228	l̥l̥751	l̥l̥224	l̥l̥736	l̥l̥228	l̥l̥751
55l̥	l̥l̥2̥4̥	l̥l̥66̥	l̥l̥2̥8̥	l̥l̥682	l̥l̥2̥4̥	l̥l̥66̥	l̥l̥2̥8̥	l̥l̥682
6l̥	l̥l̥187	l̥l̥614	l̥l̥, 1	l̥l̥625	l̥l̥187	l̥l̥614	l̥l̥, 1	l̥l̥625
7l̥	l̥l̥16̥	l̥l̥526	l̥l̥163	l̥l̥537	l̥l̥16̥	l̥l̥526	l̥l̥163	l̥l̥537
75l̥	l̥l̥15̥	l̥l̥, 1	l̥l̥153	l̥l̥5̥1̥	l̥l̥15̥	l̥l̥, 1	l̥l̥153	l̥l̥5̥1̥
8l̥	l̥l̥141	l̥l̥46̥	l̥l̥143	l̥l̥4̥6̥	l̥l̥141	l̥l̥46̥	l̥l̥143	l̥l̥4̥6̥
, l̥	l̥l̥124	l̥l̥4̥	l̥l̥128	l̥l̥4̥17	l̥l̥124	l̥l̥4̥	l̥l̥128	l̥l̥4̥17
11l̥	l̥l̥11	l̥l̥364	l̥l̥113	l̥l̥371	l̥l̥112	l̥l̥368	l̥l̥114	l̥l̥375
11l̥	l̥l̥1̥2̥	l̥l̥335	l̥l̥1̥4̥	l̥l̥342	l̥l̥1̥2̥	l̥l̥335	l̥l̥1̥4̥	l̥l̥342
12l̥	l̥l̥, 35	l̥l̥3̥7̥	l̥l̥, 54	l̥l̥313	l̥l̥, 35	l̥l̥3̥7̥	l̥l̥, 54	l̥l̥313
125l̥	l̥l̥8̥, 8	l̥l̥2̥, 5	l̥l̥, 15	l̥l̥3̥1̥	l̥l̥8̥, 8	l̥l̥2̥, 5	l̥l̥, 15	l̥l̥3̥1̥
13l̥	l̥l̥8̥63	l̥l̥284	l̥l̥8̥8̥	l̥l̥58̥	l̥l̥8̥63	l̥l̥284	l̥l̥8̥8̥	l̥l̥28̥
14l̥	l̥l̥6̥, 4	l̥l̥26̥	l̥l̥8̥1̥	l̥l̥265	l̥l̥8̥1̥2̥	l̥l̥263	l̥l̥8̥1̥7	l̥l̥268
15l̥	l̥l̥6̥741	l̥l̥243	l̥l̥6̥755	l̥l̥248	l̥l̥6̥748	l̥l̥246	l̥l̥6̥763	l̥l̥25̥
16l̥	l̥l̥6̥7̥2̥	l̥l̥231	l̥l̥6̥7̥15	l̥l̥235	l̥l̥6̥7̥1̥2̥	l̥l̥231	l̥l̥6̥7̥15	l̥l̥235
17l̥	l̥l̥6̥6̥	l̥l̥216	l̥l̥6̥73	l̥l̥22̥	l̥l̥6̥6̥	l̥l̥216	l̥l̥6̥73	l̥l̥22̥
175l̥	l̥l̥6̥42	l̥l̥21̥	l̥l̥6̥54	l̥l̥214	l̥l̥6̥42	l̥l̥21̥	l̥l̥6̥54	l̥l̥214
18l̥	l̥l̥6̥17	l̥l̥2̥2̥	l̥l̥6̥2̥	l̥l̥2̥6̥	l̥l̥6̥23	l̥l̥2̥5̥	l̥l̥6̥35	l̥l̥2̥8̥
1, l̥	l̥l̥6̥84	l̥l̥, 2	l̥l̥6̥, 6	l̥l̥, 6	l̥l̥6̥, 1	l̥l̥, 4	l̥l̥6̥1̥2̥	l̥l̥, 8
2l̥	l̥l̥6̥55	l̥l̥183	l̥l̥6̥66	l̥l̥186	l̥l̥6̥61	l̥l̥184	l̥l̥6̥72	l̥l̥188

	AWG	25 Ć		25 Ć	
		á /1000ft	á /1000ft		á /1000ft
	14	2.7	15	2.85	32
	13	2.21	7.26	2.25	7.41
	12	1.75	5.75	1.78	5.88
	11	1.37	4.8	1.3	4.56
	10	1.08	3.55	1.1	3.62
	9	0.857	2.82	0.874	2.87
	8	0.67	2.23	0.672	2.27
	7	0.53	1.76	0.55	1.81
	6	0.427	1.41	0.436	1.43
	5	0.33	1.11	0.346	1.13
	4	0.26	0.882	0.274	0.88
	3	0.213	0.71	0.217	0.713
	2	0.16	0.555	0.172	0.566
	1	0.134	0.438	0.1367	0.4485
	1/2	0.11	0.3487	0.1184	0.3556
	2/3	0.08432	0.2766	0.0858	0.282
	3/4	0.06688	0.214	0.0682	0.2238
	4/5	0.05248	0.1722	0.05352	0.1755
	14	2.62	8.62	2.68	8.78
	13	2.08	6.82	2.12	6.7
	12	1.65	5.43	1.68	5.53
	11	1.32	4.3	1.34	4.3

316A

1

AWG	21		25	
	á /1000ft	á /1000ft	á /1000ft	á /1000ft
6	16716	2 214	16852	2 248
5	15326	1.748	15436	1.784
4	14224	1.386	14314	1.414
3	13351	1.114	13418	1.121
2	12656	18714	12711	188 2
1	12117	16 13	1214	17161
1 1/2	11671	15438	11715	155 4
2 1/2	11325	14347	11351	14433
3 1/2	11161	13448	11172	13517
4 1/2	108332	12734	10851	1278

3167

ASTM G

	21				25				21				25			
	21		25		21		25		21		25		21		25	
	á	á	á	á	á	á	á	á	á	á	á	á	á	á	á	á
	11111ft km	11111ft km	11111ft km	11111ft km	11111ft km	11111ft km	11111ft km	11111ft km	11111ft km	11111ft km	11111ft km	11111ft km	11111ft km	11111ft km	11111ft km	11111ft km
14AWG	2.65	8.71	2.71	8.86	2.82	9.24	2.87	9.41								
13	2.11	6. 1	2.14	7.13	2.23	7.33	2.28	7.47								
12	1.67	5.48	1.71	5.58	1.77	5.81	1.81	5. 3								
11	1.32	4.35	1.35	4.42	1.41	4.61	1.43	4.71								
1 1/2	1.165	3.45	1.167	3.51	1.11	3.66	1.13	3.73								
1 1/4	1.832	2.73	1.84	2.78	1.884	2. 1	1.92	2. 6								
8	1.661	2.16	1.673	2.21	1.711	2.31	1.715	2.35								
7	1.523	1.71	1.533	1.75	1.545	1.7	1.555	1.82	1.858	2.82	1.875	2.88				
6	1.415	1.37	1.423	1.3	1.431	1.42	1.441	1.45	1.681	2.23	1.6	5	2.27			
5	1.32	1.18	1.336	1.11	1.343	1.12	1.34	1.14	1.541	1.77	1.551	1.81				
4	1.261	1.857	1.266	1.873	1.271	1.8 1	1.276	1.8 18	1.428	1.41	1.437	1.43				
3	1.217	1.67	1.211	1.6 3	1.215	1.717	1.21	1.721	1.341	1.11	1.347	1.13				
2	1.164	1.53	1.167	1.551	1.171	1.561	1.174	1.571	1.26	1.883	1.274	1. 11				
1	1.132	1.431	1.134	1.441	1.137	1.44	1.141	1.457	1.215	1.717	1.221	1.721				
1 1/2	1.114	1.342	1.116	1.34	1.118	1.355	1.111	1.362	1.171	1.561	1.174	1.571				
2 1/2	1.826	1.271	1.843	1.276	1.861	1.282	1.876	1.288	1.136	1.445	1.13	1.454				

13, 31	1656	1215	1668	121,	1681	1223	16, 6	1228	1167	1353	111	1361
4 1	1521	1171	1631	1174	1641	1177	1552	1181	1653	127,	166,	1286
251kmil	143	1145	1451	1148	1461	1151	146,	1154	16725	1238	16741	1243
31	168	1121	1675	1123	1684	1125	16, 1	112,	16164	11, 8	1616	1212
351	1616	1114	1622	1116	1628	1118	1635	1111	1618	1171	1628	1173
41	1676	11, 17	1682	11, 24	1688	11, 42	16, 3	11, 62	16453	114,	16462	1152
451	16246	16816	16251	16822	16255	16838	16261	16855	164163	1132	16411	1135
51	16221	16725	16225	167164	16231	16755	16235	1676,	16362	111,	16371	1121
551	16212	16663	16216	16675	16211	166, 1	16214	167163	16332	11168	16338	1111
61	16186	166167	1618,	1661,	161, 3	16631	161, 6	16644	163164	11, 6	16311	1112
71	16171	16661	16174	16671	16177	16683	16182	166, 5	16281	11, 1,	16286	11, 37
751	16148	16486	16151	164, 6	16154	165165	16157	16515	16243	167, 7	16248	16813
81	1613,	16456	16142	16464	16145	16473	16147	16483	16227	16747	16233	16762
, 1	16123	16416	16125	16413	1612,	16421	16131	1642,	16212	16664	16216	16677

1111 1111

161	111718	11233	111721	11237	111735	11242	111751	11246	11116	11181	11118	11181
171	111666	11218	11167	11222	11163	11227	111716	11232	11111	11158	11111	11165
1751	111647	11212	111661	11216	111672	11221	111685	11225	11116	11148	11118	11155
181	11162	11216	111642	11211	111654	11214	111667	11218	11113	11131		

71	162	1631	165	1641	173	166	177	1681
75	151	16, 5	164	1616	162	1631	165	1642
81	142	164	144	1673	162	16, 4	1655	1616
16	125	1613	162	1621	1635	1643	1638	1652
116	113	16371	1615	16378	1621	163, 4	16124	16167

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ASTM M

	21				25			
	21		25		21		25	
	á	á	á	á	á	á	á	á
	111ft	km	111ft	km	111ft	km	111ft	km
14AWG	2.62	8.61	2.67	8.78	2.82	25	2.88	42
13	2.11	6.8	2.13	7.13	2.26	7.41	2.31	7.54
12	1.68	5.53	1.71	5.64	1.81	5, 4	1.85	6.16
11	1.33	4.3	1.36	4.47	1.44	4.71	1.46	4.7
11	1.16	3.48	1.18	3.55	1.14	3.73	1.16	3.81
1	1.841	2.75	1.857	2.82	1.8, 8	2, 6	1.8, 21	3.12
8	1.666	2.18	1.67	2.23	1.715	2.35	1.72	2.41
7	1.533	1.75	1.544	1.78	1.572	1.88	1.584	1, 2
6	1.423	1.3	1.431	1.42	1.455	1.4	1.463	1.52
5	1.336	1.11	1.343	1.12	1.361	1.18	1.367	1.21
4	1.266	1.873	1.271	1.887	1.286	1, 37	1.2, 2	1, 56
3	1.213	1.6, 4	1.217	1.714	1.226	1.744	1.232	1.758
2	1.16	1.554	1.172	1.565	1.182	1.5, 5	1.185	1.6167
1	1.134	1.441	1.137	1.448	1.144	1.472	1.147	1.481
1.1	1.116	1.34	1.118	1.355	1.114	1.374	1.116	1.381
2.1	1.851	1.276	1.867	1.282	1.8, 13	1.311	1.8, 31	1.316
3.1	1.674	1.221	1.687	1.225	1.6724	1.238	1.6738	1.242
4.1	1.634	1.175	1.646	1.17	1.6574	1.18	1.6585	1.1, 2
251kmil	1.453	1.14	1.462	1.151	1.487	1.15	1.4, 6	1.162
31	1.377	1.123	1.385	1.125	1.4116	1.133	1.4113	1.136
351	1.323	1.116	1.32	1.118	1.347	1.114	1.354	1.116
41	1.283	1.1, 28	1.28	1.1, 47	1.314	1.1, 7	1.311	1.112
451	1.252	1.825	1.256	1.842	1.261	1.858	1.267	1.875
51	1.226	1.743	1.231	1.757	1.243	1.7, 8	1.248	1.813
551	1.216	1.675	1.211	1.688	1.221	1.6725	1.225	1.6741
61	1.18	1.61	1.1, 3	1.631	1.213	1.664	1.216	1.677
71	162	1631	165	1641	173	166	177	1681

751	1111.51	1111. 5	1111.54	1111.5115	1111.62	1111.531	1111.65	1111.542
811	1111.42	1111.64	1111.44	1111.73	1111.52	1111. 1	1111.55	1111.5118
1111	1111.25	1111.13	1111.21	1111.211	1111.35	1111.43	1111.38	1111.52
11111	1111.13	1111.71	1111.15	1111.78	1111.21	1111. 1	1111.23	1111.17

1

411

111

4112

4111481

111

111

47.1 47.1

111

111

511

111

47.2 47.1

UL1581

111

311

2116

UL62 2x 1x

UL62 UL1581 5k

47.1

5k1

CATV 1 4 75 167 CP USE-2 USE

RHW-2 RHH

SIS

	1in	25mm	
168	5k	15lb in	85
USE-2 RHW-2 RHH		13MN m	
1 4		14n cm	
121 1.8		15kg mm	
RHW RH 75 167	5k		85
113.1 235.4			
1.81			
121 1.8	6k		6k
18			

CP

	1 in 25mm 3 in 75mm	1 in 25mm	
168 71.4 N 158 N 121 N 24.8 N 18	25 1.4 IN 6.2mm	31.4 (3 in 75mm) 71.4 61.4	151.4 lbf in 1.3 MN m 1.34 n cm 1.15 kg mm 85 61.4
CP	W		

51.2

24 1.4 N 194 CP

	1 in 25mm	
168 121 N 158 N 61.4 N 141.4 121 N 24.8 N	21.4 (2 in 51mm) 11.4 (1 in 25mm) 61.4	121.4 lbf in 8.27 MN m 827 n cm 1.844 kg mm 121.4 lbf in 8.27 MN m 827 n cm 1.844 kg mm 61.4
24 CP	W	

5k21

26 6kÑ 140 CP

	1in 25mm 3in 75mm	25mm 1in	
168 7k ¥ 1.1kÑ 158 ¥ 1 121 ¥ 1.1kÑ 24 .8 ¥ 18	25 1 4IN 6.2mm	3k (3in 75mm) 7k 6k	15kbf in 1k3MN m 1k34n cm 1.1k5kg mm 7k 6k
26 CP	Ш		

5k22

32 1k5Ñ 221 CP

	1in 25mm	
168 136 ¥ 1.1kÑ 276.8 ¥ 1.81 6kÑ 14k 121 ¥ 1.1kÑ 24 .8 ¥ 1.8	2k (2in 5kmm) 1k (1in 25mm) 6k	12kbf in 8.27MN m 827n cm 1k844kg mm 12kbf in 8.27MN m 827n cm 1k844kg mm 6k
32 CP	Ш	

51.23

42 1.1.194 CPCPE NBR/PVC

	1 in 25mm	
121 1.1.194 168 24.8 1.81 6.1.14 121 1.1.194 24.8 1.8	2.1 (2 in 5mm) 1.1 (1 in 25mm) 6.1	12.1 bf in 8.27MN m 827n cm 1.844kg mm 12.1 bf in 8.27MN m 827n cm 1.844kg mm 6.1
42 CP	1.1	
42 CPE	1.1	
42 NBR/PVC		1.1

51.28

CATV

1.1

1.1

1.1 194

CPE

1.1

	1 in 25mm	
121 1.1.194 168 24.8 1.8	15.1 (1-1 2 in 38mm) 5.1	14.1 bf in 1.65MN m 65n cm 1.84kg mm 85
CPE	1.1	

51.2

CATV

USE-2

RHW-2 RHH

1.94

CPE

W

	1 in 25mm	
168 121 ¥ 1.1 24.8 ¥ 1.8 121 ¥ 1.1 24.8 ¥ 1.8 18	25 2-1 2in 62.5mm 6 6	15 lbf in 1.3MN m 1.34n cm 1.5kg mm 85 6
CPE	W	

51.3

CATV

USE

RHW-2 RHH

75 167

CPE

W

	1 in 25mm	
168 113 ¥ 1.1 235.4 ¥ 1.8 121 ¥ 1.1 24.8 ¥ 1.8 18	2 2in 5mm 6 6	15 lbf in 1.3MN m 1.34n cm 1.5kg mm 85 6
CPE	W	

5k31

CPE

	1in 25mm	
168 113 ¥ 1.1k 235.4 ¥ 1.8 121 ¥ 1.1k 24.8 ¥ 1.8 18	2k 2in 5mm 6k 6k	15k lbf in 1k 3MN m 1k 4n cm 1k 5kg mm 85 6k
CPE	W	

5k32

37 k 194

CPE

	1in 25mm	
168 113 ¥ 1.1k 235.4 ¥ 1.8 121 ¥ 1.1k 24.8 ¥ 1.8 18 6k 14k 121 ¥ 1.1k 24.8 ¥ 1.8 18	2k 2in 5mm 1k 1in 25mm 6k	12k lbf in 8.27MN m 827n cm 1k 844kg mm 12k lbf in 8.27MN m 827n cm 1k 844kg mm 6k
37 CPE	W	

51.33

47 11.5 221

CPE

	1in	25mm	
168 113 ¥ 1.1 235.4 ¥ 1.8 121 ¥ 1.1 24.8 ¥ 1.8 18 6 14 121 ¥ 1.1 24.8 ¥ 1.8 18	25 2-1 2in 62.5mm 5 6	12 12bf in 8.27MN m 827n cm 1.844kg mm 8 6	
47 CPE	5		

51.34

USE-2 USE

RHW-2 RHH

SIS

1.4

75 167

CPE

5

	1in	25mm	
168 USE-2 RHW-2 RHH 1.4 121 ¥ 1.1 24.8 ¥ 1.8 RHW RH 75 167 113.1 ¥ 1.1 235.4 ¥ 1.81 121 ¥ 1.1 24.8 ¥ 1.8 18	25 5 5 6	15 15bf in 1.33MN m 1.34n cm 1.15kg mm 85 85 6	
CP	5 1.4 CP	RHW-2 RHH	SIS

5142

RHW-2 RH RHW

RHH

EP

W

[illegible]

51.52

28 75Ñ 167

Kn 194

EPDM

	lin	25mm			
	75 N	75 N	75 N	75 N	75 N

5k53

35 1k5 **Ñ** **221** EP

Ш

	1in 25mm	
136 ¥ 1.1k Ñ 168 276.8 ¥ 1.8	25k 2-1 2in 62.5mm 5k	7k lb f in 4.83MN m 483n cm k4.2kg mm 5k
35 EP - EPM Ш EPDM - -		

5k54

44 75 **Ñ** **167** EPDM SBR NR

Ш

	1in 25mm	
1k ¥ 1.1k Ñ 24k 212.1 ¥ 1.8	25k 2-1 2in 62.5mm 5k	6k lb f in 4.14MN m 414n cm k4.22kg mm 7k

44 EPDM - -
44 SBR NR

Ш

11.5	121	24.8	18	5	5
6	14			6	6
121	24.8	18			
45	EP	-	EPM	W	PDM

51.56

RHW-2	RH	RHW	SIS	EPCV	W
				1 in 25mm	
				225	12
				2-1 2in 56.2mm	8.27MN m
					827n cm
					844kg mm
				75	75
EPCV		-	(EP)W(PE)	1, 4	CP
					RHW-2WRHH
					SIS

51.28

Z ZW ETFE W 15

N 302 ETFE CATV ECTFE ETFE

W

				1 in 25mm	
				1 in 25mm	5
					34.5MN m
					3447n cm
					3.52kg mm
				75	85
					5
					34.5MN m
					3447n cm
					3.52kg mm
ECTFE	ETFE			5MM	W

41. 21.6

5164

2163 382 ETFE

	1in 25mm	
168 232 ¥ 1.16 44,6 ¥ 1.8	2163 2in 51mm 85	2163bf in 13.7 MN m 137 n cm 144kg mm 81
ETFE 51MM 11		

5171

CATV 2163 382 TFE FEPB

	1in 25mm	
168 232 ¥ 1.16 44,6 ¥ 1.8	2163 2in 51mm 75	2163bf in 17.2MN m 1724n cm 13.76kg mm 75
ETFE 51MM 11		

5173

12 TFE

	1in 25mm	
168 232 ¥ 1.16 44,6 ¥ 1.8	2163 2in 51mm 75	2163bf in 17.2MN m 1724n cm 13.76kg mm 75
ETFE 51MM 11		

51.81

W

RH RHH

75 N 167 NBR/PVC

W

	1 in 25mm	
	2 in 51mm	15 lb bf in 1.3 MN m 1.34 n cm ² 1.5 kg mm ²
24 lb ¥ 1.8 N 212 lb ¥ 1.8	5 lb	7 lb
121 lb ¥ 1.8 N 24 lb ¥ 1.8	6 lb	6 lb
18		
a NBR PVC W		

51.83

CATV

4

4

4

RH

W-2 RHH 1.8 N 194 NBR/PVC^a

	1 in 25mm 3 in 75mm 31.25 5 16 in 7.8 mm ¥	25mm (1 in)	
--	---	--------------	--

24 lb 12
¥ 1.8 N 24 lb ¥ 1.8
121 lb ¥ 1.8 N 24 lb ¥ 1.8
18

	1 in 25mm 3 in 75mm	(1 in 25mm)	
168 ¥ 1.1 ⁶ 158.1 ⁶ ¥ 1.8 121.1 ⁶ ¥ 1.1 ⁶ 24.8 ¥ 1.8 18	31 5 16 in 7.8mm	3 ⁶ 3 in 75mm 7 ⁶ 6 ⁶	151 ⁶ bf in ² 11 ⁶ 3MN m ² 11 ⁶ 34n cm ² 1.1 ⁶ 5kgf mm ² 7 ⁶ 6 ⁶
a NBR PVC 5 ⁶ 83 ^a Ш			

5⁶ 6

23 6⁶Ш 14⁶ NBR PVC^a

	1 in 25mm 3 in 75mm	(1 in 25mm)	
168 7 ⁶ 1 ⁶ ¥ 1.1 ⁶ 158.1 ⁶ ¥ 1.8 6 ⁶ Ш 14 ⁶ 121.1 ⁶ ¥ 1.1 ⁶ 24.8 ¥ 1.8 18	31 5 16 in 7.8mm	3 ⁶ 3 in 75mm 7 ⁶ 6 ⁶	8AWG SO 181 ⁶ bf in ² 12.4MN m ² 124 ⁶ n cm ² 1.27kgf mm ² 151 ⁶ bf in ² 11 ⁶ 3MN m ² 11 ⁶ 34n cm ² 1.1 ⁶ 5kgf mm ² 7 ⁶ 6 ⁶
a 23 NBR PVC Ш			

5k 7

25 1.4 75 167 NBR PVC^a

	1 in 25mm ^b			
	75 ^Ñ 167	1 ^Ñ 1.4	75 ^Ñ 167	1 ^Ñ 1.4
24[•] 11[•] 1[•] 212[•] ¥ 1.8 168 121[•] ¥ 1[•] 24[•] .8 ¥ 1.8 6[•] 14[•] 121[•] ¥ 1[•] 24[•] .8 ¥ 1.8 18	21[•] 2 in 5[•]mm 5[•] 11[•] (1 in 25mm) 6[•]	15[•] 1[•]bf in² 1[•] 3MN m² 1[•] 34n cm² 1[•] 5kgf mm² 70% 12[•] 1[•]bf in² 8.27MN m² 827n cm² 1[•] 844kgf mm² 6[•]		
a 25 NBR PVC	Ш			

5k 8

27 1.4 NBR PVC^a

	1 in 25mm 3 in 75mm		(1 in 25mm)	
24 11.1 1.1 24.8 ¥ 1.8 6 14 121.1 ¥ 1.1 24.8 ¥ 1.8	31.25 5.16 in 7.8mm		25 2-1 2 in 62.5mm 5 (1 2 in 12.5mm)	12 12bf in² 8.27MN m² 827n cm² 1.844kgf mm² 1 1bf in² 6.21MN m² 621n cm² 1.633kgf mm²

18		6	6
a 27	NBR PVC	W	

USE-2		USE		5k ₆ 1.4		a ^a NBR PVC ^b	
		1in 25mm 3in 75mm		(1in 25mm)			
24k ₆ 121.1k ₆ ¥1.1k ₆ Ñ 24 ₆ .8 ¥1.8 121.1k ₆ ¥1.1k ₆ Ñ 24 ₆ .8 ¥1.8 18		1 ₆ 3 16in 4.8mm		3k ₆ 3in 75mm 5k ₆ (1 2in 12.5mm) 6k ₆		18k ₆ bf in ² 12.4MN m ² 124k ₆ n cm ² 1.27kgf mm ² k ₆ bf in ² 6.21MN m ² 621n cm ² k ₆ 633kgf mm ² 6k ₆	
a 27		NBR PVC		W			
bNBR PVC		W					

511

USE	75	^a NBR PVC ^b
	1 in 25mm 3 in 75mm	(1 in 25mm)
24 11. ¥ 1. 212. ¥ 1.8 121. ¥ 1. 24.8 ¥ 1.8 18	1 3 16in 4.8mm	3 3 in 75mm 5 6
a	W	
bNBR PVC	W	

5k11k5

RH

RHW

a

	1in 25mm 3in 75mm 1 _x 3.16in 4.8mm	(1in 25mm) 3 ₁ 3in 75mm	15mil 1.38mm 15k1b fTd (8) 2k65 kTd (b)T 4.32148 kTd (fTd (8) 2k65 k
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24k

1k1k1k ¥ 1.1kÑ 212k ¥ 1.8

121k ¥ 1.1kÑ 24,8 ¥ 1.8

18

5k

6k

24k 11k ¥ 1.1k 212k ¥ 1.8 121k ¥ 1.1k 24k .8 ¥ 1.8 18		5k 1 2in 12.5mm 6k	12.4MN m² 124k cm² 1.27kgf mm² 1k lbf in² 6.2MN m² 621n cm² 1k633kgf mm² 6k
a RHH RHW-2 SBR/11R/NR EP			

5k112

	1in 25mm 3in 75mm	(1in 25mm)	
24k 11k ¥ 1.1k 212k ¥ 1.8 121k ¥ 1.1k 24k .8 ¥ 1.8 18	1k 3 16in 4.8mm	3k 3in 75mm 7k 6k	15k lbf in² 1k3MN m² 1k34n cm² 1.1k5kgf mm² 7k 6k
a 5k12k a			

5k12k

	1in 25mm 3in 75mm	(1in 25mm)	
	1k 3 16in 4.8mm	25k 2-1 2in 62.5mm	12k lbf in² 8.27MN m² 827n cm² 1k844kgf mm²

168 7k ₁ ¥ 1.1k ₁ 158.1k ₁ ¥ 1.8 6k ₁ 14k ₁ : 121.1k ₁ ¥ 1.1k ₁ 24.8 ¥ 1.8 18		65	75
		6k ₁	6k ₁
a 13			

5k121

14 6k₁ 14k₁ a

	1in 25mm 3in 75mm	(1in 25mm)	
168 7k ₁ ¥ 1.1k ₁ 158.1k ₁ ¥ 1.8 6k ₁ 14k ₁ : 121.1k ₁ ¥ 1.1k ₁ 24.8 ¥ 1.8 18	25 1.4in 6.2mm	3k ₁ 3in 75mm	15k ₁ lbf in ² 1k ₁ 3MN m ² 1k ₁ 34n cm ² 1.1k ₁ 5kgf mm ² 65 14k ₁ 6k ₁
a 14			

5k122

15 6k₁ 14k₁ a

	1in 25mm 3in 75mm 1.	(1in 25mm) 3k ₁ 3in 75mm	

168 7л.л.¥1.л.Ñ 158.л. ¥1.8 6л.Ñ 14л. 121.л.¥1.л.Ñ 24.8 ¥1.8 18		7л. 6л.	15л.лbf in² 1л.3MN m² 1л.34n cm² 1.л.5kgf mm² 7л. 6л.
a 15 Ш			

5л.123

CATV Ч Ч Ч

16 75Ñ 167 a

	1 in 25mm 3 in 75mm	(1 in 25mm)	
24 121. ¥ 1. 212. ¥ 1.8 6 14 121. ¥ 1. 24. 8 ¥ 1.8 18	25 1.4 in 6.28mm	25 2-1 2 in 62.5mm 5 1 2 in 12.5mm 6	12 lbf in² 8.27MN m² 827n cm² 844kgf mm² lbf in² 6.2MN m² 621n cm² 633kgf mm² 6
a 17			

5125

41 194 a NBR/PVC^b

	1 in 25mm	
24 121. ¥ 1. 24. 8 ¥ 1.8 6 14 121. ¥ 1. 24. 8 ¥ 1.8 18	25 2 in 5mm 5 1 2 in 12.5mm 6	12 lbf in 8.27MN m 827n cm² 844kg mm² lbf in 6.21MN m 621n cm² 633kg mm² 6
a41		
b41 NBR PVC		

5133

CATV 75 167 LDFRPE^a HDFRPE^b

5 26

	1in 25mm	
12kbf in 8.27MN m 827n cm² 844kg mm² 1in 25mm	1in 25mm	12kbf in 8.27MN m 827n cm² 844kg mm²

a

	1 in 25mm	
LDPE	LDPE	LPDE
	3kbf in 3in 75mm LDPE 35kbf in 3-1 2in 87.5mm 3kbf in 3in 75mm	14kbf in 16.5MN m 1665n cm ² 1.6 kgf mm ²
HDPE		24kbf in 16.5MN m 1665n cm ² 1.6 kgf mm ²
LDPE HDPE		
48	75	75
1kbf in 1.8		
aLDPE		1kbf in 25g cm ³
[ASTMD 1248-84(R1, 8) I]		
bHBFPE		1kbf in 41-5 g cm ³
[ASTMD 1248-84(R1, 8) III]		
C 3 g cm ³ (3kg cm ³) PE 2kbf in min 5kbf in min		
3 g cm ³ (3kg cm ³) PE 2kbf in min 5kbf in min		
mm min PE 3 g cm ³ (kg cm ³)		
25N 77		
g cm ³ (3kg cm ³) 1		

5kbf in

CATV PFA^a PFA PFAH PFA^a PFA^a

	1 in 25mm	
PFA	2kbf in 2in 5kbf in 85	25kbf in 17.2MN m 1724N cm ² 1.76kgf mm ²
CATV		
6		
16kbf in 1.8		
PFAH 25kbf in		

287. 168

115 4 1 75 6

PVC^a

	1 in 25mm	
115 221	11	21
168		
136.1 1.1 276.8 1.8	5	85
1 4		
168	5	
121.1 1.1 24.8 1.8		85
75 167		
24	5	
11.1 1.1 212.1 1.8		85
6 14		
168	5	
11.1 1.1 212.1 1.8		75
APVC	W	

5144

THWN-2, THHN THWN PVC

	1 in 25mm	
HWN-2, TH THWN		
168	45	65
136.1 1.1		75

(276.8 ¥1.8)			
THWN (			
)			
168 ,	45	65	75
121.1 ¥1.1			
(24.8 ¥1.8)			

5145

THW THWN PVC^a

	1in 25mm ^b		^b	
	THWN	THW ^b	THWN	THW ^b
	151 1-1 2in 38mm	151 1-1 2in 38mm	211 13.7 Mpa MN m ² 137 n cm ² 1.41kgf mm ²	
168 121.1 ¥1.1 24.8 ¥1.8	45	35	75	
	65	51		

a PVC

b PVC THW

1) 14~7AWG ,

2) 6AWG



	1in 25mm ^b	^b
ASTM C311 23.1kN (5.3kN) (73.4kN), ,	15kN 1-1.2in 38mm 65	21kNbf in ² 13.7 Mpa(MN m ²) 137 N cm ² 1.41kgf mm ² 75
a PVC		

5k155

THW-2^b THWN-2 THHW THHN PVC^a TFN TFFN

12B 1kN 1.4 PVC^a

	1in 25mm		
	THHN THFN TFFN THWN-2	THW-2 ^b THHW	THWN-2 THW-2 ^b THHW THHN THFN TFFN
168 136.1kN (30.6kN) 276.8kN (62.1kN)	15kN 1-1.2in 37.5mm 45 65	35 5kN	21kNbf in ² 13.7 Mpa MN m ² 137 n cm ² 1.41kgf mm ² 75
a PVC b PVC THW 3) 14~7AWG , 4) 6AWG			

5k156

12B 6kN(1 4)PVC^a

		(1in 25mm)	
75N(167)	6k , 75. ¥ 1 N 167.k ¥ 1.8		5k
60N(14k)	6k , 11k ¥ 1 N 212.k ¥ 1.8		6k
a PVC 5k155 aW			

5k16k

TBS PVC^a

	1in 25mm b	b
168 121.k ¥ 1.k N 24 .8 ¥ 1.8 W	15k 1-1 2in 38mm 45 65	15kbf in ² 1k3Mpa(MN m ²) 1k4N cm ² 1.k5kgf mm ² 7k 65
a PVC		

5k165

11 6kN(14k)PVC^a

	1in 25mm	
	2k 2in 5kmm	16kbf in ² 11.kMN m ² 11k3N cm ²

168 1.12kgf mm² 85	5k	1.12kgf mm² 85
168 1.12kgf mm² 85	85	85
168 1.12kgf mm² 75	75	75
a 11 PVC		

5k166

11 6kÑ(14k)PVC^a

	1in 25mm	
168 1.12kgf mm² 85	2k 2in 5kmm 6k	16kbf in² 11.1kMN m² 11k3N cm² 1.12kgf mm² 85
168 1.12kgf mm² 75	75	75
a 11 PVC 5k165 aШ		

5k167

11 6kÑ(14k)PVC^a

	1in 25mm	
168 1.27kgf mm² 85	2k 2in 5kmm 6k	18kbf in² 12.4kMN m² 124kN cm² 1.27kgf mm² 85
168 1.27kgf mm² 75	75	75
a 11 PVC 5k165 aШ		

5k.16_s

11 6k.Ñ(14k.)PVC^a

168 121.6 ¥ 1.6 24.8 ¥ 1.8 6.6 1.6 (14.6) : 6.6 1.6 1.6 14.6 1.8 168 6.6 1.6 (14.6) : 6.6 1.6 1.6 14.6 1.8 168 6.6 1.6 1.6 14.6 1.8 6.6		1.65kgf mm ²
	45	7.6
	65	65
	75	75
	85	85
	75	75
a 12 PVC 5.6 17. a 11		

5.6 181
12 1.6 1.6 (221)PVC^a

	1in 25mm	
168 136.6 ¥ 1.6 276.8 ¥ 1.8 6.6 1.6 (14.6) : 6.6 1.6 1.6 14.6 1.8 168 6.6 1.6 (14.6) : 6.6 1.6 1.6 14.6 1.8 168 6.6 1.6 1.6 14.6 1.8 6.6	1.6 1.6 1in 25mm	15.6 1.6bf in² 1.6 3MN m² 1.6 4N cm² 1.6 5kgf mm²
	45	7.6
	65	7.6
	75	75
	85	85
	75	75
a 12 PVC 5.6 17. a 11		

51.182

CATV 61.Ñ(141.) 45.Ñ(167.) 41.Ñ(1. 4.) 11.Ñ(221.) PVC^a

4

4

43

	1in	25mm	
b		11.3	151.3 lbf in ²
		1in 25mm	11.3 MN m ²
			11.34 N cm ²
			1.15 kgf mm ²
		45	71.3
		65	71.3
61.3 Ñ (141.3) 43 :		75	75
61.3.3 1.1.3 Ñ 141.3.3 1.8			
168			
61.3 Ñ (141.3) 43 :		85	85
61.3.3 1.1.3 Ñ 141.3.3 1.8			
168			
61.3 Ñ 141.3			
61.3.3 1.1.3 Ñ 141.3.3 1.8		75	75
61.3			
a 43 PVC	Ш		
b			
</			

5k183

CATV 4

4

6k $\checkmark$ (14k) 475 $\checkmark$ (167) 4 1k $\checkmark$ (1, 4) 1k5 $\checkmark$ (221) PVC^a

6k $\checkmark$ (14k) 475 $\checkmark$ (167)

15.1 3.2 6.1 158.1 1.1 316.4 1.8 125 257 168 158.1 1.1 316.4 1.8 PVDE 3.1 136.1 1.1 276.8 1.8	5.1 d d	2.46kgf mm ² 5.1 d d
a PVDF 4 bPVDF 4 cPVDF PVDF d	5 5 2.1 2in min 5.1 5mm min 4 5	PVDF 5 5 5

5.18

RH4RHW-24RHW RHH SBR IIR NR^a

	75 167 1.4 75 167 1in 25mm 3in 75mm 2-1 2in 62.5mm	1.4 75 167 1in 25mm 3in 75mm 25 (1.4 in 6.2mm)	1in 25mm 3in 75mm 3.1 5.1	7.1bf in ² 4.83MN m ² 483N cm ² 1.4 2kgf mm ² 7.1 24.1 1.1 212.1 1.8
75 167 24.1 1.1 212.1 1.8	25 (1.4in 6.2mm)	25 (1.4 in 6.2mm)	3.1 5.1	7.1bf in ² 4.83MN m ² 483N cm ² 1.4 2kgf mm ² 7.1

5k 1.5

4 6k 14k SBR/NR^a

	(1in 25mm 3in 75mm)	(1in 25mm)	
168 7k 1.1k 158.1k 1.8	25 (1 4in 6.2mm)	35k (3-1 2in 87.5mm)	15k 1bf in ² 1k 3MN m ² 1k 34N cm ² 1.1k 5kgf mm ²
		65 14k 7k	
a 4 SBR NR	SBR 4 NR		Ш

5k 1.6

6 6k 14k SBR/NR^a

	(1in 25mm 3in 75mm)	(1in 25mm)	
168 7k 1.1k 158.1k 1.8	1 (3 16in 4.8mm)	31k (3in 75mm)	8AWG S 18k 1bf in ² 12 4MN m ² 124k 1N cm ² 1.27kgf mm ²
		65 14k 7k	
a 6 SBR NR	SBR 4 NR		Ш

5k1.7

7 75Ñ 167 SBR/NR^a

	1in 25mm	
11k1.7 1.1k1.7 212k1.7 1.8 6k1	3k1.7 3in 75mm 5k1	7k1.7bf in² 4.83MN m² 483N cm² 1.4 2kgf mm² 7k1
a 7 SBR NR	SBR NR	Ш

5k1.8

8 75Ñ 167 SBR/NR^a

	(1in 25mm 3in 75mm)	(1in 25mm)	
24k1.8 7k1.8 1.1k1.8 212k1.8 1.8	1k1.8 (3 16in 4.8mm)	25k1.8 (2-1 2in 625mm)	18k1.8bf in² 12.4MN m² 124k1.8N cm² 1.27kgf mm²
		5k1.8	7k1.8
a 8 SBR NR	SBR NR	Ш	

5k1

1k 75N 167 SBR/NR^a

	(1in 25mm 3in 75mm) 25 (1 4in 6.2mm)	(1in 25mm) 3k (3in 75mm)	15kbf in ² 1k3MN m ² 1k34N cm ² 1.k5kgf mm ²
24k 7k1k ¥ 1.kN 212 ¥ 1.8		5k	7k
a 1k SBR NR	SBR 4NR		W

5k2k

4k 6kN 14k SBR/NR^a

	1in 25mm	
	2k 2in 5kmm 65	5kbf in ² 3.45MN m ² 345N cm ² k352kgf mm ²
168H 7k1k ¥ 1.kN 158 ¥ 1.8		6k
a 4k SBR NR	SBR 4NR	W

5k2k5

SA

2k2k3 2

a

	1in 25mm	
21.1k ¥ 1.1k 411k ¥ 1.8	25k 2-1 2in 62.5mm 25	8kbf in ² 5.52MN m ² 552N cm ² k562kgf mm ² 6k
a		

5k2k6

RHH

a

	1in 25mm	
136.1k ¥ 1.1k 276.8 ¥ 1.8	25k 2-1 2in 62.5mm 65	8kbf in ² 5.52MN m ² 552N cm ² k562kgf mm ² 75
a		

5k21k

CATV

15k2k (3k2) 2k2k (3 2)

a

22

	1in 25mm	
	1k 1in 25mm	5kbf in ² 3.45MN m ²

6 2k6

15kN 3k2 6k 158.1kN 1.1kN 316.4kN 1.8 21kN 3k2 6k 21kN 1.1kN 41kN 1.8	5k 1 2in 12.5mm 25 5k 1 2in 12.5mm 25	345N cm² 1.352kgf mm² 5kbf in² 3.45MN m² 345N cm² 1.352kgf mm 6k 5kbf in² 3.45MN m² 345N cm² 1.352kgf mm 6k
a		

5k21

CATV 25kN(482)PTFE(TPE)

TFE 12C PTFE

	1in 25mm	
6k 26kN 1.1kN 5kN 1.8	175 1-3 4in 43.8mm 25	4kbf in² 27.6MN m² 2758N cm² 2.81kgf mm² 6k
a PTFE TFE 5kmm		

5k223

CATV 1kN(221) TPE

1kN(221)36 TPE

	1in 25mm			

7k 2k6

168H 136 ¥ 1.1 276.8 ¥ 1.8 6 14 168H 15 ¥ 1 3	2 5 2in 5mm 75 75	8 12 5.52MN m² 552N cm² 562kgf mm² 75 75	12 16 8.27MN m² 827N cm² 844kgf mm² 75 75	5
36	Ш			

5224

CATV (1 4) TPE

(1 4)36 TPE

	1in 25mm			
168H 136 ¥ 1.1 276.8 ¥ 1.8 6 14 168H 15 ¥ 1 3	2 5 2in 5mm 75 75	8 12 5.52MN m² 552N cm² 562kgf mm² 75 75	12 16 8.27MN m² 827N cm² 844kgf mm² 75 75	5
36 TPE	Ш			

5k.228

1. $\mathbf{N}(1, 4)$ 36

TPE

		1 in	25mm	
	15kbf in² 11.3MN m² 11.34N cm² 1.15kgf mm²	15kbf in² 11.3MN m² 11.34N cm² 1.15kgf mm²	15kbf in² 11.3MN m² 11.34N cm² 1.15kgf mm²	15kbf in² 11.3MN m² 11.34N cm² 1.15kgf mm²
a)XL	XLPE	XL PVC	XL EVA	

5k22

USE 75 **N**(167) XL^a

		1 in	25 mm	
	15 lb 1-1.2 in	37.5 mm	15 lb 11.3 MN m ² 11.34 N cm ² 1.15 kgf mm ²	7 lb
a) XL	XLPE	XL PVC	XL EVA	

5k 23k

XL^a

	1 in 25mm	
--	-----------	--

		15kN 1-1 2in 37.5mm	15kNbf in ² 11.3MN m ² 11.34N cm ² 1.15kgf mm ²	
168 11.1kN ¥ 1.1kN	212.1kN ¥ 1.8	7kN		7kN
a)XL	XLPE	XL PVC	XLEVA	
	W		W	

5kN231

CATV 1.1kN(1.4) 75kN(167)XL

XHHW-2 XHHW XHH

RHW-2 RHH RHW SIS

	(lin 25mm)	
--	----------------	--

168
121.1kN ¥ 1.1kN 24.8 ¥

XHHW-2 XHHW XHH RHW
RHH RHW SIS 1.1kN

113.1kN ¥ 1.1kN 235.4 ¥

5k232

38 15kÑ(3k2) XLPO^a

	1in	25mm	
	15k	1-1 2in 37.5mm	15kbf in ² 1k3MN m ² 1k34N cm ² 1.k5kgf mm ²
168 1k1k¥ 1.kÑ 212.k¥ 1.8		7k	7k
a)XLPO	XLPE	XL PVC	XLEVA
	W		W

5k233

1k5Ñ(221)XLPO

	1in	25mm	
	15k	1-1 2in 37.5mm	15kbf in ² 1k3MN m ² 1k34N cm ² 1.k5kgf mm ²
168 1k1k¥ 1.kÑ 212.k¥ 1.8		7k	7k
a)XLPO	XLPE	XL PVC	XLEVA
	W		W

5k237

2_ε kÑ(1_ε 4) XL^a

	1in	25mm	
	15k	1-1 2in 37.5mm	15kbf in ² 1k3MN m ²

		168 11.4kN/m ² 1.1kN/m ²	7k 	11.4kN/m ² 1.1kN/m ²	7k
a)2	XL	XLPE	XL PVC	XLEVA	
		W	W		

5k241

31 75N(167) XL^a

		1in 25mm 15k 1-1 2in 37.5mm			
	168 11.4kN/m ² 1.1kN/m ²	7k 	15k 11.4kN/m ² 1.1kN/m ² 1.1kN/m ²	7k 	
a)31	XL	XLPE	XL PVC	XLEVA	
		W	W		

5k245

33 115N(221) XL^a

		1in 25mm 15k 1-1 2in 37.5mm			
	168 11.4kN/m ² 1.1kN/m ²	7k 	15k 11.4kN/m ² 1.1kN/m ² 1.1kN/m ²	7k 	
a)33	XL	XLPE	XL PVC	XLEVA	
		W	W		

//
2141

W

1441 in 141 mm,

1441 in 141 mm,

, 2,

..

61kmm 1.32in 1mm

1 4ft 122kmm 7

12AWG (B) , 1.2 Ib 11g, 1

1.12 Ib 1.1 g, 12AWG

5 () 1mg()

211.2

(,

211.1) .

-

$$A_{\text{cmil}} = \frac{33.136 S 1k^{+6} S W_{\text{lb}}}{(11.1+K) S L_{\text{ft}}}$$

$$A_{\text{cmil}} = \frac{88.417 S 1k^{+6} S W_{\text{lb}}}{(11.1+K) S L_{\text{ft}}}$$

$$A_{\text{cmil}} = \frac{118.654 S 1k^{+6} S W_{\text{lb}}}{(11.1+K) S L_{\text{ft}}}$$

Acmil

W_{lb}

L_{ft}

K 211.2

-

,

$$A_{cmil} = \frac{114.144 \times 10^{-6} \times W_{lb}}{(114 + K) \times L_{ft} \times f}$$

$$A_{cmil} = \frac{W_{lb} \times K \times L_{ft}}{f}$$

$$lb-cmil = 114.144 \times ft$$

$$W_g = 453.5 \times 24$$

$$W_{lb}$$

210.3

(,

210.1):

$$A_{mm^2} = \frac{11248 \times W_g}{(114 + K) \times L_{mm}}$$

$$A_{mm^2} = \frac{36115 \times W_g}{(114 + K) \times L_{mm}}$$

$$A_{mm^2} = \frac{36 \times 6 \times W_g}{(114 + K) \times L_{mm}}$$

$$A_{mm^2}$$

$$W_g$$

$$L_{mm}$$

$$K \qquad 211.2$$

24inches	61	3.631	1647	1.357	615.5	1.114	512.8
	65	3.33	1784	1.471	666.8	1.16	542.5
	71	4.236	1.21	1.583	718.1	1.288	584.2
	75	4.53	215	1.66	76.3	1.381	626.1
	81	4.841	21.6	1.81	821.5	1.472	667.7
	11	5.446	2471	2.135	1.23.1	1.656	751.1
	111	6.152	2745	2.261	1126	1.841	834.6
	111	6.657	3121	2.487	1128	2.124	18.1
	121	7.262	32.4	2.713	1231	2.21	112
	131	7.867	2568	2.3	1333	2.33	1185
	141	8.472	3843	3.165	1436	2.577	116
	151	1.77	4121	3.31	1538	2.761	1252
	161	.682	43.2	3.617	1641	2.45	1336
	171	112	4667	3.843	1743	3.12	141
	175	115	4818	3.57	17.5	3.221	1461
	181	118	4.41	4.171	1846	3.313	1513
	1.1	11.51	5216	4.26	1.4	3.47	1586
	21	12.11	5488	4.522	1151	3.681	1671
a)	K 2 B C D 1						
Ш K 2							211
2-211.4	Ш						
b	F						
	F	K 211.2					
	211.3	MM					

				a	K
	B	C	D		2 ^b
					2 ^b
					2 ^b
1 _i					2 ^b
				G	H
4 _i					3
133					4
25 _i					4,5
427					5
427					6
				IK	M
7			1		4
1 _i	4				

$$k=1,2,\dots,(M-1)$$

$$(\quad)M$$

$$(a) \quad ,M=M_{\text{conc}}$$

$$M_{\text{conc}}=\frac{1+(p_2)\,s(m_2)+(p_3)\,s(m_3)+\dots+(P_y)\,s(m_3)}{1}$$

$$y \quad (\quad)$$

$$p$$

$$m \quad (\quad),$$

$$m= \frac{1+H^2}{n^2}$$

$$n \approx 1k$$

$$m= \frac{1+H^2}{(2\,n^2)}=1+\frac{4.348}{n^2}$$

$$N$$

$$N=$$

$$d$$

$$d$$

$$d= \quad +1$$

$$d= \quad -1$$

C

E a

1,

6

a

1.732xD

D

6

D

LOL

D

6

1.732xD

12

6

LOL

W

$$M_{\text{combo unilay}} = \frac{1 + 6m_2 + 6m_3 + 6 \times 1.732 \times m_4}{1 + 6 + 6 + (6 \times 1.732)}$$

m2

m3

D

m4

1.732xD

a

$$m = \sqrt{1 + \frac{1}{N}}$$

n

D

n1 =

6

D

LOL

$$n_2 = \frac{2D}{LOL}$$

6

D

LOL

$$n_3 = \frac{3.464D}{LOL}$$

3.464D

6

D

1.732xD

LOL

$$n_4 = \frac{3.732D}{LOL}$$

3.732D

n2

n3

n4

LOL

$$n_4 = \frac{3.732D}{LOL}$$

3.732D

1.732

/

22.1

2

Ш 25 Ń 77 2kŃ 68

22k2Ш

3k1~3k11 Ч

Ш

22k3~22k₄

Ш

22k2 77 2kŃ 68

22k1

77 2kŃ 68

Ш

22k3

24~28in 61k~122kmm

2 Ш

22k4

Ш

22k5

1.5 Ш

k1

Ш

22k6

84

2k6

22k₄ Ш k₄in

k₂mmШ

22k₇ Ш

15~3k₈ Ń Ń

Ш 22k₂ 22k₁ aШ

22k₈

Ш Ч

Ш

22k₄ Ч Ч

Ш

Ш

Ш

22k₁

a

		25 Ń 77		2k ₈ Ń 68	
Ń					
k ₄	32k ₄	1.1k ₇	1.11k ₄	1.1k ₈₅	1.1k ₈₈

5	41.1	1.184	1.185	1.163	1.164
6	42.8	1.17	1.181	1.15	1.161
7	44.6	1.175	1.176	1.154	1.155
8	46.4	1.171	1.172	1.151	1.151
9	48.2	1.166	1.167	1.145	1.146
10	50.1	1.161	1.163	1.141	1.142
11	51.8	1.157	1.15	1.137	1.138
12	53.6	1.153	1.154	1.133	1.133
13	55.4	1.148	1.151	1.128	1.12
14	57.2	1.144	1.145	1.124	1.124
15	59.1	1.141	1.141	1.121	1.121
16	60.8	1.136	1.137	1.116	1.116
17	62.6	1.132	1.133	1.112	1.112
18	64.4	1.128	1.128	1.108	1.108
19	66.2	1.124	1.124	1.104	1.104
20	68.1	1.121	1.121	1.101	1.101
21	69.8	1.116	1.116	1.096	1.096
22	71.6	1.112	1.112	1.092	1.092
23	73.4	1.108	1.108	1.088	1.088
24	75.2	1.104	1.104	1.085	1.084
25	77.1	1.101	1.101	1.081	1.081
26	78.8	1.096	1.096	1.077	1.076
27	80.6	1.092	1.092	1.073	1.072
28	82.4	1.088	1.088	1.071	1.07
29	84.2	1.085	1.085	1.066	1.065
30	86.1	1.081	1.081	1.062	1.061
31	87.8	1.077	1.077	1.058	1.057
32	89.6	1.074	1.073	1.055	1.054
33	91.4	1.071	1.071	1.051	1.051
34	93.2	1.067	1.066	1.048	1.047
35	95.1	1.063	1.062	1.044	1.043
36	96.8	1.05	1.058	1.041	1.03
37	98.6	1.056	1.055	1.037	1.036
38	100.4	1.052	1.051	1.034	1.032
39	102.2	1.04	1.048	1.031	1.02
40	104.1	1.045	1.044	1.027	1.025
41	105.8	1.042	1.041	1.024	1.022
42	107.6	1.038	1.037	1.021	1.018
43	109.4	1.035	1.034	1.017	1.015
44	111.2	1.031	1.031	1.014	1.011
45	113.1	1.028	1.027	1.011	1.008

46	114.8	10, 25	10, 24	10, 108	10, 105
47	116.6	10, 22	10, 210	10, 105	10, 102
48	118.4	10, 18	10, 17	10, 101	10, 8
49	120.2	10, 15	10, 13	10, 8	10, 5
50	122.0	10, 12	10, 110	10, 5	10, 2
51	123.8	10, 10	10, 107	10, 2	10, 88
52	125.6	10, 106	10, 104	10, 88	10, 886
53	127.4	10, 102	10, 100	10, 885	10, 882
54	129.2	10, 88	10, 7	10, 882	10, 87
55	131.0	10, 6	10, 4	10, 87	10, 876
56	132.8	10, 3	10, 1	10, 876	10, 873
57	134.6	10, 10	10, 888	10, 873	10, 8710
58	136.4	10, 887	10, 884	10, 8710	10, 867
59	138.2	10, 884	10, 881	10, 867	10, 864
60	140.0	10, 881	10, 878	10, 864	10, 861
61	141.8	10, 878	10, 875	10, 861	10, 858
62	143.6	10, 875	10, 872	10, 858	10, 855
63	145.4	10, 872	10, 86	10, 856	10, 852
64	147.2	10, 86	10, 866	10, 853	10, 84
65	149.0	10, 866	10, 863	10, 8510	10, 846
66	150.8	10, 863	10, 8610	10, 847	10, 843
67	152.6	10, 8610	10, 857	10, 844	10, 8410
68	154.4	10, 858	10, 855	10, 842	10, 838
69	156.2	10, 855	10, 852	10, 83	10, 835
70	158.0	10, 852	10, 84	10, 836	10, 832
71	159.8	10, 84	10, 846	10, 833	10, 82
72	161.6	10, 846	10, 843	10, 8310	10, 826
73	163.4	10, 844	10, 841	10, 828	10, 824
74	165.2	10, 841	10, 838	10, 825	10, 821
75	167.0	10, 838	10, 835	10, 822	10, 818
76	168.8	10, 835	10, 832	10, 81	10, 815
77	170.6	10, 833	10, 82	10, 817	10, 813
78	172.4	10, 8310	10, 827	10, 814	10, 8110
79	174.2	10, 828	10, 824	10, 812	10, 8108
80	176.0	10, 825	10, 821	10, 810	10, 8105
81	177.8	10, 822	10, 818	10, 8107	10, 8102
82	179.6	10, 8210	10, 816	10, 8104	10, 8110
83	181.4	10, 817	10, 813	10, 8102	10, 7
84	183.2	10, 815	10, 811	10, 7	10, 5
85	185.0	10, 812	10, 8108	10, 7	10, 2
86	186.8	10, 8110	10, 8106	10, 7	10, 10

87	188.6	10817	10813	107.2	10787
88	1.4	10815	10811	1078	10785
8	1.2.2	10812	107.8	10787	10782
10	1.4.10	10811	107.6	10784	10781
a 15~310N(5'-86') 22107					

228.1 ,

228.2 , 4

() (

) ().

(N) (,

N 228.1).

228.3 ,

228.1()

228.2() 4 ,

228.4 , (228.5)

1in 2mm , 1.1

5ft

, 1.1k , P
 2k 1.1k ,
 P
 228.5 , 12in 3kmm
 6in 15kmm , 6,
 1.1k , P
 15k 1.1k ,
 P

228.1

1 43 44 2 1 W		a	Tan a=2 3.1416 P (D+2) C	3
			a(arctan)	1 W
			sin a	3
		F	F= N P d sin a	3
		G	G=2F-F ²	3

		K	$K=114.5 \frac{S}{G}$	1
		$\tan a=2 \frac{S}{3.1416} \frac{P}{S} \frac{C}{(D+2)}$ $F= N \frac{S}{P} \frac{S}{w} \sin a$		
			, Deq	D
			, Deq	D
C= d= , 1.111 in 1.111 mm D= , 1.111 in 1.1 mm Deq= , 1.111 in 1.1 mm, 3.1416(π) N= $N = \frac{(r + s) \sin a}{r + s}$ P= 228.4 228.5 t= , 1.111 in 1.1 mm w= , 1.111 in 1.1 mm				

228.2 ()

1 43 44		a	Tan a=3.1416 $\frac{S}{3}$ (D+d) L a(arctan) cos a	3 1 ^w 3
2				

1	Ш		$B = H \sqrt{\frac{d}{D+d}} \cdot 3.1416 \sqrt{\cos \alpha}$	3
		K	$K = 1.4 \sqrt{B}$	1
		$\tan \alpha = 3.1416 \sqrt{\frac{L}{D+t}}$ $B = H \sqrt{\frac{w}{D+t}} \cdot 3.1416 \sqrt{\cos \alpha}$		
			, Deq D	
			, Deq D	

d= , 1.1111 in 28.1 mm
D= , 1.111 in 28.1 mm
Deq= , 1.111 in 28.1 mm,
H= 3.1416(π)

5 (1**4**3**4**5...),

1.

[illegible]

5 (k4244...),

 $6\sim$

5 (1**4**3**4**5...),

1.

24k7 24k1~24k4 ,

kkkkin kkk1mm

241.3

243.3 4in 114mm

,

,

,

, , 1000 in 100 mm.

$$, \quad 24k5 \quad 24k6 \quad ,$$

100 in 100 mm.

$$24k_8 \quad 24k_3 \quad , \quad 24k_3$$

24k7

•

3 2k6

24k₄ 4in 1k₄mm

24k₁1k₁

(k₁78 S k₁315in 1.8 S .52mm) 25 ¥ 2gf

k₁25 ¥ k₁2N k₁437in 11.1k₁mm,

k₁2k₁in k₁51mm(k₁43in 1.k₁ mm)

k₁43in 1.k₁ mm).

k₁41in k₁41mm,

k₁41in k₁42mm , 24k₁

24k₁11 , 24k₁

()

k₁41in

k₁42mm

24k₁12

24k₁11

24k₁13

24k₁5 24k₁6

, k₁41in k₁41mm,

24k14 24k8~24k13 ,

1.111in 1.111mm

24k5 24k6

, 1.111in 1.11mm,

25k1 25k11 ,

25k6~25k11 1.143in 1.1 mm
, 24 22 2kAWG ,18AWG

25k2 ,
, 2,
,
, 1.111in 1.11mm
, (1.178in 1.315in
1. 8 S .52mm) 1.1 2gf 1.1 1.1 2N

25k3 ,
, 5 2k6

25k4

0.001 in 0.01 mm

25k5

0.001 in 0.01 mm

3mil 0.08mm.

25k6

25k

25 ¥ 2gf

0.25 ¥ 0.2N

0.043 in

1.1 m

(18AWG

0.437 in

11.1 mm,

0.043 in

1.1 mm,

(0.043 in 0.312 in 1.1 mm 7.2mm).

25k7

25k8

25k

0.001 in

1.1mm

25.1

1.1in 1.1mm

3mil 1.8mm

25.11

1.43in 1. mm,

1.43in 1. mm

1.2in 1.51mm

7

26.1

6in 15mm

1ft 3m

26.2

4

PVC 4

3.8in

1mm

()

26.3

4

3

(1.43 1.315in 1. 7.2mm)

25 ¥2gf 1.25 ¥1.2N

1.437in 11.1mm, 1.42in 1.51mm,

1.441in 1.41mm,

1.441in 1.41mm . 24.2

26.4

PVC.

1.441in 1.42mm

5

PVC

26.5

26.4

26.6

PVC

24.5

24.6

1.441in 1.41mm,

PVC

26.8

26.7

24.5

24.6

1.441in

1.41mm,

PVC.

26k8

26k3~26k7

,

kkkkin kkkmm

.

,

24k5

24k6

,

kkkin kklmm,

.

24k5

24k6

,

kkkin kklmm,

.

.

4

7

28k1

,

2,

,

,

,

kkkin kklmm,

,

(kk78 S k315in 1. 8 S

52mm)

1k¥2gf

k1k¥kk2N

,

,

kkkkin

kkkmm

28k2

,

44

2k6

1-

2

ASTM D412- 2

42k2

,

.

42k1

ASTM

C

,

1.4in

6mm

C

,

ASTM

D,

1.8in

3mm

,

C

42k3

42k1

,

42k2

42k1

a

b

,

c

, c

5.8in

16mm

, d

42k4

W

1in 25mm

W

1k1

2k6

Ш

421.5

4

a) 6AWG

b) 31mil 1.76mm 4

421.1

1 8 inch	1.125	3.18
3 16	1.188	4.76
1 4	1.251	6.35
5 16	1.312	7.2
3 8	1.375	8.52
1 2	1.511	12.7
1 32	1.54	15.1
5 8	1.625	16
11 16	1.688	17.48
3 4	1.751	17.1
7 8	1.875	22.2
1	1.911	25.4
1-1 16	1.962	27.1
1-1 8	1.125	28.6
1-1 4	1.251	31.8
1-17 64	1.266	32.2
1-1 2	1.5	38
1-3 4	1.75	44.5
2-3 8	2.375	61.3
3-1 4	3.251	82.6
3-7 8	3.875	98.4

6	6	152
1 ft 6 inches	18	457
2 8	32	813

421.2

42k₆ ASTM D 5423- 3(R1_{6 6 6})(II)
ASTMD 5374- 3(R1_{6 6 6}) ,

11k₂ 21k₂ ,
4 3 ¥
1.1k₆ Ñ ¥ 1.8 F 3

44k₆
44k₆1 4

3 24.1k₆ ¥ 8.1k₆ Ñ 75.2 ¥ 14.4 F
3 48

3
44k₆2 6AWG 44k₆11

3
3

4 6AWG 5mil 2.41mm
42k₆5

42k₆6 4
XL PE 44k₆3 ,

11k₆4 21k₆6

441.3

XL PE

31

441.4

2ft 61mm

115

216

44k.5 44k.4

44k6

1.2in 13mm

44k7 24k1~24k7

1.4in 6mm

4418

1in 25mm

44k -----

, $44k_{\bullet}1k_{\bullet}44k_{\bullet}11$

44k.12

44k 1k ----

42k7

1.4

1k6 2k6

44k.11 -----

44k.4~44k.8 , 24.k¥ 8.kÑ

(75.2 ¥ 14.4) ,

, , ----- ,

, , , , ,

,

44k.12 ----- ,

,

44k.13 ,

(+) ,

,

44k.14 ,

,

44k.15 , 8in 2kmm

, (+) ,

,

,

44k.16 44k.22~44k.24 44k.14 44k.15

, 4 3k

， k125in 3mm 。

44k17 ，

。 42k4 1in

25mm ，

，

44k18 ，

， 4k7~44k8

。

44k1 42k7 ，

，

44k11 ，

44k2k ， 44k13~44k16

44k22~44k24 。

44k21 ，

。 44k17

1in 25mm

42k22 (7in 18kmm),

(,

), .

, 42k2 44k23

, 1in 25mm

44k23 ,

, .

, .

44k24 , kkk1in

kk1mm 1.2in 13mm

, 1.4in 6mm

,

k25k¥ kkk1in 6.4 ¥ k2mm , 3.k ¥ 1.kozf .85 ¥

3gf k84 ¥ k2N , ,

1.16in 2mm ,

kkk1in kkk1mm .

7/

46k1 .

46k2 2k¥ 1in min 5k¥ 25mm min

2 , 2

k1in k1mm

7
47k1

1.1 W
1in 25mm
W

1.2in 13mm W

W 2k¥ 1in min 5k¥ 25mm min

2k¥ 1.2in min 5k¥ 5mm min 5k136 c

W
W

11k 2k6

W

a

1.5 1bf 1.22N 23gf

b

W

W

W

W

1in 2mmW

11.4*

1in

25mm

W

471.2

4

4

W

W

471.3

$$A=1.7854(D^2-d^2)$$

A

4

4

D

4

4

D

4

4

47k4 (4)

A_n _____

A

W 1k1n k1g

G 47k5~47k

A_n _____

A_n _____

A_n _____

A 4

W 25kmm k1g

G 47k5~47k

47k5 47k4 ,

G, 2 .

, () .

, 4 4 (

).

47k6

4 4

1k1n

25k1mm

,

.

.

,

,

47k1

.

47k7

2in

5k1mm

,

5g

5g

1k1k51k1n

,

1k127mm(36AWG),

47k8

,

.

,

,

.

,

,

.

,

.

,

.

,

.

.

.

,

.

,

2

G

47k1

()

471₄

, ()

W_1 , 5mg.

, ,

,

,

.

,

.

,

.

,

.

.

W_2 , 5mg.

,

,

,

W_3 .

2

.

471₄11₄

A

,

.

S

,

4

4

P 4 4

W 4 4

T 4 4 3

7

4811 ,

 ,

 ,

31 , 4 4 4

 , 31

ASTM

C ,

 ,

 ,

4812 , 24.1¥

8.1Ñ(75.2 ¥ 14.4) , A©P`#ý z h

48k3 42k, ,

48k5 IRM 1.2. ATSM D471- 8 .

48k6 1in 25mm 4 6in 15kmm .

, ,
14~7AWG ,

U ,

. THWN-2 4 THWN THHN .

, U ,

48k7 TFN TFFN (48k8) ,

5kml . ,

, ,
U , () .

48k8 TFN TFFN , 1in

25mm 4 6in 15kmm . ,

U ,

, U ,

48k₈ TFN TFFN

48k₈ 1 in 25mm

ASTM C ASTM471- 8

48k₁₁TFN TFFN , 48k₈

, 1in 25mm , ASTM

C, ASTM D 471- 8

48k₁₁ ASTM C

4

4

481.1 481.2~481.8

481.2

44k 1 2 3

42k

481.3

6 12k 15k

18k 21k

481.3

T_{test} ()

1k2 , T_{test}

$$T_{\text{test}(\check{N})} = 1.12 \times 273.15 + T_{\text{rating}(\check{N})} - 273.15$$

481.4 481.2
 ,

 , 47k 1-

1. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 841.

6

W

481.5 () .

$$E(t) = E_k \cdot e^{-R(t-k)}$$

$$E(t) \propto t^{-4} \quad E_k \propto k^{-4}$$

RW

$$481.6 \quad Y=1n \quad E(t) \quad \Psi=1n \quad E_k \quad T= \quad t_k$$

$$Y=B \quad RT$$

48k7 k ,

B R, 31k.

48k8 3k 5k .

C

1

4 k1 --- PVC

4 k2

(FTIR)

(cm-1) 1 2

W

4k1k4k1k

4 k3

PVC

() (THF,

4 k4)

()THF

PVC

.THF

4 k4 THF

,---

4 k 1 24

4 2 41-

2 4 3

THF

THFW

THFW

W

4

4

4

4

W

4 k5

(KBr)

KBr

4.1.6

()

(KBr)

1mm 1.2in 12.7mm

11111~151111bf.in² 6 ~113 Mpa 7~11 kgf. mm²

4.1.7

PVC

THF

4.4

1

1

11

471.8

PVC

THF

4.4

1

1

485

11

4.1

1

a

PVC

11

b

c

11

11

d

11

4.1.1

1

PVC

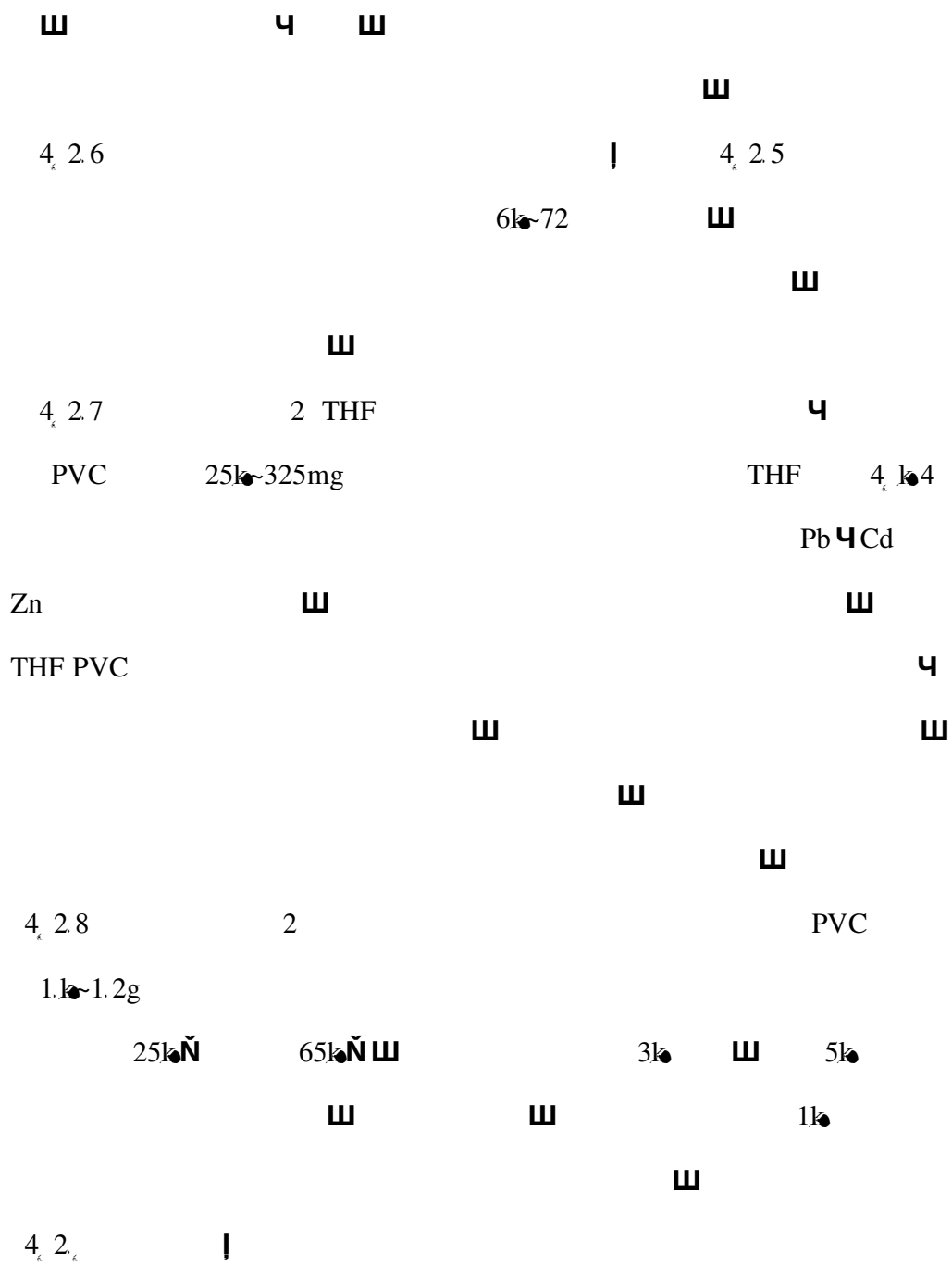
11

ISO3451-8 pt5 1

PVC

4 1.2 | A W
 a 1mg
 b
 c d e
 d
 e 85k ¥ 5k N 1562 ¥ k
 f W
 4 1.3 | PVC 4~5g 4
 W W
 W
 85k ¥ 5k N 1562 ¥ k 3k
 W W
 | 1.5mg W
 3 W 3
 3 W
 4 1.4 W
 1k
 1k W
 4 1.5 | 85k ¥ 5k N 1562 ¥ k

4_x 1.6 |
 a PVC 4
 b
 c 1.1mg
 d 1
 e
 -
 4_x 2.1 | PVC 4 4
 4_x 2.2 AA 4
 4_x 2.3 1 2 4
 4_x 2.4 4 4
 4_x 2.5 1 4 4
 PVC 25k~325mg 6_x ~72
 4_x 2.6 6_x ~71 4



a 1 2 PVC

4

b

c 4 AA

d

e 4

4 3.1 4 GPC

4 GPC

4

PVC

4

4 3.2

4

4

4

THF 4 4

PVC

4

4

4

4 3.3

4

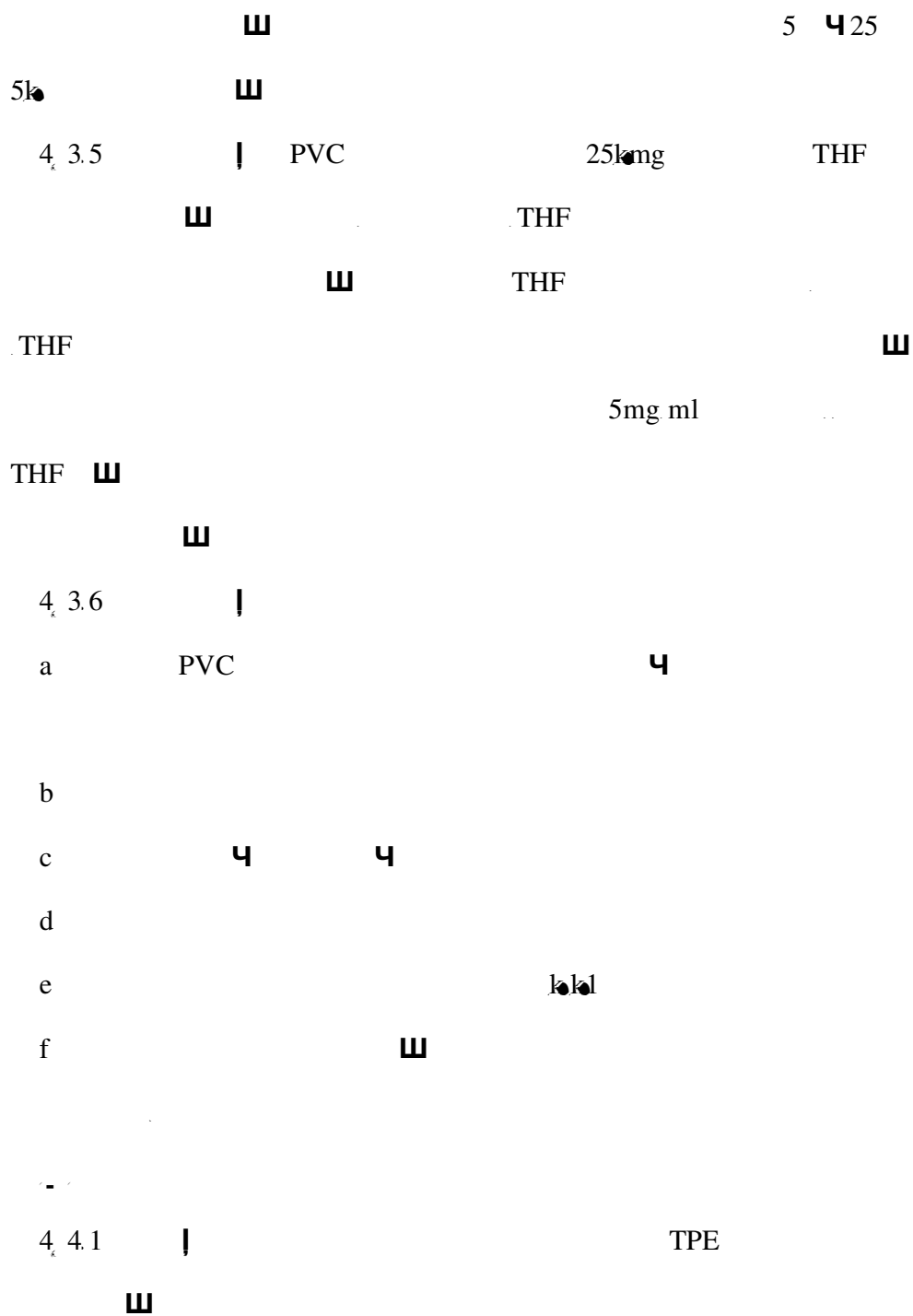
4

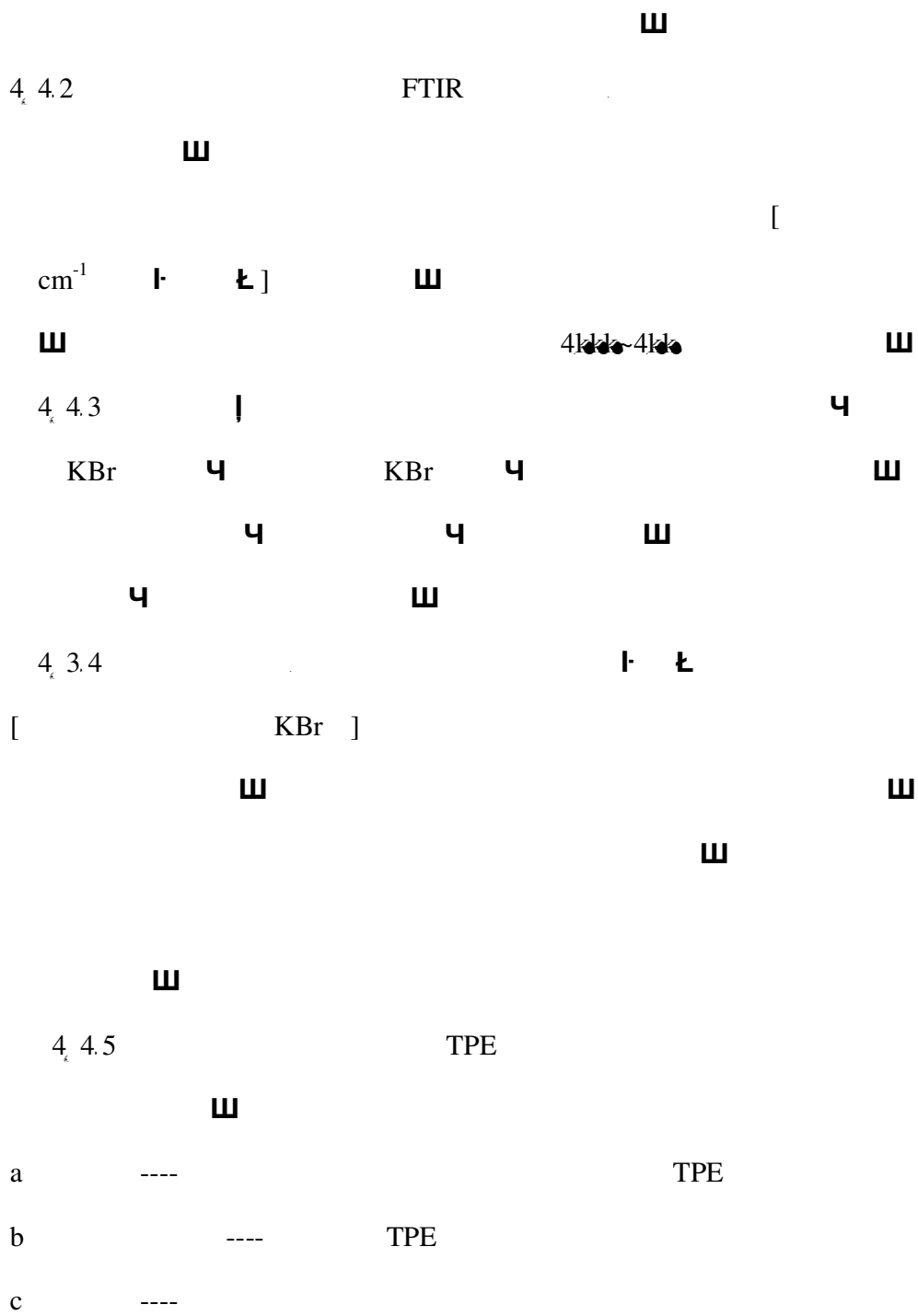
4 3.4

4

THF

4 2





d -----

4.4.6 TPE

,
, 3~5
, (2um)
,
(KBr),

1mm 1.2in 12.7mm ,
11111~15111 1bf.in² 6~113 Mpa
7~11kgf. mm² , ,

4.4.7 ---

- a) TPE , ,
- b) () ,
- c) ,
- d) ()
- e) ,

4.5.1 ----- TPE

,
()

4.5.2

4.5.3

4.5.4

a)

TPE

b)

()

c)

d)

4.6.1

TPE

, ASTM D3851-4(R2011)

1

21(36)

4.6.2 ASTM D 3851

4.6.3

a) TPE , .. .

b) ()

c)

d)

4.7.1 TPE

, ASTM D 3418- 2(R1)

Ł ,

2(36)

4.7.2 ASTM D 3418

(A h (G k,X Ò E ,XE 2 A

aA

11

5111

(511 1 1
)

4"5

¢6408.982 -2697 -0.25
E 0ú ÜTd (íB5)45Õ ê,XA© P4

1.8) 1 ,

(),

54k2 1AWG TW THW-2 THHW THW

THWN-2 THWN THHN TBS

4

1kAWG TW THW-2 THHW THW

THWN-2 THWN THHN TBS

18k U 42k_x

121k 1k (24_x .8 1.8) 1

(),

7

56k1 14~4k , 1in

25mm , ,

T₁ D₁, kkk1in kkk1mm,

85 3gf k84 kkk2N 3k 1k.ozf .

, k25k kkk1in 6.4 k2mm.

, 1.5in 38mm .

T₁.

1.1in 1.1mm .

$$T_1 = \frac{D_1 - d}{2}$$

562 252-211cmil . ,

8in 21mm , 1in

16 25mm 14mm , 443 .

, 1.6in 1.52mm

561

T₁, 1.1in 1.1mm ,

563

T₁, 561 .

1in 25mm , .

564 561 . , 3

1.75 1.1in 1. 1.2mm 25kg

3.4in 1 mm 1.375 1.1in .5 1.2mm

, ,

(25kg 2.45N)

56k.1

()

56k.5 3 2-1.4in 57mm() ,

(8-1.2in 2-3.4in

1.4in 216mm 7kmm 6mm).

, (

,).

,

3.4in 1 mm ,

(2-3.4in 7kmm)

3 (1.4in 6mm).

,

, ().

(3.8in .5mm).

56k.6 () ,

(

) , 36 TPE

, 15k 1k (3k 1.8) 3k PE , 1k
 1k (212.k 1.8) THHN , 136.k 1k (276.8 1.8)
) , 121.k 1k (24 .8 1.8).

6k .6k ,

, ,

. 6k ,

, , .

56k7 6k , , ((T₂, kkin

k1mm. T₁ ,

, T₂ , T₁ d,

,

15 ,

, .

$$(\) = \frac{1k (T_1 - T_2)}{T_1}$$

56k8 ,

3 (56k). 6k ,

3 , .

,3 .

56k ,

，

.

，

.

， 561.8 3 ()
3

7

581.1

.

4 ，

6 ().

3 (18 3 6)，

，

，

31.

()

7

583.1 4 ---25.1 2.1 (---13.1 3.6) ，

583.2~583.15

583.2 3in 76mm ,

(583.3) (583.12). , (

583.3), ,

583.3 , 2mil(2in) 1mil,

5mm 1mm,

,583.4~583. ,

583.4 , ,

.583.5 583.6 ,

1mil 1mm.

583.5 5in 12.7mm .

78in 1.8mm, 375in .52mm

1 2gf 1 2N .

583.6 5in 12.7mm

583.7 583.8 ,

1mil

1mm

583.8

583.

2k

4

6

24k.5

(

)

24k.6

(

)

2k. mil

5mm

583.1k

583.3~5. 3.

---25.k

2.k (---13.k 3.6)

583.11

4

583.12

(583.3) 18k.

583.15

583.13

583.14

583.15

583.15

SE

1.6in 1.5mm

()

5.3.1

8in 213mm 2 4

5.3.2

3 lb 1.36 kg 1in

25mm

5.3.3

11 5in

131mm

543.4

41.1 1.2 (41.1 3.6)

4

24.1 8.1

(75.2 14.4)

53.5

4

5.3.6

15

()

(

)

5.3.5

36in 15mm.

36iN 15mm

24.1 8.1 (75.2 14.4)

24

()

5.3.7

5.3.6

1k

1k

2

14k

2k6

5.5. 11N 254mm 14AWG ,
 1 , 1
 1in 254mm, 5in
 127mm.

, 5 5in min 1 1mm min
 2in 5mm. 3.4in 1 mm.
 , 25.

5. (77. k)

5.2 ,

5.3 ,

5 5in min 1 1mm min

1 225lbf 11N
 12kgf,

1

6k1.1

1k5in min 1k 1mm min 2in 5kmm
23.1k 5.1k (73.4 k)

6k1.2

1k1in 2.55m

1k

in 23kmm

in 23kmm

6k1.3

()

6k1.4

1k5k 1k5in min 1k 1mm min

6k1.5

1k

1k

X

X

X

62k1

14~2AWG

1k

2in 51mm . ,
 1.51 1.15in min 11 1mm min .
 2in 51mm , .
 . , . 24.1 8.1 (75.2
 14.4) ,
 (

71 X X X
 71.1 14AWG 6 15in 381mm ,
 2in 4in 51mm 111mm
 () ,

45 ,
 71.2 1 lb 1.454kgf , 3.4in 21mm,
 ,
 ,
 18in 461mm 13.16in 22mm
 ,
 ,

71.1()
 71.3 24.1 8.1 (75.2 14.4)

18in 46mm 5

7k4 24k 8k (75.2 14.4)

(,). 48~62Hz

82k1

7k5

6k 1k , 1k 1k

(5kV.s).

6

7k6 6 15in 38mm , 7k4 7k5

6

72k XHHW-2.XHHW XHH

72k1 72k1

24k 8k (75.2 14.4)

14AWG XHHW-2.XHHW XHH

6 15in 38mm . ,

72k1 k V

72k2 72k2 ,

(72k1).

72k1 ()

72k3 , ,

14k k1 of 3.8

k3N 3.7 3gf, (),

28 , ,

7 /

78k1

15in

38kMM

k

2in

5kMM

U

5IN

25MM

78k2

76k2

76k3

6k

8k1

8k11

，

， 1 ，

，

() ，

8k2

，

，

8k3

82k1

82k4

7 /

82k1

， (

， --- ，

).

48~62Hz ,
rms ,

5kV.s. ()

5~1k ,
()

1 , 5 .

,

82k2 ,
6in 15mm

,

6 ,

82k3 ,

82k4 ,

6k 1k , 1k 1k

(5kV.s).

rms ,

6k .

6k ,

82k5

, 2k

“

7

83k1

83k2

83k3

83k2

1 ,

83k3

48~62Hz

()

5~1k5 .

()

5kV.s

1

5

83k4

(

)

24

- //

k1

k2~k17

()

k2

k3

k4

U V

(1-1.2in 4mm)

k5

15k 2k6

kl1

kl6

kl7

kl8

kl1

| a | | a | | | | | |
|------|-----|-----|----|-----|----|-----|----|
| | | | | | | | |
| in | mm | in | mm | in | mm | in | mm |
| 3 16 | 5.1 | 1 2 | 13 | 1 2 | 13 | 3 8 | 1 |
| 3 32 | 2.5 | | | | | | |
| a | | | | | | | |

kl

kl1kl

a) 2left 6m

b)

c)

kl11

18 (

).

=5_κ () ()

=5_κ () ()

， 11_κ2

11_κ12

，

， ()

()

，

11_κAWG (

),

11_κ13

，

L 11_κ2

| Hz | (L) | (L) |
|-------------------|----------|--------------------------------------|
| 51 _κ | 27.8Lin | 11 _κ 333Lmm |
| 61 _κ | 33.3 Lin | 11 _κ 411 _κ Lmm |
| 111 _κ | 55.6 Lin | 11 _κ 667 Lmm |
| 411 _κ | 222 Lin | 2.67 Lmm |
| 1111 _κ | 556 Lin | 6.67 Lmm |
| 3111 _κ | 1667 Lin | 211 _κ Lmm |
| 4111 _κ | 2222 Lin | 26.7 Lmm |

kl14

kl13

kl15

kl16

kl17

kl15

a) 1~125kHz

b)

c)

kl16

1.2in 13mm.

5k

(5k).

(

)

kl17

a) 1~3kHz

b)

c)

d)

1k

1k1

1k2~ 1k15

()

1k2

a)

b)

5mA,

1 ,

5

2ft

61mm

1k3

1k4

1k5

U V

(1-1.2in 4mm)

1k6

1k1

1k1

| a | | a | | | | | |
|-------|-----|-----|----|-----|----|-----|----|
| | | | | | | | |
| in | mm | in | mm | in | mm | in | mm |
| 3 16 | 5.1 | 1 2 | 13 | 1 2 | 13 | 3 8 | 1k |
| 3 32 | 2.5 | | | | | | |
| a , . | | | | | | | |

1k7

1k8

1k

1k1k

1k11 ,

1k12 ,

24.1in 611mm ,

=k2

k666

1k13 ,

5.k 1.1in 125 25mm

1k14 ,

18

()

=5 () ()

=5 () ()

, 1.2

1.2
L

| | | |
|----|------|------|
| Hz | (L) | (L) |
|----|------|------|

- /

2k1

1k

1k~5kV

6k

6k

2k2 55ft 22m

5kft 2km 82k2

6

1k~2.4 5k~85.k

1 1.8

14k

167

2k3

5kft 5k1kft 15m 15k1m

2k4

12 25kft 75m 12

4

1k~26.7 5k~8k 1

1.8

2k5

16k 2k6

7 / 7

1121

3

24

7

14

141

.1 1

86.1 1.8

167

.1 1

167.1

1.8

1.4

.1 1

1.4.1

1.8

$$=13.61k \cdot C \cdot \log_{1k} \frac{DIA}{dia}$$

14k .k 1 158.k 1.8 167

.k 1 17.6 1.8

25mm 1mm 1AWG

1k4k.3~1k4k.8 1.kAWG

1k4k.

.k 1 158.k 1.8

.k 1 158.k 1.8

$$= \frac{w_2 - w_3}{s} \quad w_3 \quad w_1$$

$$= \frac{w_2 - w_1}{s} \quad w_3 \quad w_1$$

$$S=2 \quad +2T \quad +$$

1143.1

32ft 1km 5
 32ft 2 16 23 3ft
 7ft 1km 1 3 5
 7 m 2m 5
 1in 1mm 1in
 1mm
 1d
 143.2 24in 6mm
 .1 1 122.1 1.8

143.3 5
 1 D

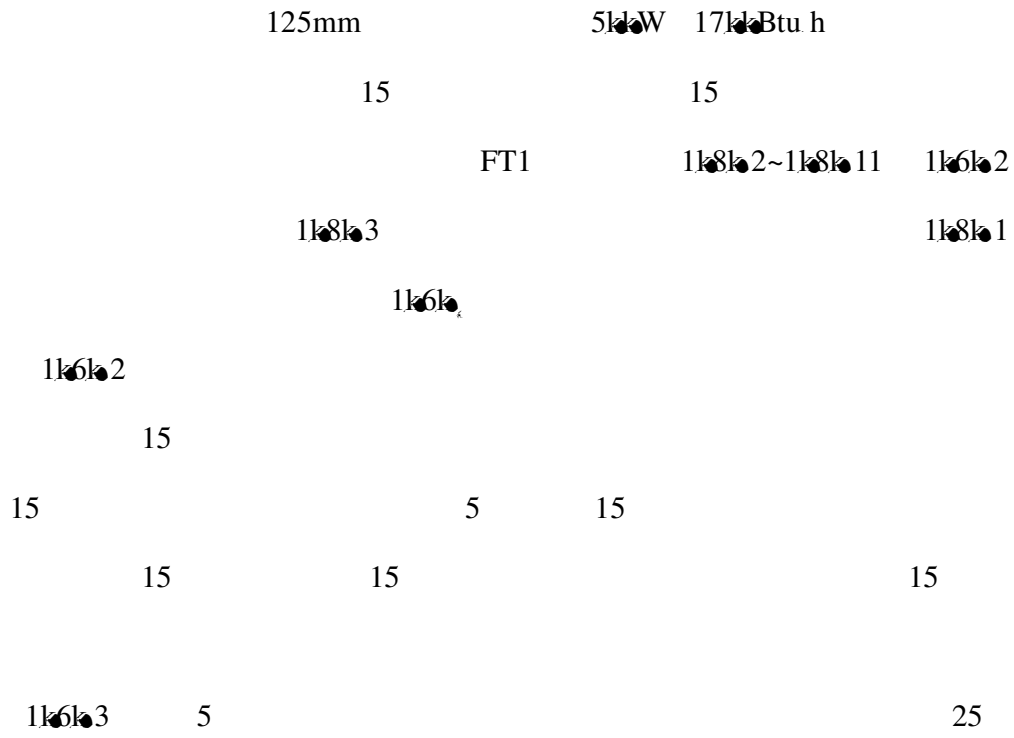
I 2

$I = 1 D - d$

1
 161 5 15

a

b



1k61.1

3

6k

c

d

125mm

51k_W 171k_{Btu h}

3k

3k

1k8k₂~1k8k₁₁

1k61.2

1k8k₃

1k8k₁

1k61.3

1k6k₂

6k

3k

3

3k

3k

3k

3k

1k6k₃

3

25

3

6k

1111111111

168

2k6

1181 5 15

e

f

125mm

5W 17Btu h

15

15

15

1182~11813

11813

ANSI ASTM

D525- 4

a

ANSI ASTM

D527- 1

11814

A ASTM D525-

13-1 27-111

UL

Atlas Electric Devices Company

(ASTM D 525)

4114 North Ravenswood Avenue

1 1 13mm

Chicago IL 60613 USA

1.6 15mm

Humboldt Manufacturing Company

732 West Agatite Avenue

Norridge IL 60656 USA

1182

$$24\text{in} \quad 610\text{mm}$$

$$14\text{ft}^3 \quad 4\text{m}^3$$

$$7\text{ft}^3 \quad 2\text{m}^3$$

$$1181.3 \quad (\quad 8.1 \quad),$$

$$1141\text{Btu}(\quad) \quad 37.3 \text{ MJ} \cdot \text{m}^3 \quad 8. \quad ($$

$$) \quad ,$$

$$1181.4 \quad (\quad 1181.7)$$

$$1181.5 \quad ,$$

$$23.1 \quad 5.1 \quad .1$$

~ -1.2in

23k~24kmm,B 5k~W

1k8k1 VW-1 ()

1k8k7 ,

125 1kmm 4-7.8in, 4k 2mm 1- .16in,

,
()

, ,
, 4k 2mm 1- .16in,
1k~2k lbf in² 6 ~138 Kpa

6 k~138k mbar 7k~14k gf cm²

,
1k8k8 (1k8k2)

2k ().

, 1.4in 6mm.

A () B (

) 1-16in 4mm B

1k8k (1k8k2)

(

)

1k8k2

1k8k1k 6Ib 4g m², 1.2in 1kmm,

5mil 1mm,

B

1kin 25mm,B

3.4in ho 2kmm, 1k8k8 (1k8k1).

B 2-3in 5k-75mm.

1k8k11 1k8k,

,
 1181.12 ,
 15 , 15
 (, 1181.13).
 , 5 15 , 15
 (, 1181.13).
 15 , 15

1181.13 15 ,

1181.14 5 25
 (),
 (6k ,

77
 1181.1 1 3k 225W(77k Btu h)
 5mm

a)

b)

11.8.2~11.8.5 11.8.2~11.8.6 (),
11.8.3 ANSI ASTM D 525-

a ANSI ASTM D 527- 8 ,

125mm 5mm

c) 125mm 5mm , 5mm ,

25mm 1in

d) 44 1mL min, 45 5mm

e) 5 4mm 2in,

16.5 1.5mm 11.16in

f) 1 2s.

11.8.7

a ASTM D 525- 4 , 11.8.1 a

11.8.2 11.8.2

, () . (

) () 4ft

12mm .

24in 61mm ,

22in56mm 3

3 , 3.4in 2mm.3

2in 51mm 7in 178mm 13in 316mm ,

() .

1.4in 6mm,

24in(610mm) 12in(305mm) ,

$\sim -1.2in$

23k~24kmm(1k 1).

1k 13

5k 1kmm 2in, 17 1mm 11.16in,

() .

17 1mm 11.16in,

1k~2k lbf in² 6_k ~13_k Kpa 6_k ~138kmmbar

7k~14kkgf cm²

1k 14

(

). 1.4in 6mm

2in 51mm

A

16.5 1.5mm 11.16in ,A 2in
 51mm .A

1k k5 1k k4

1k k1 ()

1k k6 1k k5 , (

,)

2in 51mm (A), 3k

, ,

7in 178mm

, 7in 178mm 13in 33kmm

, 7in 178mm 13in 33kmm

1k k7 1k k6 7in 178mm

12in 33kmm 1in mm min,

(

),

1k 1~1k ,

11

.()

111k3

,

3k ,

,

111k4

11kmm 3-15 16in,

111~115

116k UL

UL1685

1161-1163

1164 FT4 IEEE12k2

UL1685

1165~11

12kk

12kk1, 5.

12kk2 12kk3~12kk6

12kk7~12kk1k,

12kk11~12kk15.

,

,

1.kk 1.k1r. min.

12kk3

ASTMG155-kk

ASTMG151-kk

774kPyrex

1.35W.m², (

34kkA 34kMM).,

ASTMG155-kk 1.

12kk4

,
 . ,ASTM 414
 , 2111
 .
 1214.5 2 18 ,
 , 2 1214.6 112
 18 (,PH 6.1~8.1 16.1 5.1
 3.1

6.k~8.k

16.k 5.k

3.k

15~17A

, 3

17 . 2k

6 , 1k2

18 .

181 2k6

，
，
16，6，

12k11 --- 5 5
(
)，

12k12 5 5
，

，

12k13 5 5
(
)，
，

12k14，5
PVC

k13in 3.3mm，
，PVC，

12k15 ----- 5 5

, 2in min .

5 , 5

,

3k1 ,

k85, 72k ,

k8k

85 , UL854

(1k3k 5k) 65

15 5 , UL854

7

125k1 SA

, 4in 1m

, 1.8in 3mm .

,

125k2 5g 11k 5

2k

$$7k \cdot X = \frac{1k}{\quad}$$

X

1.1

—

1321.2

, .

. 1141.

, , 12in 3148mm

11ft 3148mm .

1321.3

, .

,

UA

.

, .

1.5kV 13mm ,

, 5kV 1kM , 3 ,

5kV 1kM ,

1411 3921 3.84099 KS™1

5.1

18

216

5.1

1. 1

216

8.1

1582.1 6 15ft 5m , 8.k

| AWG | | | | () | | | |
|-----|-----|------|-----|-----|------|----|----|
| | kgf | N | lbf | mm | In | 2 | 3 |
| | | | | | | A | A |
| 18 | 1 | 7 | 2.2 | 8 | 3.15 | 11 | 7 |
| 17 | 1 | 7 | 2.2 | 8 | 3.15 | 12 | - |
| 16 | 1.5 | 14.7 | 3.3 | 12 | 4.72 | 13 | 11 |
| 15 | 1.5 | 14.7 | 3.3 | 12 | 4.72 | - | - |
| 14 | 1.5 | 14.7 | 3.3 | 12 | 4.72 | 18 | 15 |
| 12 | 1.5 | 14.7 | 3.3 | 12 | 4.72 | 25 | 21 |
| 11 | 1.5 | 14.7 | 3.3 | 12 | 4.72 | 31 | 25 |
| 8 | 1.5 | 14.7 | 3.3 | 12 | 4.72 | 41 | 35 |
| 6 | 1.5 | 14.7 | 3.3 | 12 | 4.72 | 55 | 45 |

| | | | | | | | |
|---|-----|------|-----|----|------|---|---|
| 4 | 1.5 | 14.7 | 3.3 | 12 | 4.72 | 7 | 6 |
| 2 | 1.5 | 14.7 | 3.3 | 12 | 4.72 | 5 | 8 |

1582.3 ,

, 33m s 12 ,

1m 3.4in, 15

1582.4 6 15

,

/

15 14 12 1AWG THWN-2 THWN THHN

, 4 , 6

A , 2X238 13 11.5 153 11.5 7 8 k Ö ü 15.1222M d (,)T

1_x mm

6in

15k_{mm}

24.k_{8.k}

k_{1.5}in min

1k_{1mm} min

6k₆

k_{1.5}in min

1k_{1mm} min

16k₄

2

3

3

3

2k_{1bf}

8_x k_N

1, 5

2k₆

1KGF

1611.5 --- 4-3 4in 212mm

3in 76mm 5in 127mm

4-3 4in 3in 212mm 76mm

1611.6 3 lb 1.36kgf ,

1-1 4in 31.8mm, () 1 16in 1.5mm

1611.7

,

,

1611.8 , 24.1 8.1

48~62Hz

16k11

16k7

A×8V † ĨJø,X !5B S k J β><.9990 Td (è !58 -25 h ϕE- p12.0Gž /R553 11.5997 Tf 2.88090747Td (è !

4

21.1 1.1

~1.4in 3~6mm,

2~2-1.2in 5~6mm , 2AWG

161.2 F 4.5 6 1.1 ,

161.1

| | in | mm |
|-------|-------|----|
| 14AWG | 1.313 | 8 |
| 13 | 1.351 | |
| 12 | 1.375 | |
| 11 | 1.415 | 11 |
| 11 | 1.563 | 14 |
| | 1.585 | 15 |
| 8 | 1.688 | 17 |
| 7 | 1.741 | 1 |
| 6 | 1.251 | 32 |
| 5 | 1.315 | 33 |
| 4 | 1.375 | 35 |
| 3 | 1.458 | 37 |

| | | |
|--------------|--------|-----|
| 2 | 1.563 | 41 |
| 1 | 2.688 | 68 |
| 1 1/2 | 2.875 | 73 |
| 1 1/2 | 3.125 | 76 |
| 3 1/2 | 3.251 | 83 |
| 4 1/2 | 3.512 | 87 |
| 25 1/2 kemil | 5.188 | 132 |
| 3 1/2 | 5.512 | 141 |
| 35 1/2 | 5.875 | 147 |
| 4 1/2 | 6.251 | 157 |
| 45 1/2 | 6.625 | 168 |
| 5 1/2 | 6.751 | 171 |
| 55 1/2 | 11.512 | 267 |
| 66 1/2 | 11.125 | 277 |
| 65 1/2 | 11.251 | 286 |
| 7 1/2 | 11.512 | 292 |
| 75 1/2 | 12.125 | 315 |
| 8 1/2 | 12.251 | 311 |
| 1 1/2 | 12.875 | 327 |
| 11 1/2 | 13.512 | 343 |
| 11 1/2 | 17.125 | 432 |
| 12 1/2 | 17.251 | 438 |
| 125 1/2 | 17.512 | 445 |
| 13 1/2 | 17.751 | 451 |
| 14 1/2 | 18.125 | 461 |
| 15 1/2 | 18.512 | 471 |
| 16 1/2 | 18.875 | 477 |
| 17 1/2 | 19.375 | 492 |
| 175 1/2 | 19.751 | 512 |
| 18 1/2 | 19.875 | 515 |
| 1 1/2 | 21.125 | 511 |
| 2 1/2 | 21.512 | 521 |

161 1/2

F

| | | |
|----|----|---|
| in | mm | F |
|----|----|---|

1 1/2 2 1/2

| | | |
|-------------|------------|-----|
| 1.51~1.75 | 12.71~1.16 | 4.5 |
| 1.751~1.125 | 1.16~28.58 | 6 |
| 1.126~1.51 | 28.5~38.1 | ε |
| 1.51 | 38.1 | 1k |

1614

21.1 1.1

7

167k1 HPN

4 in 1kmmR

12kV

48-62Hz

15A

167k2

3.8in .5mm

4IN 1kMM

1-1.2IN 38MM 816C 15kF ---

1.2IN 13MM 12k

7

168k1 4kN 1M

2k1 2k6

24IN 61kMM

168k2 24IN 61kMM

24V 48-62Hz

2k4MA 8-1.2IN 215MM

168k1

168k1

| AWG | lbf | N | Gf |
|-----|-----|------|------|
| 18 | 2 | 8.8 | 17 |
| 17 | 2.5 | 11.1 | 1134 |
| 16 | 3 | 13.3 | 1361 |
| 14 | 4 | 17.8 | 1814 |
| 12 | 5 | 22.2 | 2268 |

168k3

12

1k 18k

2k2 2k6

16814

213

216

168k7 168k1 ,

12k 2V 48~62Hz

12kV
(
) (,
).

168k1 ()

168k8 168k3

168k3

| AWG | A |
|-----|-----------|
| 18 | 11k 1k5 |
| 16 | 15.1k 1k5 |
| 14 | 21k 1k5 |
| 12 | 31k 1k5 |

168k₅ , 7-3.4in 1₅ 7mm (

168k1 G)

,

3~4 2k

,

168k1k (),

2k

168k11

2k4 2k6

2k ,

7 /

16 k1

3kmm

12in

16 k2

42k8~42k

(

1k~2k

)

,

6k

23.k 5.k

5.k

2k5

2k6

~1k

,

,

,

-----the end-----