The Electrician's Handbook

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INTRODUCTION

The material presented in this handbook has been extracted from the Canadian Electrical Code, Part 1, CSA Standard C22.1 – 1998, and other sources.

For authoritative reference or ruling please see the Canadian Electrical Code or consult your local inspection authority or Canadian Standards Association at (416) 747-4000.

CAUTION

In case of fire, well-maintained early-warning smoke detectors will give an alarm long before non-metallic coverings become combustible. However, the Electrical and Electronic Manufacturers Association of Canada has suggested that all purchasers of PVC insulated/jacketed products be advised of the following:

- Non-metallic coverings of electrical cables can burn and may transmit fire when ignited.
- Burning non-metallic coverings may emit acid gases which are toxic and may generate dense smoke.
- Emission of acid gases may corrode metal in the vicinity; e.g., sensitive instruments and reinforcing rods in cement.

TABLE OF CONTENTS

TABLE 1

(See Rules 4-004, 8-104, 12-2212, 26-000, 26-744, 42-008, 42-016, and Tables 5A, 5B, 19 and D3)

ALLOWABLE AMPACITIES FOR SINGLE COPPER CONDUCTORS IN FREE AIR

*Based on Ambient Temperature of 30°C

	Allowable Ampacity†					
	60°C‡	*75°C‡*	*85–90°C‡*	*110°C‡*	*125°C‡*	*200°C‡*
Size AWG kcmil	*Type TW*	*Types RW75, TW75*	*Types R90, RW90, T90 Nylon* / *Single-Conductor Mineral-Insulated Cable§*	*See Note (3)*	*See Note (3)*	*Bare Wire*
Col. 1	*Col. 2*	*Col. 3*	*Col. 4*	*Col. 5*	*Col. 6*	*Col. 7*
14	20	20	20	40	40	45
12	25	25	25	50	50	55
10	40	40	40	65	70	75
8	55	65	70	85	90	100
6	80	95	100	120	125	135
4	105	125	135	160	170	180
3	120	145	155	180	195	210
2	140	170	180	210	225	240
1	165	195	210	245	265	280
0	195	230	245	285	305	325
00	225	265	285	330	355	370
000	260	310	330	385	410	430
0000	300	360	385	445	475	510

TABLE 1 *(continued)*

250	340	405	425	495	530	—
300	375	445	480	555	590	—
350	420	505	530	610	655	—
400	455	545	575	665	710	—
500	515	620	660	765	815	—
600	575	690	740	855	910	—
700	630	755	815	940	1,005	—
750	655	785	845	980	1,045	—
800	680	815	880	1,020	1,085	—
900	730	870	940	—	—	—
1,000	780	935	1,000	1,165	1,240	—
1,250	890	1,065	1,130	—	—	—
1,500	980	1,175	1,260	1,450	—	—
1,750	1,070	1,280	1,370	—	—	—
2,000	1,155	1,385	1,470	1,715	—	—
Col. 1	*Col. 2*	*Col. 3*	*Col. 4*	*Col. 5*	*Col. 6*	*Col. 7*

* See Table 5A for the correction factors to be applied to the values in columns 2 to 7 for ambient temperatures over 30°C.

† The ampacity of single conductor aluminum-sheathed cable is based on the type of insulation used on the copper conductor.

‡ These are maximum allowable conductor temperatures for single conductors run in free air and may be used in determining the ampacity of other conductor types in Table 19, which are so run as follows: From Table 19 determine the maximum allowable conductor temperature for that particular type, then from the above Table determine the ampacity under the column of corresponding temperature rating.

§ These ratings are based on the use of 90°C insulation on the emerging conductors and for sealing. Where a deviation has been allowed in accordance with Rule 2-030, mineral-insulated cable may be used at higher temperatures without decrease in allowable ampacity, provided that insulation and sealing material approved for such higher temperature is used.

Notes:

1. The ratings of Table 1 may be applied to a conductor mounted on a plane surface of masonry, plaster, wood, or any material having a conductivity not less than 0.4W/(m°C).
2. For correction factors where from 2 to 4 conductors are present and in contact, see Table 58.
3. These ampacities are only applicable under special circumstances where the use of insulated conductors having this temperature rating are acceptable to the inspection department.
4. Type R90 silicone wire may be used in ambient temperatures up to 65°C without applying the correction factors for ambient temperatures above 30°C provided the temperature of the conductor at the terminations does not exceed 90°C.

TABLE 2

(See Rules 4-004. 8-104, 12-012, 12-2212, 26-000; 26-744, 42-008, 42-016, and Tables 5A, 5C, 19 and D3)

ALLOWABLE AMPACITIES FOR NOT MORE THAN 3 COPPER CONDUCTORS IN RACEWAY OR CABLE

*Based on Ambient Temperatures of 30°C

	Allowable Ampacity†					
	60°C‡	*75°C‡*	*85–90°C‡*	*110°C‡*	*125°C‡*	*200°C‡*
Size AWG kcmil	*Type TW*	*Types RW75, TW75*	*Types R90, RW90, T90 Nylon* / *Paper* / *Mineral-Insulated Cable***	*See Note (1)*	*See Note (1)*	*See Note (1)*
Col. 1	*Col. 2*	*Col. 3*	*Col. 4*	*Col. 5*	*Col. 6*	*Col. 7*
14	15	15	15	30	30	30
12	20	20	20	35	40	40
10	30	30	30	45	50	55
8	40	45	45	60	65	70
6	55††	65	65	80	85	95
4	70	85	85	105	115	120
3	80	100	105	120	130	145
2	100	115	120	135	145	165
1	110	130	140	160	170	190
0	125	150	155	190	200	225
00	145	175	185††	215	230	250
000	165	200	210	245	265	285
0000	195	230	235	275	310	340

TABLE 2 *(continued)*

250	215	255	265	315	335	—
300	240	285	295	345	380	—
350	260	310	325	390	420	—
400	280	335	345	420	450	—
500	320	380	395	470	500	—
600	355	420	455	525	545	—
700	385	460	490	560	600	—
750	400	475	500	580	620	—
800	410	490	515	600	640	—
900	435	520	555	—	—	—
1,000	455	545	585	680	730	—
1,250	495	590	645	—	—	—
1,500	520	625	700	785	—	—
1,750	545	650	735	—	—	—
2,000	560	665	775	840	—	—
Col. 1	*Col. 2*	*Col. 3*	*Col. 4*	*Col. 5*	*Col. 6*	*Col. 7*

* See Table 5A for the correction factors to be applied to the values in columns 2 to 7 for ambient temperatures over 30°C.

† The ampacfty of aluminum-sheathed cable is based on the type of insulation used on the copper conductors.

‡ These are maximum allowable conductor temperatures for 1, 2, or 3 conductors run in a raceway or 2 or 3 conductors, run in a cable and may be used in determining the ampacity of other conductor types in Table 19, which are so run as follows: From Table 19 determine the maximum allowable conductor temperature for that particular type; then from the above Table determine the ampacity under the column of corresponding temperature rating.

** These ratings are based on the use of 90°C insulation on the emerging conductors and for sealing. By special permission, mineral-insulated cable may be used at higher temperatures without decrease in allowable ampacity, provided that insulation and sealing material approved for such higher temperature is used.

†† For 3-wire 120/240 and 120/208 V residential services or subservices, the allowable ampacity for sizes No. 6 and No. 2/0 AWG shall be 60 A and 200 A respectively. In this case, the 5% adjustment of Rule 8-106(1) cannot be applied.

‡‡ See Table 5C for the correction factors to be applied to the values in Columns 2 to 7 where there are more than 3 conductors in a run of raceway or cable.

Notes:

1. These ampacities are only applicable under special circumstances where the use of insulated conductors having this temperature rating are acceptable to the inspection department
2. Type R90 silicone wire may be used in ambient temperatures up to 65°C without applying the correction factors for ambient temperatures above 30°C provided the temperature of the conductor at the terminations does not exceed 90°C.

TABLE 3

(See Rules 4-004, 8-104, 12-2212, 26-000, 26-744, 42-008 and 42-016 and Tables 5A, 5B, 19 and D3)

ALLOWABLE AMPACITIES FOR SINGLE ALUMINUM CONDUCTORS IN FREE AIR

*Based on Ambient Temperature of 30°C

	Allowable Ampacity†					
	60°C‡	*75°C‡*	*85–90°C‡*	*110°C‡*	*125°C‡*	*200°C‡*
Size AWG kcmil	*Type TW*	*Types RW75, TW75*	*Types R90, RW90, T90 Nylon*	*See Note (3)*	*See Note (3)*	*Bare Wire*
Col. 1	*Col. 2*	*Col. 3*	*Col. 4*	*Col. 5*	*Col. 6*	*Col. 7*
12	20	20	20	40	40	45
10	30	30	30	50	55	60
8	45	45	45	65	70	80
6	60	75	80	95	100	105
4	80	100	105	125	135	140
3	95	115	120	140	150	165
2	110	135	140	165	175	185
1	130	155	165	190	205	220
0	150	180	190	220	240	255
00	175	210	220	255	275	290
000	200	240	255	300	320	335
0000	230	280	300	345	370	400

TABLE 3 *(continued)*

250	265	315	330	385	415	—
300	290	350	375	435	460	—
350	330	395	415	475	510	—
400	355	425	450	520	555	—
500	405	485	515	595	635	—
600	455	545	585	675	720	—
700	500	595	645	745	795	—
750	515	620	670	775	825	—
800	535	645	695	805	855	—
900	580	700	750	—	—	—
1,000	625	750	800	930	990	—
1,250	710	855	905	—	—	—
1,500	795	950	1,020	1,175	—	—
1,750	875	1,050	1,125	—	—	—
2,000	960	1,150	1,220	1,425	—	—
Col. 1	*Col. 2*	*Col. 3*	*Col. 4*	*Col. 5*	*Col. 6*	*Col. 7*

* See Table 5A for the correction factors to be applied to the values in columns 2 to 7 for ambient temperatures over 30°C.
† The ampacity of single conductor aluminum-sheathed cable is based on the type of insulation used on the aluminum conductor.
‡ These are the maximum allowable conductor temperatures for single conductors run in free air and may be used in determining the ampacity of other conductor types in Table 19, which are so run, as follows: From Table 19 determine the maximum allowable conductor temperature for that particular type; then from the above Table determine the ampacity under the column of corresponding temperature rating.

Notes:
1. The ratings of Table 3 may be applied to a conductor mounted on a plane surface of masonry, plaster, wood or any material having a conductivity not less than 0.4 W/(m°C).
2. For correction factors where from 2 to 4 conductors are present and in contact, see Table 5B.
3. These ampacities are only applicable under special circumstances where the use of insulated conductors having this temperature rating are acceptable.

TABLE 4

(See Rules 4-004, 8-104, 12-2212, 26-000, 26-744, 42-008, 42-016 and Tables 5A, 5C, 19 and D3)

ALLOWABLE AMPACITIES FOR NOT MORE THAN 3 ALUMINUM CONDUCTORS IN RACEWAY OR CABLE

*Based on Ambient Temperature of 30°C

	Allowable Ampacity†§					
	60°C‡	*75°C‡*	*85–90°C‡*	*110°C‡*	*125°C‡*	*200°C‡*
Size AWG kcmil	*Type TW*	*Types RW75, TW75*	*Types R90, RW90, T90 Nylon* / *Paper*	*See Note*	*See Note*	*See Note*
Col. 1	*Col. 2*	*Col. 3*	*Col. 4*	*Col. 5*	*Col. 6*	*Col. 7*
12	15	15	15	25	30	30
10	25	25	25	35	40	45
8	30	30	30	45	50	55
6	40	50	55**	60	65	75
4	55	65	65	80	90	95
3	65	75	75	95	100	115
2	75	90	95**	105	115	130
1	85	100	105	125	135	150
0	100	120	120	150	160	180
00	115	135	145	170	180	200
000	130	155	165	195	210	225
0000	155	180	185**	215	245	270

TABLE 4 *(continued)*

250	170	205	215	250	270	—
300	190	230	240	275	305	—
350	210	250	260	310	335	—
400	225	270	290	335	360	—
500	260	310	330	380	405	—
600	285	340	370	425	440	—
700	310	375	395	455	485	—
750	320	385	405	470	500	—
800	330	395	415	485	520	—
900	355	425	455	—	—	—
1,000	375	445	480	560	600	—
1,250	405	485	530	—	—	—
1,500	435	520	580	650	—	—
1,750	455	545	615	—	—	—
2,000	470	560	650	705	—	—
Col. 1	*Col. 2*	*Col. 3*	*Col. 4*	*Col. 5*	*Col. 6*	*Col. 7*

* See Table 5A for the correction factors to be applied to the values in columns 2 to 7 for ambient temperatures over 30°C.

† The ampacity of aluminum-sheathed cable is based on the type of insulation used on the copper conductors.

‡ These are maximum allowable conductor temperatures for 1, 2, or 3 conductors run in a raceway or 2 or 3 conductors, run in a cable and may be used in determining the ampacity of other conductor types in Table 19, which are so run as follows: From Table 19 determine the maximum allowable conductor temperature for that particular type; then from the above Table determine the ampacity under the column of corresponding temperature rating.

§ SeeTable 5C for the correction factors to be applied to the values in Columns 2 to 7 where there are more than 3 conductors in a run of raceway or cable.

** For 3-wire 120/240 and 120/208 V residential services or subservices, the allowable ampacity for sizes No. 6, No. 2 and No. 4/0 AWG shall be 60 A, 100 A, and 200 A respectively. In this case, the 5% adjustment of Rule 8-106(1) cannot be applied.

Note.
These ampacities are only applicable under special circumstances where the use of insulated conductors having this temperature rating are acceptable.

TABLE 5A

(See Rules 4-004(8), 12-2212 and Tables 1, 2, 3, 4, 57, 58 and D3)

CORRECTION FACTORS APPLYING TO TABLES 1, 2, 3 AND 4

AMPACITY CORRECTION FACTORS FOR AMBIENT TEMPERATURES ABOVE 30°C

(These correction factors apply, column for column, to Tables 1, 2, 3, and 4. The correction factors in column 2 also apply to Table 57)

	Correction Factor					
	60°C	*75°C*	*85–90°C*	*110°C*	*125°C*	*200°C*
Ambient Temperature °C	*Type TW*	*Types RW75, TW75*	*Types R90, RW90, T90 Nylon*	*See Note (2)*	*See Note (2)*	*See Note (2)*
Col. 1	*Col. 2*	*Col. 3*	*Col. 4*	*Col. 5*	*Col. 6*	*Col. 7*
40	0.82	0.88	0.90	0.94	0.95	1.00
45	0.71	0.82	0.85	0.90	0.92	1.00
50	0.58	0.75	0.80	0.87	0.89	1.00
55	0.41	0.65	0.74	0.83	0.86	1.00
60	—	0.58	0.67	0.79	0.83	0.91
70	—	0.35	0.52	0.71	0.76	0.87
75	—	—	0.43	0.66	0.72	0.86
80	—	—	0.30	0.61	0.69	0.84
90	—	—	—	0.50	0.61	0.80
100	—	—	—	—	0.51	0.77
120	—	—	—	—	—	0.69
140	—	—	—	—	—	0.59

Notes:

1. The ampacity of a given conductor type at these higher ambient temperatures is obtained by multiplying the appropriate value from Table 1, 2, 3, or 4 by the correction factor for that higher temperature.
2. These ampacities are only applicable under special circumstances where the use of insulated conductors having this temperature rating are acceptable.

TABLE 5B

(See Rules 4-004(9) and Tables 1, 3 and D3)

CORRECTION FACTORS FOR TABLES 1 AND 3
WHERE FROM 2 TO 4 SINGLE CONDUCTORS ARE PRESENT AND IN CONTACT

Number of Conductors	*Correction Factors*
2	0.90
3	0.85
4	0.80

Notes: 1. Where four conductors form a three-phase-with-neutral system, the values for three conductors may be used, Where three conductors form a single-phase, three-wire system, the values for two conductors may be used.
2. Where more than four conductors are in contact, the ratings for conductors in raceways shall be used.

TABLE 5C

(See Rules 4-004 and 12-2212 and Tables 2 and 4)

AMPACITY CORRECTION FACTORS FOR TABLES 2 AND 4

Number of Conductors	*Ampacity Correction Factor*
1 – 3	1.00
4 – 6	0.80
7 – 24	0.70
25 – 42	0.60
43 and up	0.50

TABLE 5D

(See Rule 12-2212)

CURRENT RATING CORRECTION FACTORS WHERE SPACINGS ARE MAINTAINED
(VENTILATED AND LADDER TYPE CABLE TRAYS)

Number of Conductors or Cables Horizontally	*1*	*2*	*3*	*4*	*5*	*6*
Vertically						
1	1.00	0.93	0.87	0.84	0.83	0.82
2	0.89	0.83	0.79	0.76	0.75	0.74

TABLE 8

(See Rule 12-1014)

MAXIMUM ALLOWABLE PER CENT CONDUIT AND TUBING FILL

	Maximum Conduit and Tubing Fill, Per Cent				
	Number of Conductors or Multi-conductor Cables				
	1	*2*	*3*	*4*	*Over 4*
Conductors or multi-conductor cables (not lead-sheathed)	53	31	40	40	40
Lead-sheathed conductor or multi-conductor cables	55	30	40	38	35

TABLE 6

(See Rule 12-1014)

MAXIMUM NUMBER OF CONDUCTORS OF ONE SIZE IN TRADE SIZES OF CONDUIT OR TUBING

(NOTE: For ampacity derating factors for more than three conductors in raceways, see Rule 4-004)

Size of Conduit or Tubing (inches)		*½*	*¾*	*1*	*1¼*	*1½*	*2*	*2½*	*3*	*3½*	*4*	*4½*	*5*	*6*
Conductor Type	*Conductor Size AWG kcmil*													
	14	3	6	10	18	25	41	58	90	121	155	195	200	200
RW9OEP	12	3	5	9	15	21	35	49	77	103	132	166	200	200
RW75EP	10	2	4	7	13	17	29	41	64	86	110	138	174	200
	8	1	2	4	8	10	17	25	39	52	67	84	105	152
	6	1	1	2	5	6	11	15	24	32	41	51	64	93
	4	0	1	1	3	5	8	12	18	24	31	39	50	72
RW75	3	0	1	1	3	4	7	10	16	21	28	35	44	63
	2	0	1	1	3	4	6	9	14	19	24	31	38	56
R90	1	0	1	1	1	3	5	7	11	14	18	23	29	42
RW75	0	0	0	1	1	2	4	6	9	12	16	20	25	37
(XLPE)**	00	0	0	1	1	1	3	5	8	11	14	18	22	32
	000	0	0	1	1	1	3	4	7	9	12	15	19	28
RW90 (XLPE)**	0000	0	0	0	1	1	2	4	6	8	10	13	16	24

TABLE 6 *(continued)*

Size of Conduit or Tubing (inches)		*½*	*¾*	*1*	*1¼*	*1½*	*2*	*2½*	*3*	*3½*	*4*	*4½*	*5*	*6*
Conductor Type	*Conductor Size AWG kcmil*													
	250	0	0	0	1	1	1	3	5	6	8	10	13	19
	300	0	0	0	1	1	1	3	4	5	7	9	11	17
	350	0	0	0	1	1	1	1	3	5	6	8	10	15
	400	0	0	0	0	1	1	1	3	4	6	7	9	14
RW75	500	0	0	0	0	1	1	1	3	4	5	6	8	11
R90	600	0	0	0	0	0	1	1	2	3	4	5	6	9
	700	0	0	0	0	0	1	1	1	3	4	4	6	8
	750	0	0	0	0	0	1	1	1	3	3	4	5	8
RW75	800	0	0	0	0	0	1	1	1	2	3	4	5	8
(XLPE)**	900	0	0	0	0	0	1	1	1	2	3	4	5	7
RW90	1000	0	0	0	0	0	1	1	1	1	2	3	4	6
(XLPE)**	1250	0	0	0	0	0	0	1	1	1	1	3	3	5
	1500	0	0	0	0	0	0	0	1	1	1	2	3	4
RW75EP	1750	0	0	0	0	0	0	0	1	1	1	1	2	4
RW90EP	2000	0	0	0	0	0	0	0	1	1	1	1	2	3
	14	4	7	11	20	28	46	65	100	135	173	200	200	200
TWU	12	3	6	10	17	23	39	55	85	114	147	184	200	200
RWU75(XLPE)	10	3	5	8	14	19	32	45	70	94	121	152	190	200
RWU90(XLPE)	8	1	2	4	7	10	16	23	36	48	61	77	97	140
	6	1	1	3	5	8	13	18	28	38	49	61	77	111

TABLE 6 *(continued)*

	4	1	1	2	4	6	10	14	22	29	38	48	60	86
	3	1	1	1	4	5	9	12	19	26	33	42	52	76
	2	0	1	1	3	4	7	11	17	22	29	36	45	65
	1	0	1	1	2	3	5	8	12	17	22	27	34	49
	0	0	1	1	1	3	5	7	11	14	19	23	29	43
	00	0	0	1	1	2	4	6	9	12	16	20	25	37
TWU	000	0	0	1	1	1	3	5	8	10	14	17	21	31
	0000	0	0	1	1	1	3	4	6	9	11	14	18	26
RWU75	250	0	0	0	1	1	2	3	5	7	9	12	15	21
(XLPE)	300	0	0	0	1	1	1	3	5	6	8	10	13	19
	350	0	0	0	1	1	1	3	4	6	7	9	11	17
	400	0	0	0	1	1	1	2	4	5	6	8	10	15
	500	0	0	0	0	1	1	1	3	4	5	7	9	13
RWU90	600	0	0	0	0	1	1	1	2	3	4	6	7	10
(XLPE)	700	0	0	0	0	0	1	1	2	3	4	5	6	9
	750	0	0	0	0	0	1	1	1	3	4	5	6	9
	800	0	0	0	0	0	1	1	1	3	3	4	6	8
	900	0	0	0	0	0	1	1	1	2	3	4	5	7
	1000	0	0	0	0	0	1	1	1	2	3	4	5	7
	1250	0	0	0	0	0	0	1	1	1	2	3	4	5
	1500	0	0	0	0	0	0	1	1	1	1	2	3	5
	1750	0	0	0	0	0	0	1	1	1	1	2	3	4
	2000	0	0	0	0	0	0	1	1	1	1	1	2	4

(continued)

TABLE 6 *(continued)*

Size of Conduit or Tubing (inches)		*½*	*¾*	*1*	*1¼*	*1½*	*2*	*2½*	*3*	*3½*	*4*	*4½*	*5*	*6*
Conductor Type	*Conductor Size AWG kcmil*													
	14	3	5	8	14	20	32	46	71	96	123	155	194	200
	12	2	4	7	12	17	28	40	62	83	107	134	168	200
	10	1	3	6	10	14	24	34	52	70	91	114	143	200
	8	1	1	3	6	8	14	20	31	42	54	68	85	123
RWU75 (EP)	6	1	1	1	3	5	8	11	18	24	31	39	49	70
	4	0	1	1	3	4	6	9	14	19	25	32	40	57
	3	0	1	1	2	3	6	8	13	17	23	28	35	51
	2	0	1	1	2	3	5	7	11	15	20	25	31	46
	1	0	1	1	1	2	4	5	9	12	15	19	24	35
	0	0	0	1	1	1	3	5	8	10	13	17	21	31
	00	0	0	1	1	1	3	4	7	9	12	15	18	27
	000	0	0	1	1	1	2	4	6	8	10	13	16	23
	0000	0	0	0	1	1	2	2	5	7	9	11	14	20
RWU90 (EP)	250	0	0	0	1	1	1	2	4	5	6	8	10	15
	300	0	0	0	1	1	1	1	3	4	6	7	9	13
	350	0	0	0	0	1	1	1	3	4	5	7	8	12
	400	0	0	0	0	1	1	1	3	4	5	6	8	11
	500	0	0	0	0	0	1	1	2	3	4	5	7	10

TABLE 6 *(continued)*

RWU75	600	0	0	0	0	0	1	1	1	3	4	4	6	8
(EP)	700	0	0	0	0	0	1	1	1	2	3	4	5	8
	750	0	0	0	0	0	1	1	1	2	3	4	5	7
	800	0	0	0	0	0	1	1	1	2	3	4	5	7
RWU90	900	0	0	0	0	0	1	1	1	1	3	3	4	6
(EP)	1000	0	0	0	0	0	0	1	1	1	2	3	4	6
	1250	0	0	0	0	0	0	0	1	1	1	2	3	4
	1500	0	0	0	0	0	0	0	1	1	1	1	2	4
	1750	0	0	0	0	0	0	0	1	1	1	1	2	3
	2000	0	0	0	0	0	0	0	1	1	1	1	1	3
	14	9	15	25	44	60	99	142	200	200	200	200	200	200
TW	12	7	12	20	35	47	78	111	171	200	200	200	200	200
TW75	10	5	9	15	26	36	60	85	131	176	200	200	200	200
R90	8	2	4	7	12	17	28	40	62	83	107	134	168	200
Silicone	6	1	1	4	7	10	16	23	36	48	62	78	97	141
(Sizes No. 8	4	1	1	3	5	7	12	17	27	36	47	58	73	106
and larger)	3	1	1	2	4	6	10	15	23	31	40	50	63	91
RW75	2	1	1	2	4	5	9	13	20	27	34	43	54	78
(XLPE)§	1	0	1	1	3	4	6	9	14	19	25	31	39	57
R90	0	0	1	1	2	3	5	8	12	16	21	27	33	49
(XLPE)	00	0	1	1	1	3	5	7	10	14	18	23	28	41
RW90	000	0	0	1	1	2	4	6	9	12	15	19	24	35
(XLPE)§	0000	0	0	1	1	1	3	5	7	10	13	16	20	29

(continued)

TABLE 6 *(continued)*

Size of Conduit or Tubing (inches)		*½*	*¾*	*1*	*1¼*	*1½*	*2*	*2½*	*3*	*3½*	*4*	*4½*	*5*	*6*
Conductor Type	*Conductor Size AWG kcmil*													
	250	0	0	0	1	1	2	4	6	8	10	13	16	23
	300	0	0	0	1	1	2	3	5	7	9	11	14	20
TW	350	0	0	0	1	1	1	3	4	6	8	10	12	18
TW75	400	0	0	0	1	1	1	2	4	5	7	9	11	16
R90	500	0	0	0	0	1	1	1	3	4	6	7	9	14
Silicone														
(Sizes No. 8	600	0	0	0	0	1	1	1	3	4	5	6	7	11
and larger)	700	0	0	0	0	0	1	1	2	3	4	5	7	10
RW75	750	0	0	0	0	0	1	1	2	3	4	5	6	9
(XLPE)§	800	0	0	0	0	0	1	1	1	3	4	5	6	9
R90	900	0	0	0	0	0	1	1	1	2	3	4	5	8
(XLPE)														
RW90	1000	0	0	0	0	0	1	1	1	2	3	4	5	7
(XLPE)§	1250	0	0	0	0	0	0	1	1	1	2	3	4	6
	1500	0	0	0	0	0	0	1	1	1	1	3	3	5
	1750	0	0	0	0	0	0	0	1	1	1	2	3	4
	2000	0	0	0	0	0	0	0	1	1	1	1	2	4
R90	14	5	10	16	27	37	62	88	136	183	200	200	200	200
Silicone	12	4	8	13	23	31	51	73	112	150	193	200	200	200
	10	3	6	10	18	25	41	58	90	121	155	195	200	200

TABLE 6 *(continued)*

	14	13	24	39	69	93	154	200	200	200	200	200	200	200
T90	12	10	18	29	51	69	115	163	200	200	200	200	200	200
NYLON	10	6	11	18	32	44	73	104	160	200	200	200	200	200
	8	3	5	9	15	21	35	50	78	105	135	169	200	200
	6	2	4	6	11	15	25	36	56	76	98	122	154	200
	4	1	2	4	7	9	15	22	34	46	60	75	94	136
	3	1	2	3	6	8	13	19	29	39	51	64	80	116
	2	1	1	2	5	6	11	16	24	33	43	53	67	97
	1	0	1	2	3	5	8	12	19	26	33	42	52	76
	1/0	0	1	1	3	4	7	10	15	20	26	33	42	61
	2/0	0	0	1	2	3	5	8	13	17	22	28	35	51
	3/0	0	0	1	2	3	4	7	10	14	18	23	29	42
	4/0	0	0	1	1	2	4	5	9	12	15	19	24	35
	250	0	0	0	1	2	3	4	7	9	12	15	19	28
	300	0	0	0	1	1	2	4	6	8	10	13	17	24
	350	0	0	0	1	1	2	3	5	7	9	12	15	21
	400	0	0	0	1	1	2	3	4	6	8	10	13	19
	500	0	0	0	0	1	1	2	4	5	7	8	11	16

§ These are the values for RW75XLPE and RW90XLPE without a jacket.
** These are the values for Types RW75XLPE and RW90XLPE with a jacket.

TABLE 9

(See Rule 12-1014)

CROSS-SECTIONAL AREAS OF CONDUIT AND TUBING

Trade Size Inches	*Internal Diameter Inches*	*Per Cent Cross-Sectional Area of Conduit – Square Inches*							
		100%	*55%*	*53%*	*40%*	*38%*	*35%*	*31%*	*30%*
½	0.622	0.30	0.165	0.159	0.120	0.114	0.105	0.09	0.090
¾	0.824	0.53	0.292	0.281	0.212	0.202	0.185	0.16	0.159
1	1.049	0.86	0.473	0.456	0.344	0.327	0.301	0.27	0.258
1¼	1.380	1.50	0.825	0.795	0.600	0.570	0.525	0.47	0.450
1½	1.610	2.04	1.122	1.081	0.816	0.776	0.714	0.63	0.612
2	2.067	3.36	1.848	1.780	1.344	1.277	1.176	1.04	1.008
2½	2.469	4.79	2.635	2.540	1.916	1.820	1.677	1.48	1.437
3	3.068	7.38	4.060	3.910	2.952	2.805	2.585	2.29	2.214
3½	3.548	9.90	5.450	5.250	3.960	3.765	3.465	3.07	2.970
4	4.026	12.72	7.000	6.745	5.088	4.840	4.450	3.94	3.820
4½	4.506	15.94	8.771	8.452	6.378	6.060	5.581	4.94	4.784
5	5.047	20.00	11.000	10.600	8.000	7.600	7.000	6.20	6.000
6	6.065	28.89	15.900	15.320	11.556	10.980	10.120	8.96	8.670

Note:
The dimensions represent average conditions only and variations will be found in dimensions of conduit and tubing of different manufacture.

TABLE D5
STRANDINGS FOR BUILDING WIRE AND CABLE

Nominal		*Standard*			*Flexible*			*Extra Flexible*		
AWG	*CM Area*	*No. of Wires*	*Diam. of Each Wire (inches)*	*Diam. of Stranded Conductor (inches)*	*No. of Wires*	*Diam. of Each Wire (inches)*	*Diam. of Stranded Conductor (inches)*	*No. of Wires*	*Diam. of Each Wire (inches)*	*Diam. of Stranded Conductor (inches)*
14*	4 110	7	0.0242	0.0726	19	0.0147	0.0735	37	0.0105	0.0735
12*	6 530	7	0.0305	0.0915	19	0.0185	0.0925	37	0.0133	0.0931
10*	10 380	7	0.0385	0.116	19	0.0234	0.117	37	0.0167	0.117
8	16 510	7	0.0486	0.146	19	0.0295	0.148	37	0.0211	0.148
6	26 240	7	0.0612	0.184	19	0.0372	0.186	37	0.0266	0.186
4	41 740	7	0.0772	0.232	19	0.0469	0.235	37	0.0336	0.236
3	52 630	7	0.0867	0.260	19	0.0526	0.263	37	0.0377	0.264
2	66 360	7	0.0974	0.292	19	0.0591	0.296	37	0.0424	0.297
1	83 690	19	0.0664	0.332	37	0.0476	0.333	61	0.0370	0.333
0	105 600	19	0.0745	0.373	37	0.0534	0.374	61	0.0416	0.375
00	133 100	19	0.0837	0.419	37	0.0600	0.420	61	0.0467	0.421
000	167 800	19	0.0940	0.470	37	0.0673	0.471	61	0.0524	0.472
0000	211 600	19	0.1055	0.528	37	0.0756	0.529	61	0.0589	0.530
	250 000	37	0.0822	0.575	61	0.0640	0.576	91	0.0524	0.577
	300 000	37	0.0900	0.630	61	0.0701	0.631	91	0.0574	0.632

*These sizes are customarily supplied with solid conductors.

(continued)

TABLE D5 *(continued)*

Nominal		*Standard*			*Flexible*			*Extra Flexible*		
AWG	*CM Area*	*No. of Wires*	*Diam. of Each Wire (inches)*	*Diam. of Stranded Conductor (inches)*	*No. of Wires*	*Diam. of Each Wire (inches)*	*Diam. of Stranded Conductor (inches)*	*No. of Wires*	*Diam. of Each Wire (inches)*	*Diam. of Stranded Conductor (inches)*
	350 000	37	0.0973	0.681	61	0.0757	0.682	91	0.0620	0.682
	400 000	37	0.1040	0.728	61	0.0810	0.729	91	0.0663	0.730
	450 000	37	0.1103	0.772	61	0.0859	0.774	91	0.0703	0.774
	500 000	37	0.1162	0.813	61	0.0905	0.815	91	0.0741	0.815
	550 000	61	0.0950	0.855	91	0.0777	0.855	127	0.0658	0.856
	600 000	61	0.0992	0.893	91	0.0812	0.894	127	0.0687	0.894
	650 000	61	0.1032	0.929	91	0.0845	0.930	127	0.0715	0.930
	700 000	61	0.1071	0.964	91	0.0877	0.965	127	0.0742	0.966
	750 000	61	0.1109	0.998	91	0.0908	0.999	127	0.0768	0.999
	800 000	61	0.1145	1.031	91	0.0938	1.032	127	0.0794	1.033
	900 000	61	0.1215	1.094	91	0.0994	1.094	127	0.0842	1.095
	1 000 000	61	0.1280	1.152	91	0.1048	1.153	127	0.0887	1.154
	1 250 000	91	0.1172	1.289	127	0.0992	1.290	169	0.0860	1.290
	1 500 000	91	0.1284	1.412	127	0.1087	1.413	169	0.0942	1.414
	1 750 000	127	0.1174	1.526	169	0.1018	1.527	217	0.0898	1.527
	2 000 000	127	0.1255	1.632	169	0.1088	1.632	217	0.0960	1.632

TABLE 10

(See Rule 12-1014)

DIMENSIONS OF INSULATED CONDUCTORS FOR CALCULATING CONDUIT AND TUBING FILL

Note 1. Subject to the range of conductors and types of wires for which aluminum conductors are approved.

Note 2. The dimensions represent average conditions only and variations will be found in dimensions of conductors of different manufacture.

Size AWG kcmil	*Rubber- (Thermoset) and Thermoplastic-insulated Conductors (0–600 V)*									
	*Types RW75, RW75 EP, RW90 EP, RW75 (XLPE)**, RW90(XLPE)***		*Types TW, TW75, RW75 (XLPE)§, RW90 (XLPE)§, R90 Silicone, R90 (XLPE)§*		*Types TW U, RWU75 (XLPE)§, RWU90 (XLPE)§*		*Types RWU75 EP RWU90 EP*		*Type T90 Nylon*	
	Diameter Inches	*Area Square Inches*	*Diameter Inches*	*Area Square Inches*	*Diameter Inches*	*Area Square Inches*	*Diameter Inches*	*Area Square Inches*	*Diameter Inches*	*Area Square Inches*
14	(2/64) 0.171	0.0230	0.131	0.0135	—	—	—	—		
14	(3/64) 0.204*	0.0327*	0.166†	0.0216†	—	—	—	—		
14	—	—	—	—	0.193	0.0293	0.231	0.0419	0.105	0.0087
12	(2/64) 0.188	0.0278	0.148	0.0172	—	—	—	—		
12	(3/64) 0.221*	0.0384*	0.183†	0.0263†	—	—	—	—		
12	—	—	—	—	0.209	0.0343	0.247	0.0479	0.122	0.0117
10	0.242	0.0460	0.168	0.0224	—	—	—	—		
10	—	—	0.204†	0.0327†	—	—	—	—		
10	—	—	—	—	0.230	0.0415	0.268	0.0564	0.153	0.0184

(continued)

TABLE 10 *(continued)*

Size AWG kcmil	*Rubber (Thermoset) and Thermoplastic-insulated Conductors (0–600 V)*									
	*Types RW75, RW75 EP, RW90 EP, RW75 (XLPE)**, RW90(XLPE)***		*Types TW, TW75, RW75 (XLPE)§, RW90 (XLPE)§, R90 Silicone, R90 (XLPE)§*		*Types TW U, RWU75 (XLPE)§, RWU90 (XLPE)§*		*Types RWU75 EP RWU90 EP*		*Type T90 Nylon*	
	Diameter Inches	*Area Square Inches*	*Diameter Inches*	*Area Square Inches*	*Diameter Inches*	*Area Square Inches*	*Diameter Inches*	*Area Square Inches*	*Diameter Inches*	*Area Square Inches*
8	0.311	0.0760	0.248	0.0475	0.324	0.0824	0.345	0.0935	0.219	0.0377
6	0.397	0.1238	0.323	0.0819	0.363	0.1035	0.456	0.1633	0.257	0.0519
4	0.452	0.1605	0.372	0.1087	0.412	0.1333	0.505	0.2003	0.328	0.0845
3	0.481	0.1817	0.401	0.1263	0.440	0.1521	0.533	0.2231	0.356	0.0995
2	0.513	0.2067	0.433	0.1473	0.473	0.1757	0.566	0.2516	0.388	0.1182
1	0.588	0.2715	0.508	0.2027	0.544	0.2324	0.649	0.3308	0.450	0.1590
0	0.629	0.3107	0.549	0.2367	0.585	0.2688	0.690	0.3739	0.491	0.1893
00	0.675	0.3578	0.595	0.2781	0.632	0.3137	0.737	0.4266	0.537	0.2265
000	0.727	0.4151	0.647	0.3288	0.684	0.3675	0.789	0.4889	0.588	0.2715
0000	0.785	0.4840	0.705	0.3904	0.744	0.4347	0.849	0.5661	0.646	0.3278
250	0.868	0.5917	0.788	0.4877	0.822	0.5307	0.977	0.7497	0.716	0.4026
300	0.933	0.6837	0.843	0.5581	0.878	0.6055	1.033	0.8381	0.771	0.4669
350	0.985	0.7620	0.895	0.6291	0.930	0.6793	1.085	0.9246	0.822	0.5307

TABLE 10 *(continued)*

Size AWG kcmil	Rubber (Thermoset) and Thermoplastic-insulated Conductors (0–600 V)									
	Types RW75, RW75 EP, RW90 EP, RW75 (XLPE)**, RW90(XLPE)**		Types TW, TW75, RW75 (XLPE)§, RW90 (XLPE)§, R90 Silicone, R90 (XLPE)§		Types TW U, RWU75 (XLPE)§, RWU90 (XLPE)§		Types RWU75 EP RWU90 EP		Type T90 Nylon	
	Diameter Inches	Area Square Inches	Diameter Inches	Area Square Inches	Diameter Inches	Area Square Inches	Diameter Inches	Area Square Inches	Diameter Inches	Area Square Inches
400	1.032	0.8365	0.942	0.6969	0.978	0.7512	1.133	1.0082	0.869	0.5931
500	1.119	0.9834	1.029	0.8316	1.064	0.8891	1.219	1.1671	0.955	0.7163
600	1.233	1.1940	1.143	1.0261	1.180	1.0936	1.301	1.3294		
700	1.304	1.3355	1.214	1.1575	1.252	1.2311	1.373	1.4806		
750	1.339	1.4082	1.249	1.2252	1.287	1.3009	1.408	1.5570		
800	1.372	1.4784	1.282	1.2908	1.321	1.3706	1.442	1.6331		
900	1.435	1.6173	1.345	1.4208	1.385	1.5066	1.506	1.7813		
1000	1.494	1.7531	1.404	1.5482	1.444	1.6377	1.565	1.9236		
1250	1.676	2.2062	1.577	1.9532	1.616	2.0510	1.809	2.5702		
1500	1.801	2.5475	1.702	2.2748	1.741	2.3806	1.934	2.9377		
1750	1.916	2.8895	1.817	2.5930	1.858	2.7113	2.051	3.3039		
2000	2.021	3.2079	1.922	2.9013	1.966	3.0357	2.159	3.6610		

* These are the dimensions for Types RW75 and R90.

† Dimensions of R90 silicone in sizes No. 14 to 10 AWG. Dimensions of R90 silicone in sizes No. 8 AWG and larger are the same as Type TW.

§ Dimensions for Types RW75 XLPE, R90 XLPE, RW90 XLPE, RWU75 XLPE, and RWU90 XLPE conductors without a jacket.

** Dimensions for Types RW75 XLPE and RW90 XLPE conductors with a jacket.

TABLE 19

(See Rules 4-006, 6-300, 12-100, 12-302, 12-602, 12-606, 12-902, 12-904, 12-1606, 12-2104, 12-2204, 16-112, 16-210, 22-200, 22-202, 22-204, 22-206, 26-642, 30-312, 30-1004, 30-1102, 32-100, 32-202, 34-216, 38-006, 54-100, 56-104, 60-304, 74-004, 78-104, and 80-004, 82-018, and Tables 1, 2, 3, 4, and D1)

CONDITIONS OF USE AND MAXIMUM ALLOWABLE CONDUCTOR TEMPERATURE OF WIRES AND CABLES OTHER THAN FLEXIBLE CORDS, PORTABLE POWER CABLES, AND EQUIPMENT WIRES.

Conditions of Use	*Trade Designation*	*CSA Type Designation*	*Maximum Allowable Conductor Temperature °C*	*Reference Notes*
For exposed wiring in dry locations only	Armoured Cable	TECK90 AC90	90 90	4, 10, 12 4, 10, 12
For exposed wiring in dry locations where exposed to corrosive action, if suitable for corrosive conditions encountered	Armoured Cable	TECK90	90	2, 4, 10, 12
For exposed wiring in dry locations where not exposed to mechanical injury	Nonmetallic Sheathed Cable	NMD90	90	23
For exposed wiring in dry locations and in Category 1 and 2 locations, where not exposed to mechanical injury	Nonmetallic Sheathed Cable	NMW, NMWU	60	23

TABLE 19 *(continued)*

Conditions of Use	*Trade Designation*	*CSA Type Designation*	*Maximum Allowable Conductor Temperature °C*	*Reference Notes*
For exposed wiring in dry or damp locations	Rubber (Thermoset-) Insulated Cable	R90	90	4, 9, 10, 11, 12
	Thermoplastic-Insulated Cable	TW	60	4
	Nylon Jacketed Thermoplastic-Insulated Cable	T90 NYLON*	90	14
	Nonmetallic Sheathed Cable	NMD90	90	18, 23
For exposed wiring in wet locations	Armoured Cable	TECK90 ACWU90	90 90	4, 7, 10, 12 4, 7, 10, 12
	Rubber (Thermoset-) Insulated Cable	RW75 RL90, RW90	75 90	4, 7, 10, 12 4, 7, 10, 12
	Aluminum-Sheathed Cable	RA75 RA90	75 90	7 4, 7, 10, 12
	Mineral-Insulated Cable	MI, LWMI	90	1, 7, 21
	Thermoplastic-Insulated Cable	TW TW 75*	60 75	4, 7 4, 7
	Nonmetallic Sheathed Cable	NMWU	60	7, 8, 23

(continued)

TABLE 19 *(continued)*

Conditions of Use	*Trade Designation*	*CSA Type Designation*	*Maximum Allowable Conductor Temperature °C*	*Reference Notes*
For exposed wiring where exposed to the weather	Armoured Cable	TECK90	90	4, 10, 12
	Rubber (Thermoset-) Insulated Cable	RW75 R90, RW90	75 90	4, 10, 12 4, 10, 12
	Thermoplastic-Insulated Cable	TW, TWU TWU75	60 75	4 4
	Neutral-Supported Cable	NS-1, NSF-2	75	—
	Nonmetallic Sheathed Cable	NMWU	60	8, 23
For concealed wiring dry locations only	Armoured Cable	TECK90 AC90	90 90	4, 10, 12 4, 10, 12
For concealed wiring dry and damp locations	Nonmetallic Sheathed Cable	NMD90	90	18, 23
For concealed wiring in dry locations and in Category I and 2 locations where not exposed to mechanical injury	Nonmetallic Sheathed Cable	NMW, NMWU	60	23

TABLE 19 *(continued)*

Conditions of Use	*Trade Designation*	*CSA Type Designation*	*Maximum Allowable Conductor Temperature °C*	*Reference Notes*
For concealed wiring in wet locations	Armoured Cable	TECK90 ACWU90	90 90	4, 7, 10, 12 4, 7, 10, 12
	Nonmetallic Sheathed Cable	NMWU	60	7, 8, 23
	Aluminum-Sheathed Cable	RA75 RA90	75 90	7 4, 7, 10, 12
	Mineral-Insulated Cable	MI, LWMI	90	1, 7, 21
For use in raceways, except cable trays, in dry or damp locations	Rubber (Thermoset-) Insulated Cable	R90	90	4, 9, 10, 11, 12
	Thermoplastic-Insulated Cable	TW	60	4
	Nylon Jacketed Thermoplastic-Insulated Cable	T90 NYLON*	90	14
For use in raceways, except cable trays, in wet locations	Rubber (Thermoset-) Insulated Cable	RW75, RWU75 RW90, RWU90	75 90	4, 7, 10, 12 4, 7, 10, 12
	Thermoplastic-insulated Cable	TW, TWU TW75,* TWU75	60 75	4, 6, 7 4, 7

(continued)

TABLE 19 *(continued)*

Conditions of Use	*Trade Designation*	*CSA Type Designation*	*Maximum Allowable Conductor Temperature °C*	*Reference Notes*
For use in ventilated, non-ventilated and ladder type cable trays in dry locations only	Armoured Cable	AC90 TECK90	90 90	4, 10, 12 4, 10, 12
For use in ventilated, non-ventilated and ladder type cable trays in wet locations	Armoured Cable	TECK90 ACWU90	90 90	4, 7, 10, 12 4, 7, 10, 12
	Aluminum-Sheathed Cable	RA75 RA90	75 90	7 4, 7, 10, 12
	Mineral-Insulated Cable	MI, LWMI	90	7
	Rubber (Thermoset-) Insulated Lead-Sheathed Cable	RL90	90	4, 7, 10, 12
For use in ventilated and non-ventilated cable trays in vaults and switch rooms	Rubber (Thermoset-) Insulated Cable	RW75 RW90	75 90	4, 10, 12, 13 4, 10, 12, 13

TABLE 19 *(continued)*

Conditions of Use	*Trade Designation*	*CSA Type Designation*	*Maximum Allowable Conductor Temperature °C*	*Reference Notes*
For direct earth burial (with protection as required by inspection authority)	Armoured Cable	ACWU90 TECK90	90 90	4, 5, 10, 12 4, 5, 10, 12
	Nonmetallic Sheathed Cable	NMWU	60	5, 23
	Rubber (Thermoset-) Insulated Cable	RWU75 RL90, RWU90	75 90	4, 5, 10, 12 4, 5, 10, 12
	Aluminum-Sheathed Cable	RA75 RA90	75 90	5 4, 5, 9, 10
For direct earth burial (with protection as required by inspection authority)	Mineral-Insulated Cable	MI, LWMI	90	1, 5, 21
	Thermoplastic-Insulated Cable	TWU TWU75	60 75	4, 5, 6 4, 5
	Airport series lighting cable	ASLC	90	22
For service entrance above ground	Armoured Cable	AC90 ACWU90 TECK90	90 90 90	19
	Aluminum-Sheathed Cable	RA75 RA90	75 90	—

(continued)

TABLE 19 *(continued)*

Conditions of Use	*Trade Designation*	*CSA Type Designation*	*Maximum Allowable Conductor Temperature °C*	*Reference Notes*
For service entrance above ground	Mineral-Insulated Cable	MI	90	1, 21
	Neutral Supported Cable	NS-1, NSF-2	75	—
For service entrance below ground	Service-Entrance Cable	USEI90 USEB90	90 90	4, 5, 10, 12 4, 5, 10, 12, 15
	Thermoplastic-Insulated Wire	TWU TWU75	60 75	4, 5 4, 5
	Rubber (Thermoset-) Insulated Cable	RWU75 RWU90	75 90	4, 5, 10, 12 4, 5, 10, 12
	Armoured Cable	TECK90 ACWU90	90 90	—
	Aluminum-Sheathed Cable	RA75 RA90	75 90	5 5
For high-voltage wiring in luminous-tube signs	Luminous-Tube Sign Cable	GTO, GTOL	60	—

TABLE 19 *(continued)*

Conditions of Use	*Trade Designation*	*CSA Type Designation*	*Maximum Allowable Conductor Temperature °C*	*Reference Notes*
For use in raceways in hoistways	Hoistway Cable		60	16, 17
For use in Class 2 circuits, in exposed or concealed wiring or use in raceways, in dry or damp locations	Extra-Low-Voltage Control Cable	LVT	60	—
For use in Class 2 circuits in dry locations in concealed wiring or exposed wiring where not subject to mechanical injury	Extra-Low-Voltage Cable	ELC	60	20
For use when concealed indoors under carpet squares, in dry or damp locations	Flat Conductor Cable	FCC	60	—
For use in communication circuits when exposed, concealed or used in raceways indoors in dry or damp locations, or in ceiling air handling plenums	Inside Wiring Cable	IWC	60	25
	Z Station Wire	ZSW	60	25
	Premise Communication Cable	PCC	60	25
	Communication Cable	MPP, CMP, MPR, CMR, MPG, CMG, MP, CM, CMX, CMH	60	25

(continued)

TABLE 19 *(continued)*

Conditions of Use	*Trade Designation*	*CSA Type Designation*	*Maximum Allowable Conductor Temperature °C*	*Reference Notes*
For use in communication and community antenna distribution circuits, when exposed, concealed or used in raceways, indoors in dry or damp locations or in plenums	Coaxial Cable	CXC	60	27
For use in communication circuits, when exposed, concealed, or used in raceways, in dry or damp locations, within and between buildings	Communication Building Cable	CBC	60	—
For use in communication circuits when concealed indoors under-carpet squares, in dry or damp locations	Communication Flat Cable	CFC	60	24
For use in communication circuits when exposed, concealed or used in raceways, indoors in dry or damp locations, or in ceiling air handling plenums	Flame and Smoke Tested Cable	FSTC	60	25

TABLE 19 *(continued)*

Conditions of Use	*Trade Designation*	*CSA Type Designation*	*Maximum Allowable Conductor Temperature °C*	*Reference Notes*
For use in fire alarm, signal and voice communication circuits where exposed, concealed or used in raceways, indoors in dry or damp locations	Fire Alarm and Signal Cable	FAS FAS 90 FAS 105 FAS 200	60 90 105 200	26
For use in raceways, including ventilated, non-ventilated and ladder type cable trays in wet locations and where exposed to weather	Tray Cable	TC	—	28
For use in cable trays in Class I Division 2 and Class II Division 2 hazardous locations	Tray Cable	TC	—	28
For use in buildings in dry or damp locations, where exposed, concealed or used in raceways, or in plenums	Non-conducti ve Optical Fibre Cable	OFNP, OFNR, OFNG, OFN, OFNH	—	9
For use in buildings in dry or damp locations, where exposed, concealed or used in raceways, or in plenums	Conductive Optical Fibre Cable	OFCP, OFCR, OFCG, OFC, OFCH	—	29
For use in buildings in dry or damp locations, where exposed or concealed	Hybrid Conductor Cable	NMDH90	90	30

(continued)

Reference Notes to Table 19

(1) A maximum sheath temperature of 250°C is permissible for mineral-insulated cable, provided the temperature at the terminations does not exceed that specified in Tables 1 and 2. Any protective covering provided shall be suitable for the applicable sheath temperature.

(2) May be used where exposed to heat, grease, or corrosive fumes, if suitable for the corrosive condition.

(3) For bare or tinned copper conductors having individual strands smaller in diameter than 0.015 inch, the maximum allowable conductor temperature is 150°C.

(4) When any of these types have an insulation or covering suitable for installation and use at temperatures down to minus 40°C, they are surface printed with the type designation followed by “MINUS 40°C” or “(–40°C)”.

(5) Conductors or cable assemblies acceptable for direct earth burial may be used for underground services in accordance with Rule 6-300.

(6) Types TW and TWU, when provided with a nylon jacket, are also approved for use where adverse conditions may exist, such as in oil refineries and around gasoline storage or pump areas (eg, where subjected to alkaline conditions in the presence of petroleum solvents).

(7) Types suitable for use in wet locations may also be used in dry or damp locations.

(8) Type NMWU cable is not suitable for use in aerial spans.

(9) Types having silicone rubber insulation are surface marked with the type designationfollowed by “silicone”, eg, R90 (silicone).

(10) Types having cross-linked polyethlene insulation are surface marked with the type designation followed by “X-Link” or “XLPE”, eg, R90 (X-Link) or R90 XLPE.

(11) Type R90 silicone may be used to connect equipment which is marked as requiring supply conductors having insulation suitable for a temperature up to 125°C.

(12) Types having ethylene-propylene insulation are surface marked with the type designation followed by “EP”, eg, R90 (EP).

(13) Types RW75 and RW90, when used under Rule 12-2204, are required to be flame tested.

(14) When exposed to oil, Type T90 NYLON is limited to 60°C.

(15) Type USEB90 shall have a nonmetallic jacket over concentric neutral conductor.

(16) Hoistway cables may also be provided with 90°C insulation.

(17) Except for short runs not exceeding 1.5 m in length, the parallel construction is intended for use in raceways in which the cables are laid in.

(18) With thermoplastic jacket in damp locations.

(19) For dry locations only.

Reference Notes to Table 19 *(continued)*

(20) Type ELC cable is limited to Class 2 circuit application as per Rule 16-210.

(21) Mineral-insulated cable having a stainless steel sheath requires a separate grounding conductor. (See Rule 10-804(e)).

(22) Type ASLC is for use only in accordance with Section 74.

(23) NMD90, NMW, and NMWU were previously marked NMD-7, NMW-9. and NMW-10 respectively.

(24) CFC conductors that are used to electrically connect communications equipment to a telecommunications network shall not be smaller than No. 26 AWG copper. Conductors of No. 28 and No. 30 AWG copper shall be permitted for other types of communications applications.

(25) FSTC, IWC, ZSW, and PCC that meet with the flame spread requirements of Rule 2-128 for plenum spaces shall also be permitted for communication circuits when exposed in ceiling air handling plenums.

(26) Types FAS, FAS 90, FAS 105, and FAS 200 may be provided with mechanical protection such as interlock armour or an aluminum sheath, with or without overall thermoplastic covering. A thermoplastic covering shall be provided over the interlock armoured cable when installed in a damp location.

(27) CXC that meets the flame spread requirements of Rule 2-128 for plenum spaces shall also be permitted for communication and community antenna distribution circuits when exposed in ceiling air handling plenums.

(28) The maximum allowable conductor temperature for Type TC cables is dependent on the temperature rating of the cable so marked.

(29) OFNP, OFNR, OFNG, OFN, OFNH, OFCP, OFCR, OFCG, OFC, and OFCH shall have a minimum cable temperature rating of 60°C. Cables having a temperature rating greater than 60°C shall be permitted provided that the temperature rating is surface marked on the cable.

(30) The signalling conductors of a hybrid conductor cable shall not be smaller than No. 24 AWG.

*Although not in the 1994 CEC, CSA now recognizes a T90/TWN75 construction. This wire is suitable for operation at 90°C dry, 75°C wet and 60°C where exposed to oil. Nexans Canada Inc. has CSA approval for T90/TWN75. T90/TWN75 is not sunlight resistant.

TABLE 20

(See Rules 12-204 and 12-214)

SPACINGS FOR CONDUCTORS

Voltage of Circuit Volts	*Minimum Distance–Millimetres*	
	Between Conductors	*From Adjacent Surfaces*
0 to 300	65	13
301 to 750	100	25

TABLE 21

(See Rule 12-120)

SUPPORTING OF CONDUCTORS IN VERTICAL RUNS OF RACEWAYS

Conductor Size AWG and kcmil	*Maximum Distance–Metres*	
	Copper	*Aluminum*
14 to 8	30	30
6 to 0	30	60
00 to 0000	24	55
250 to 350	18	40
Over 350 to 500	15	35
Over 500 to 750	12	30
Over 750	10	25

TABLE 22

(See Rule 12-3038)

SPACE FOR CONDUCTORS IN BOXES

Size of Conductor	*Usable Space Required for Each Insulated Conductor*
AWG	*Cubic Inches*
14	1.5
12	1.75
10	2.25
8	2.75
6	4.5

CORFLEX* II ALUMINUM SHEATHED CABLES
600 VOLTS 90°C

CORFLEX* II RA90
XLPE
MINUS 40°C

Description: Single or multi copper or ACM aluminum conductors in sizes 14 AWG to 2000 MCM with Exelene* Insulation (RW90 XLPE) enclosed in a liquid- and vapour-tight solid corrugated aluminum sheath.

Low temperature flame retardant low gas emission/low flame spread PVC jacket. Rated FT4 and AG 14.

CSA Spec C22.2 No. 123-96.

Application: For exposed and concealed wiring in dry or wet locations and where exposed to the weather.

For use in ventilated, non-ventilated, and ladder type cabletrays and ventilated flexible cableways in dry or wet locations.

For direct earth burial (with protection as required by Inspection Authority).

For direct embedding in concrete, masonry or plaster (with permission as required by local Inspection Authority).

For hazardous locations: Class I, Groups A, B, C, and D. Class II: Groups E, F, and G; Class III: Connectors used must also be approved for the particular Class and Groups required for the location.

Our Corflex* II Cables and connectors are rated for hazardous locations and bear the mark HL.

Cables are also rated and marked FT4 – for more details see page 96.

*Registered Trademark of Nexans Canada Inc.

CORFLEX* II RA90 (XLPE) MINUS 40°C – 600 VOLTS

COPPER CONDUCTORS *Canada Patent No. 1, 120, 113 Other sizes available upon request

Size AWG or MCM	Approximate Diameter Over Sheath mm	Over Sheath in.	Over PVC Jacket mm	Over PVC Jacket in.	Approximate Net Cable Weight Without Jacket kg/km	Without Jacket lbs/kft	With PVC Jacket kg/km	With PVC Jacket lbs/kft	Connectors (Nexans Cataloque No.) Dry Location Type D	Wet or Hazardous Location Type W	Minimum# Bending Radius mm	Minimum# Bending Radius in.	Ampacity 30°C Ambient (amps)
SINGLE COPPER CONDUCTOR													(CE Code Table 1)
1	16.0	.63	18.5	.73	536	360	640	430	16D2	16W2	178	7	210
1/0	19.1	.75	21.8	.86	674	453	796	535	20D3	20W3	203	8	245
2/0	19.6	.77	22.4	.88	804	540	930	625	20D3	20W3	203	8	285
3/0	20.3	.80	23.1	.91	970	652	1101	740	20D3	20W3	229	9	330
4/0	23.1	.91	25.9	1.02	1213	815	1362	915	25D3	25W3	254	10	385
250	24.1	.95	26.9	1.06	1400	941	1555	1045	25D3	25W3	254	10	425
300	25.1	.99	27.7	1.09	1640	1102	1801	1210	25D3	25W3	254	10	480
350	28.7	1.13	31.5	1.24	1968	1322	2150	1445	30D4	30W4	305	12	530
400	29.7	1.17	32,3	1.27	2208	1484	2396	1610	30D4	30W4	305	12	575
500	33.0	1.30	36.1	1.42	2752	1849	2961	1990	35D5	35W5	330	13	660
600	35.1	1.38	37.6	1.48	3246	2181	3467	2330	35D5	35W5	356	14	740
750	38.9	1.53	41.7	1.64	4044	2717	4293	2885	40D5	40W5	381	15	845
1000	42.4	1.67	45.2	1.78	5273	3543	5543	3725	45D6	45W6	432	17	1000

#CE Code Rule 12-712(3)

*Registered Trademark of Nexans Canada Inc.

CORFLEX* II RA90 (XLPE) MINUS 40°C – 600 VOLTS *(continued)*

COPPER CONDUCTORS *Canada Patent No. 1, 120, 113 Other sizes available upon request

Size AWG or MCM	Approximate Diameter Over Sheath mm	Over Sheath in.	Over PVC Jacket mm	Over PVC Jacket in.	Approximate Net Cable Weight Without Jacket kg/km	Without Jacket lbs/kft	With PVC Jacket kg/km	With PVC Jacket lbs/kft	Connectors (Nexans Cataloque No.) Dry Location Type D	Wet or Hazardous Location Type W	Minimum# Bending Radius mm	Minimum# Bending Radius in.	Ampacity 30°C Ambient (amps)
TWO COPPER CONDUCTORS													(CE Code Table 2)
14	11.9	.47	14.7	.58	126	85	134	90	13D2	13W2	152	6	15
12	13.0	.51	15.7	.62	164	110	238	160	13D2	13W2	152	6	20
10	14.0	.55	17.0	.67	201	135	283	190	13D2	13W2	178	7	30
8	19.2	.76	21.8	.86	324	218	446	300	20D3	20W3	203	8	45
6	20.1	.79	22.6	.89	422	283	551	370	20D3	20W3	229	9	65
4	23.4	.92	26.2	1.03	609	409	759	510	25D3	25W3	254	10	85
3	24.4	.96	26.9	1.06	715	480	871	585	25D3	25W3	254	10	105
2	25.4	1.00	27.9	1.10	850	571	1012	680	25D3	25W3	254	10	120
1	30.2	1.19	32.8	1.29	1125	756	1317	885	30D4	30W4	305	12	140
1/0	33,8	1.33	36.3	1.43	1402	942	1615	1085	35D5	35W5	330	13	155
2/0	35.3	1.39	37.8	1.49	1668	1121	1890	1270	35D5	35W5	356	14	185
3/0	39.1	1.54	41.9	1.65	2093	1407	2344	1575	40D5	40W5	381	15	210
4/0	40.9	1.61	43.7	1.72	2513	1689	2775	1865	40D5	40W5	406	16	235
250	44.5	1.75	47.0	1.85	3117	2095	3400	2285	45D6	45W6	432	17	265
300	48.5	1.91	51.3	2.02	3694	2482	4003	2690	50D8	50W8	483	19	295

#CE Code Rule 12-712(3)

*Registered Trademark of Nexans Canada Inc.

CORFLEX* II RA90 (XLPE) MINUS 40°C – 600 VOLTS *(continued)*

COPPER CONDUCTORS | *Canada Patent No. 1, 120, 113 | Other sizes available upon request

Size AWG or MCM	Approximate Diameter Over Sheath mm	Over Sheath in.	Over PVC Jacket mm	Over PVC Jacket in.	Approximate Net Cable Weight Without Jacket kg/km	Without Jacket lbs/kft	With PVC Jacket kg/km	With PVC Jacket lbs/kft	Connectors (Nexans Cataloque No.) Dry Location Type D	Wet or Hazardous Location Type W	Minimum# Bending Radius mm	Minimum# Bending Radius in.	Ampacity 30°C Ambient (amps)
					THREE COPPER CONDUCTORS								(CE Code Table 2)
14	12.4	.49	15.5	.61	164	110	238	160	13D2	13W2	152	6	15
12	13.5	.53	16.5	.65	201	135	283	190	13D2	13W2	152	6	20
10	15.2	.60	18.3	.72	290	195	379	255	16D2	16W2	178	7	30
8	19.6	.77	22,6	.89	439	295	551	370	20D3	20W3	229	9	45
6	20.8	.82	23.4	.92	567	381	699	470	20D3	20W3	229	9	65
4	24.1	.95	26.9	1.06	834	561	990	665	25D3	25W3	254	10	85
3	25.1	99	27.9	1.10	992	667	1153	775	25D3	25W3	254	10	105
2	29.2	1.15	31.8	1.25	1281	861	1466	985	30D4	30W4	304	12	120
1	33.5	1.32	36.3	1.43	1627	1093	1838	1235	35D5	35W5	330	13	140
1/0	35.1	1.38	37.6	1.48	1937	1302	2158	1450	35D5	35W5	356	14	155
2/0	38.9	1.53	41.7	1.64	2423	1628	2671	1795	40D5	40W5	381	15	185††
3/0	40.6	1.60	43.2	1.70	2932	1971	3192	2145	40D5	40W5	406	16	210
4/0	43.7	1.72	46.2	1.82	3605	2423	3884	2610	45D6	45W6	432	17	235
250	48.5	1.91	51.3	2.02	4394	2952	4703	3160	50D8	50W8	483	19	265

#CE Code Rule 12-712(3)

††For 3 wire 120/240 and 120/208 volt residential services or sub-services, the ampacity for #2/0 AWG copper is 200 amperes. In this case the 5% adjustment per C.E. Code Rule 8-106(1) cannot be applied.

*Registered Trademark of Nexans Canada Inc.

CORFLEX* II RA90 (XLPE) MINUS 40°C – 600 VOLTS *(continued)*

COPPER CONDUCTORS | *Canada Patent No. 1, 120, 113 | Other sizes available upon request

Size AWG or MCM	Approximate Diameter Over Sheath mm	Over Sheath in.	Over PVC Jacket mm	Over PVC Jacket in.	Approximate Net Cable Weight Without Jacket kg/km	Without Jacket lbs/kft	With PVC Jacket kg/km	With PVC Jacket lbs/kft	Connectors (Nexans Cataloque No.) Dry Location Type D	Wet or Hazardous Location Type W	Minimum# Bending Radius mm	Minimum# Bending Radius in.	Ampacity*** 30°C Ambient (amps)
FOUR COPPER CONDUCTORS													(CE Code Table 2)
14	13.3	.53	16.3	.64	195	130	270	180	13D2	13W2	125	5.0	15
12	15.1	.59	18.1	.71	275	185	360	240	16D2	16W2	135	5.5	20
10	16.0	.63	19.0	.75	350	235	445	300	16D2	16W2	145	6.0	30
8	20.6	.81	23.6	.93	536	360	655	440	20D3	20W3	229	9	45
6	23.9	.94	26.4	1.04	770	517	923	620	25D3	25W3	254	10	65
4	25.7	1.01	28.2	1.11	1086	730	1250	840	25D3	25W3	254	10	85
3	29.7	1.17	32.3	1.27	1397	939	1585	1065	30D4	30W4	305	12	105
2	33.0	1.30	36.1	1.42	1741	1170	1949	1310	35D5	35W5	330	13	120
1	35.6	1.40	38.1	1.50	2113	1420	2336	1570	35D5	35W5	356	14	140
1/0	39.4	1.55	41.9	1.65	2628	1766	2880	1935	40D5	40W5	381	15	155
2/0	41.1	1.62	43.7	1.72	3175	2134	3170	2130	40D5	40W5	406	16	185††
3/0	44.2	1.74	46.7	1.84	3914	2630	4197	2820	45D6	45W6	432	17	210
4/0	48.8	1.92	51.6	2.03	4838	3251	5149	3460	50D8	50W8	483	19	235

***Assuming 4th conductor is the neutral of a balanced 3-phase 4 wire system.
#CE Code Rule 12-712(3)
††For 3 wire 120/240 and 120/208 volt residential services or sub-services, the ampacity for #2/0 AWG copper is 200 amperes. In this case the 5% adjustment per C.E. Code Rule 8-106(1) cannot be applied.

CORFLEX* II RA90 (XLPE) MINUS 40°C – 600 VOLTS

ACM ALUMINUM CONDUCTORS *Canada Patent No. 1, 120, 113

Size AWG or MCM	Approximate Diameter Over Sheath mm	Over Sheath in.	Over PVC Jacket mm	Over PVC Jacket in.	Approximate Net Cable Weight Without Jacket kg/km	Without Jacket lbs/kft	With PVC Jacket kg/km	With PVC Jacket lbs/kft	Connectors (Nexans Cataloque No.) Dry Location Type D	Wet or Hazardous Location Type W	Minimum# Bending Radius mm	Minimum# Bending Radius in.	Ampacity 30°C Ambient (amps)
SINGLE ACM ALUMINUM CONDUCTOR													(CE Code Table 3)
1/0	19.1	.75	21.8	.86	331	223	454	305	20D3	20W3	203	8	190
2/0	19.6	.77	22.4	.88	380	255	506	340	20D3	20W3	203	8	220
3/0	20.3	.80	23.1	.91	435	292	566	380	20D3	20W3	229	9	255
4/0	23.1	.91	25.9	1.02	536	360	685	460	25D3	25W3	254	10	300
250	24.1	.95	26.9	1.06	604	406	759	510	25D3	25W3	254	10	330
300	25.1	.99	27.7	1.09	687	462	848	570	25D3	25W3	254	10	375
350	28.7	1.13	31.5	1.24	842	566	1039	698	30D4	30W4	305	12	415
400	29.7	1.17	32.3	1.27	928	624	1116	750	30D4	30W4	305	12	450
500	33.0	1.30	36.1	1.42	1152	774	1362	915	35D5	35W5	330	13	515
600	35.1	1.38	37.6	1.48	1326	891	1548	1040	35D5	35W5	356	14	585
750	38.9	1.53	41.7	1.64	1648	1107	1897	1275	40D5	40W5	381	15	670
1000	42.4	1.67	45.2	1.78	2073	1393	2344	1575	45D6	45W6	432	17	800
1250	45.7	1.80	48.0	1.89	2529	1700	2820	1895	45D6	45W6	457	18	905

#CE Code Rule 12-712(3)

CORFLEX* II RA90 (XLPE) MINUS 40°C – 600 VOLTS *(continued)*

ACM ALUMINUM CONDUCTORS *Canada Patent No. 1, 120, 113

Size AWG or MCM	Approximate Diameter Over Sheath mm	Over Sheath in.	Over PVC Jacket mm	Over PVC Jacket in.	Approximate Net Cable Weight Without Jacket kg/km	Without Jacket lbs/kft	With PVC Jacket kg/km	With PVC Jacket lbs/kft	Connectors (Nexans Cataloque No.) Dry Location Type D	Wet or Hazardous Location Type W	Minimum# Bending Radius mm	Minimum# Bending Radius in.	Ampacity 30°C Ambient (amps)
THREE ACM ALUMINUM CONDUCTOR													(CE Code Table 4)
6	20.8	.82	23.4	92	321	216	454	305	20D3	20W3	229	9	55††
4	24.1	.95	26.9	1.06	425	286	580	390	25D3	25W3	254	10	65
2	29.2	115	31.8	1.25	641	431	826	555	30D4	30W4	305	12	95††
1	33.5	1.32	36.3	1.43	816	548	1027	690	35D5	35W5	330	13	105
1/0	35.1	1.38	37.6	1.48	925	622	1146	770	35D5	35W5	356	14	120
2/0	38.9	1.53	41.7	1.64	1141	767	1391	935	40D5	40W5	381	15	145
3/0	40.6	1.60	43.2	1.70	1310	881	1570	1055	40D5	40W5	406	16	165
4/0	43.7	1.72	46.2	1.82	1566	1053	1845	1240	45D6	45W6	432	17	185††
250	48.5	1.91	51.3	2.02	1990	1337	2299	1545	50D8	50W8	483	19	215
300	50.3	1.98	53.1	2.09	2248	1511	2575	1730	50D8	50W8	483	19	240
350	56.4	2.22	59.2	2.33	2560	1720	2924	1965	N/A	N/A	533	21	260
400	56.4	2.22	59.2	2.33	2813	1890	3177	2135	N/A	N/A	533	21	290
500	63.0	2.48	65.8	2.59	3441	2312	3847	2585	N/A	N/A	610	24	330

#CE Code Rule 12-712(3)

††For 3-wire 120/240 and 120/208 volt residential services or sub-services, the allowable ampacity for sizes #6 and #2 AWG shall be 60 and 100 amperes respectively. In this case the 5% adjustment per C.E. Code Rule 8-106(1) cannot be applied.

CORFLEX* II RA90 (XLPE) MINUS 40°C – 600 VOLTS *(continued)*

ACM ALUMINUM CONDUCTORS *Canada Patent No. 1, 120, 113

Size AWG or MCM	Approximate Diameter Over Sheath mm	Over Sheath in.	Over PVC Jacket mm	Over PVC Jacket in.	Approximate Net Cable Weight Without Jacket kg/km	Without Jacket lbs/kft	With PVC Jacket kg/km	With PVC Jacket lbs/kft	Connectors (Nexans Cataloque No.) Dry Location Type D	Wet or Hazardous Location Type W	Minimum# Bending Radius mm	Minimum# Bending Radius in.	Ampacity** 30°C Ambient (amps)
FOUR ACM ALUMINUM CONDUCTOR													(CE Code Table 3)
6	23.9	.94	26.4	1.04	435	292	588	395	25D3	25W3	254	10	55††
4	25.7	1.01	28.2	1.11	543	365	707	475	25D3	25W3	254	10	65
2	33.0	1.30	36.1	1.42	885	595	1094	735	35D5	35W5	330	13	95††
1	35,6	1.40	38.1	1.50	1489	1000	1265	850	35D5	35W5	330	13	105
1/0	39.4	1.55	41.9	1.65	1274	865	1525	1025	40D5	40W5	356	14	120
2/0	41.1	1.62	43.7	1.72	1471	989	1734	1165	40D5	40W5	381	15	145
3/0	44.2	1.74	46.7	1.84	1749	1175	2031	1365	45D6	45W6	406	16	165
4/0	48.8	1.92	51.6	2.03	2130	1431	2441	1640	50D8	50W8	432	17	185††
250	56.4	2.22	59.2	2.33	2501	1680	2865	1925	N/A	N/A	483	19	215
300	54.4	2.22	59.2	2.33	2836	1905	3200	2150	N/A	N/A	533	21	240
350	63.0	2.48	65.8	2.59	3293	2212	3698	2485	N/A	N/A	610	24	260
400	63.0	2.48	65.8	2.59	3627	2437	4033	2710	N/A	N/A	610	24	290
500	71.1	2.80	73.9	2.91	4796	3223	5253	3530	N/A	N/A	686	27	330

#CE Code Rule 12-712(3). **Assuming 4th conductor is the neutral of a balanced 3-phase 4 wire system. Other sizes available upon request.
††For 3-wire 120/240 and 120/208 volt residential services or sub-services, the allowable ampacity for sizes #6 and #2 AWG shall be 60 and 100 amperes respectively. In this case the 5% adjustment per C.E. Code Rule 8-106(1) cannot be applied.

Refer to page 47 for support clips and connector information

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SUPPORT CLIPS

Connector *Size Hype D or W)*	*Hub Size**	*Knockout Opening mm*	*in*	*Cable Support Clip (Nexans Cataloque No.) No PVC Jacket*	*With PVC Jacket*
13	1/2	22	7/8	HC5	CS6
16	1/2	22	7/8	CS6	CS7
20	3/4	29	1-1/8	CS7	CS10
25	3/4	29	1-1/8	CS12	CS13
30	1	35	1-3/8	CS14	CS15
35	1-1/4	44	1-3/4	CS15	CS16
40	1-1/4	44	1-3/4	CS17	CS18
45	1-1/2	51	2	CS18	CS19
50	2	64	2-1/2	CS20	CS21

Nexans Series CS Clip

Note: Connector size number indicates diameter (mm) of the Corflex* aluminum sheath.

* Hub size is thread size in inches.

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CORFLEX* II INSTALLATION NOTES

1. Corflex* cables should be installed using only the approved Nexans Canada Inc. wet and dry type connectors. For details of connectors see pages 39-46, 50 and 51.

2. **Recommended spacings** for single conductor Corflex* cables to qualify for Table 1 and 3 (C.E. Code) ampacity ratings are:
   In air, on tray, racks, etc., 1 diameter apart. See page 60.
   Direct buried, embedded. See page 61.

3. When installed in metallic or non-metallic ducts in free air, single conductor Corflex* cables should be rated per Tables 2 and 4 of the C.E. Code. Alternatively to IEEE S135 as allowed by Appendix B rule 4-004 (1), (2). For installations in underground duct, see page 62.

4. The Corflex* sheath and connector may be used as an EQUIPMENT Bonding Conductor (not as a SYSTEM ground) and is sized to meet the requirements of the C.E. Code Table 16 (Ref. Rules 10-812 and 10-814).

   When used as SERVICE ENTRANCE feeders, Corflex* cables should be fitted with non-ferrous grounding type bushings at the service equipment end (Ref. C.E. Code Rules 10-602 to 10-610).

   For other than service entrance circuits, bonding continuity of the sheath is established through the Corflex* connectors.

5. Installation of *any single conductor* metal sheathed or armoured cables should be made with due consideration of the effects of sheath currents and of induced eddy currents in ferrous end plates. (Refer to Rules 4-008, 10-302(2) and 12-3026 and the notes on these rules in Appendix 'B' of the C.E. Code.)

   Where sheath currents are allowed to flow in single conductor Corflex* cables (carrying above 425 amps), the manufacturer's recommended ratings are shown on pages 52 and 53 of this handbook. Where sheaths are isolated, it may be necessary to install a supplementary equipment bonding wire. For single conductor cables carrying more than 200 amps, non-ferrous entrance plates, connectors, bushings, washers and clamps, etc., must be used.

6. **Minimum recommended bend radius**
   — see pages 39 to 45.

7. **Recommended spacing of supports:**
   Horizontal
   Single conductor cables
   up to 1.25" diameter: **3–4 ft.**
   Single conductor cables
   over 1.25" diameter: **4–5 ft.**
   Multiconductor Power Cable
   4–5 ft.
   5 or more conductors Cable
   3–4 ft.

   Vertical
   All constructions: **6–8 ft.**
   Spacing of supports for single conductor cables should be reduced from above if short circuit conditions are unusually severe.

8. Minimum recommended installation temperature minus 40°C (with suitable handling procedures). Maximum conductor temperature 90°C.

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BONDING and GROUNDING SINGLE CONDUCTOR CORFLEX* II CABLES

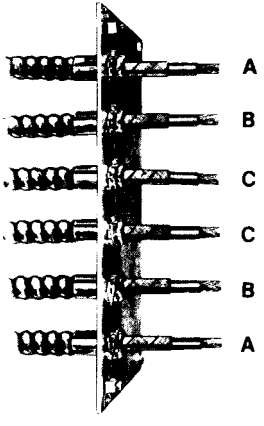
Bonding of the sheaths in a circuit of single conductor cables means the provision of a solid, common metallic-connection between cable sheaths. Grounding means the metallic connection of a sheath to ground potential. Hence, “bonding and grounding” of the sheaths of 1-conductor cables means that sheaths are metallically connected together and this common connection grounded.

SERVICES ONLY

A recognized method of assuring continuity of grounding at service equipment in accordance with Rule 10-604 of the Canadian Electrical Code is shown.

When current per conductor exceeds 200 amperes, the Code requires insertion in the steel box of a non-magnetic metal plate. Thickness should be 1/4" minimum.

Pass the threaded portion of the connector, after attaching it to the cable, through a clear hole in the entrance plate and secure it firmly with a locknut. The cable sheaths should be additionally grounded by attaching an approved grounding bushing to the threaded end of each connector and passing continuously through each grounding lug, the largest copper conductor which the lugs can accommodate. This method is illustrated above for two single conductor cables in parallel per phase, but is equally applicable to one single conductor cable per phase.



Alternative arrangement of cables

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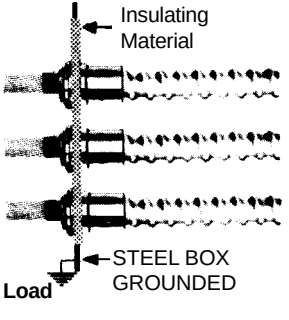
OTHER THAN SERVICES

For terminations other than services, all CORFLEX connectors with locknut or locknut and grounding bushing provide adequate grounding of the cable sheath as shown below.

When current per conductor exceeds 200 amperes, follow the standard instructions outlined above for insertion of a non-magnetic metal plate and also non-ferrous grounding bushings should be used.

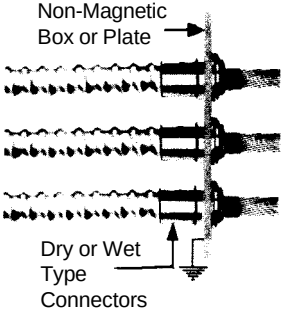
Above 350 MCM Aluminum (250 MCM Copper) cable sheaths should be bonded and grounded at supply end only. Separate copper bonding conductor is required. Up to and including 350 MCM Aluminum (250 MCM Copper), it is recommended that cable sheaths be bonded and grounded at both ends (sheath currents).



NO SHEATH CURRENTS
(PVC Jacket recommended)

ALUMINUM SHEATHS

Separate Bonding Conductor MAY be required

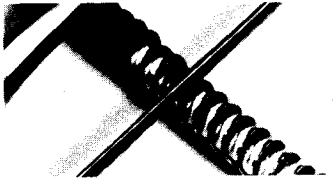


NOTE:
Any C.S.A. certified connector may be used, e.g.,
Type “D” and
Type “W”
C.S.A. Certified grounding bushings are available from Distributors.

For termination with sheath currents, install as shown above except replace the insulating material at the load end with a non-magnetic box or plate.

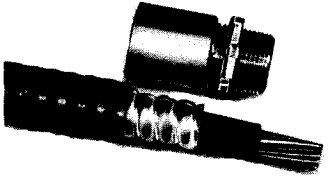
STEPS FOR TERMINATING CORFLEX* II WITH TYPE "D" DRY LOCATION CONNECTOR

1. Pencil indicates relative location to cut sheath. Score line with knife "squarely" around cable where sheath is to be cut.



2. Carefully cut through the raised helix using a fine-tooth hacksaw (24T). Be careful not to cut into cable insulation.

3. Crack scored sheath by gently bending back and forth. Slick off burr with knife edge. Pull off sheath, slightly rotating in direction of conductor lay.



4. If cable has a PVC jacket, cut jacket back to length of connector barrel.

5. Slip body over cable. Carefully thread the connector onto the sheath and turn by hand until the end of the sheath binds against the internal shoulder. Tighten by hand only.

6. Type "D" connector has a "one unit" body with internal threading matched to the profile of the sheath.

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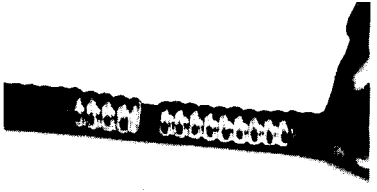
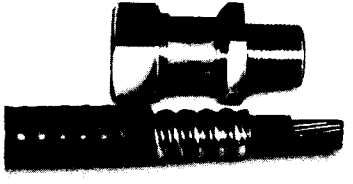
STEPS FOR TERMINATING CORFLEX* II WITH TYPE "W" MOISTURE-PROOF OR SUBMERSIBLE CONNECTOR



1. Score and cut sheath (as per dry connector instructions). Slide unwanted sheath off conductor(s).



2. Cut back jacket for length of connector body only.

3. Place packing nut and sealing grommet onto cable, ensuring that grommet is completely over the PVC jacket.

4. Thread the connector body onto the sheath and turn by hand only until the sheath binds against the internal shoulder. Tighten by hand.

5. Thread packing nut onto the body and tighten sufficiently to begin squeezing grommet out from under the packing nut.

6. When connecting to plate, ensure rubber gasket is placed between connector and outside surface of plate.

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CORFLEX* II CABLE DERATING DUE TO SHEATH CURRENTS

When ***single conductor*** metal sheathed cables carrying ***over 425 amps*** are installed with both ends of the sheath grounded, derating of the cable is normally required (Ref. Canadian Electrical Code Part 1 Rule 4-008 and Appendix B) due to the heating effect of sheath currents.

The following curves show the ***manufacturer's recommended*** current carrying capacity for CORFLEX* II cables operating with sheath currents flowing.

The "Calculated Ratings (no sheath currents)" curves show the calculated current required to obtain full 90°C conductor operating temperature, and illustrates the margin of safety available in the CORFLEX design over Code ratings (Tables 1 and 3 of C.E. Code).

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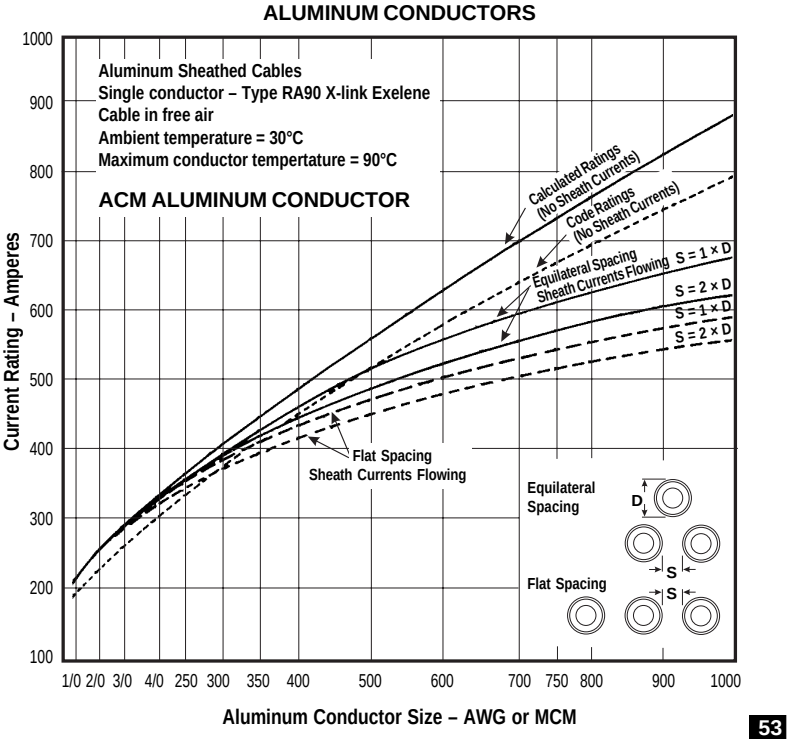
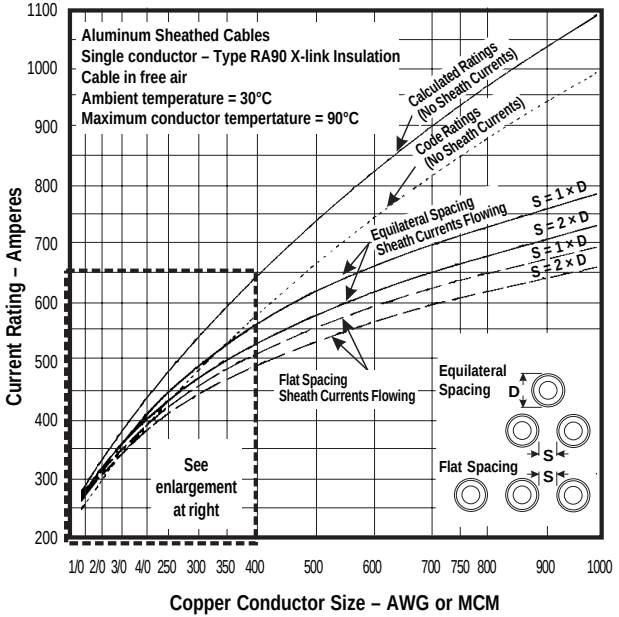
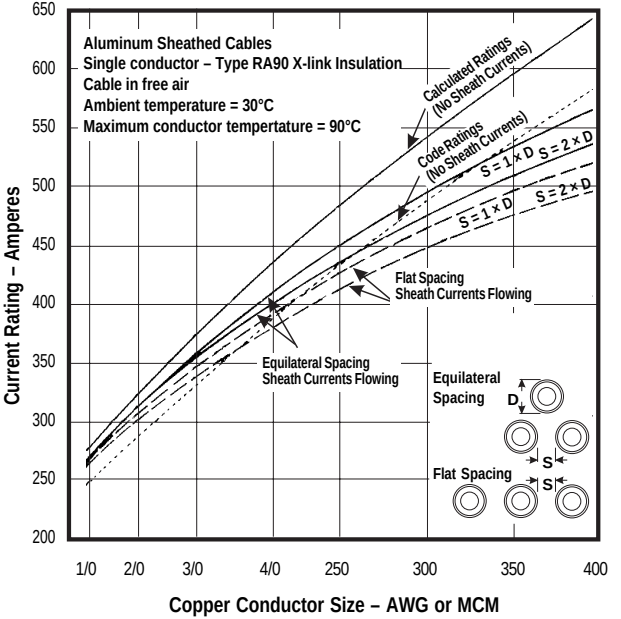


ALUMINUM CONDUCTORS – CURRENT CARRYING CAPACITY





ACWU90
XLPE INSULATION
MINUS 40°C
ACM ALUMINUM CONDUCTORS

Description: One to four ACM aluminum conductors with low temperature Exelene* cross-linked polyethylene insulation (RW90 XLPE) and bare aluminum bonding wire in multi-conductor cables. Single conductor cables have copper concentric bonding wire. Conductor assembly is wrapped and enclosed in an interlocked aluminum armour with an overall low acid gas and low flame spread PVC jacket (LAG/LFS) with FT4 and AG14 rating

H.L. rated for Class I Div 1 & 2 Groups A, B, C & D, Class II Div 1 & 2 Groups E, F & G and Class Ill Hazardous Locations.

CSA Spec C22.2 No. 51-M89.

Application: For exposed and concealed wiring in dry or wet locations and where exposed to the weather.

For use in ventilated flexible cableways in dry or wet locations.

For direct earth burial (with protection as required by Inspection Authority).

For service entrance above or below ground.

For hazardous locations with approved connectors.

Minimum recommended installation temperature minus 40°C (with suitable handling procedures). Maximum conductor temperature 90°C.

ACWU90 XLPE INSULATION MINUS 40°C ACM ALUMINUM CONDUCTORS – 600 VOLTS

Size AWG or MCM	*Insulation Thickness*		*Bonding Wire Size*	*Approximate Diameter*				*Approximate Net Cable Weight*		*Ampacity** (30°C Ambient)*
				Armour		*PVC Jacket*				
	mm	*in.*	*AWG*	*mm*	*in.*	*mm*	*in.*	*kg/km*	*lbs/kft*	*(amps)*
ONE STRANDED CONDUCTOR (plus bonding wire)										
1/0	1.40	.055	6	20.3	0.80	23.0	0.91	670	450	190
2/0	1.40	.055	4	21.4	0.84	24.1	0.95	730	490	220
3/0	1.40	.055	4	23.2	0.91	25.9	1.02	855	575	255
4/0	1.40	.055	4	25.1	0.99	27.9	1.10	1005	675	300
250	1.65	.065	3	26.8	1.06	29.6	1.16	1175	790	330
300	1.65	.065	3	28.2	1.11	30.9	1.22	1275	860	375
350	1.65	.065	2	30.1	1.19	32.8	1.29	1455	975	415
400	1.65	.065	2	31.3	1.23	34.0	1.34	1555	1045	450
500	1.65	.065	1	33.4	1.31	36.1	1.42	1850	1245	515
600	2.03	.080	1	36.1	1.42	38.9	1.53	2080	1400	585
750	2.03	.080	1/0	39.5	1.56	42.9	1.69	2530	1700	670
1000	2.03	.080	1/0	43.4	1.71	46.7	1.84	2980	2000	800
1250	2.41	.095	2/0	48.3	1.90	51.6	2.03	3850	2585	905
1500	2.41	.095	3/0	52.4	2.06	55.8	2.20	4490	3015	1020

**Ampacity in accordance with Table #3 of the Canadian Electrical Code Part #1 (1994)

ACWU90 XLPE INSULATION MINUS 40°C ACM ALUMINUM CONDUCTORS – 600 VOLTS *(continued)*

Size AWG or MCM	Insulation Thickness mm	Insulation Thickness in.	Bonding Wire Size AWG	Approximate Diameter Armour mm	Approximate Diameter Armour in.	Approximate Diameter PVC Jacket mm	Approximate Diameter PVC Jacket in.	Approximate Net Cable Weight kg/km	Approximate Net Cable Weight lbs/kft	Ampacity** (30°C Ambient) (amps)
THREE STRANDED CONDUCTORS (plus bonding wire)										
6 (7)	1.14	.045	8 (7)	21.4	0.84	24.1	0.95	540	360	55#
4 (7)	1.14	.045	6 (7)	24.1	0.95	26.9	1.06	680	455	65
3 (7)	1.14	.045	6 (7)	25.5	1.00	28.2	1.11	765	515	75
2 (7)	1.14	.045	6 (7)	27.0	1.06	29.7	1.17	860	575	95#
1 (19)	1.40	.055	4 (7)	30.5	1.20	33.3	1.31	1045	700	105
1/0 (19)	1.40	.055	4 (7)	32.5	1.28	35.3	1.39	1185	795	120
2/0 (19)	1.40	.055	4 (7)	34.9	1.38	37.7	1.49	1365	915	145
3/0 (19)	1.40	.055	4 (7)	37.7	1.48	40.5	1.60	1580	1060	165
4/0 (19)	1.40	.055	4 (7)	40.8	1.61	44.1	1.74	1890	1270	185#
250 (37)	1.65	.065	2 (7)	44.4	1.75	47.8	1.88	2200	1480	215
300 (37)	1.65	.065	2 (7)	48.5	1.91	51.8	2.04	2695	1810	240
350 (37)	1.65	.065	2 (7)	51.2	2.01	54.5	2.15	2990	2010	260
400 (37)	1.65	.065	2 (7)	53.7	2.11	57.0	2.25	3255	2185	290
500 (37)	1.65	.065	1 (19)	58.2	2.29	62.4	2.46	3965	2665	330
600 (61)	2.03	.080	1 (19)	64.3	2.53	68.2	2.69	4670	3140	370
750 (61)	2.03	.080	1/0 (19)	69.7	2.75	73.9	2.91	5520	3710	405

**Ampacity in accordance with Table #4 of the Canadian Electrical Code Part #1 (1994).

#For 3-wire 120/240 and 120/208V residential services or sub-services, the allowable ampacity for sizes #6, #2 and #4/0 AWG aluminum shall be 60, 100 and 200 amperes respectively. In these cases the 5% adjustment per C.E. Code Rule 8-106(1) cannot be applied.

ACWU90 XLPE INSULATION MINUS 40°C ACM ALUMINUM CONDUCTORS – 600 VOLTS *(continued)*

Size AWG or MCM	Insulation Thickness mm	Insulation Thickness in.	Bonding Wire Size AWG	Approximate Diameter Armour mm	Approximate Diameter Armour in.	Approximate Diameter PVC Jacket mm	Approximate Diameter PVC Jacket in.	Approximate Net Cable Weight kg/km	Approximate Net Cable Weight lbs/kft	Ampacity** (30°C Ambient) (amps)
FOUR STRANDED CONDUCTORS (plus bonding wire)										
6 (7)	1.14	.045	8 (7)	23.4	0.92	26.2	1.03	635	430	55#
4 (7)	1.14	.045	6 (7)	26.5	1.04	29.2	1.15	820	550	65
3 (7)	1.14	.045	6 (7)	28.0	1.10	30.7	1.21	920	620	75
2 (7)	1.14	.045	6 (7)	30.0	1.18	32.8	1.29	1050	705	95#
1 (19)	1.40	.055	4 (7)	33.8	1.33	36.6	1.44	1270	855	105
1/0 (19)	1.40	.055	4 (7)	36.0	1.42	38.9	1.53	1465	985	120
2/0 (19)	1.40	.055	4 (7)	38.5	1.52	41.8	1.65	1735	1165	145
3/0 (19)	1.40	.055	4 (7)	41.4	1.63	44.7	1.76	2005	1350	165
4/0 (19)	1.40	.055	4 (7)	46.1	1.81	49.4	1.95	2535	1705	185#
250 (37)	1.65	.065	2 (7)	50.1	1.97	53.5	2.11	2965	1990	215
300 (37)	1.65	.065	2 (7)	53.4	2.10	56.7	2.23	3355	2255	240
350 (37)	1.65	.065	2 (7)	56.4	2.22	59.8	2.35	3735	2510	260
400 (37)	1.65	.065	2 (7)	59.2	2.33	63.3	2.49	4195	2820	290
500 (37)	1.65	.065	1 (19)	64.3	2.53	68.5	2.70	5015	3370	330
600 (61)	2.03	.080	1 (19)	70.9	2.79	75.1	2.96	5900	3965	370
750 (61)	2.03	.080	1/0 (19)	77.2	3.04	81.9	3.23	7115	4780	405

**Ampacity in accordance with Table #4 of the Canadian Electrical Code Part #1 (1994). Assuming the 4th conductor in a 4/c cable is the neutral of a balanced 3 phase 4 wire system.

#For 3-wire 120/240 and 120/208V residential services or sub-services, the allowable ampacity for sizes #6, #2 and #4/0 AWG aluminum shall be 60, 100 and 200 amperes respectively. In these cases the 5% adjustment per C.E. Code Rule 8-106(1) cannot be applied.

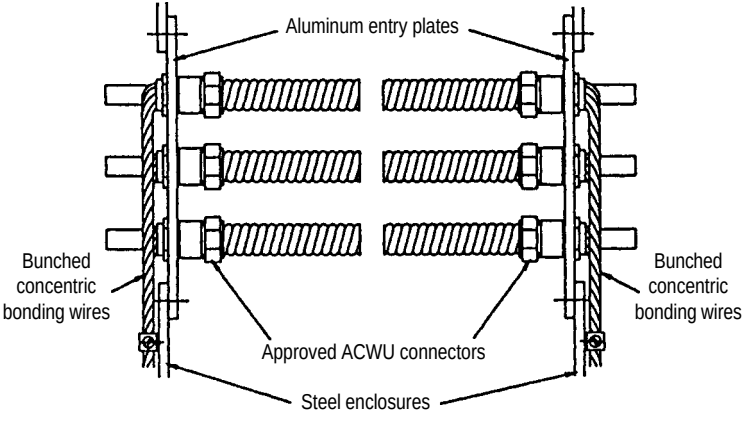
INSTALLATION OF SINGLE CONDUCTOR ACWU90 CABLES

1. For Circuit Ampacity up to and including 425 Amperes

- When the current per conductor exceeds 200 amperes, the code requires the insertion in the steel box of a non-magnetic metal plate. Thickness should be 1/4" minimum.

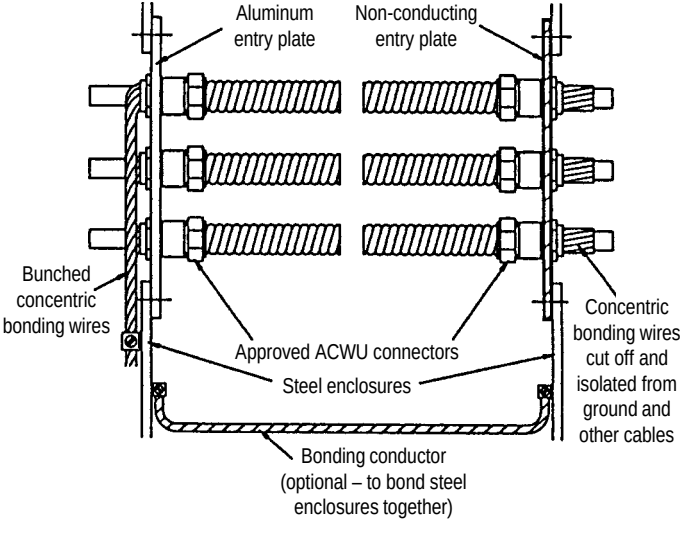
- Attach an approved connector to the armour of each cable. Pass the threaded portion of each connector through the entry hole in the non-magnetic entry plate and secure it with a non-magnetic locknut.

- Single conductor ACWU90 cables are supplied with a concentrically applied bonding conductor. This bonding conductor should extend through the armour connector and be left long enough to be bunched or twisted with the other bonding wires and attached to the bonding lug or connector inside the enclosure.



2. For Circuit Ampacity over 425 Amperes

- Follow the instructions on the previous page for the installation of the single conductor cables at the source end of the circuit.
- With single conductor armoured cables carrying over 425 amperes, currents induced in the armour and concentric bonding conductor become excessive. If not eliminated, circulating currents cause cable heating and prevent the cable from carrying its rated Table 1 or 3 (from the Canadian Electrical Code) current. In order to eliminate these circulating currents the armour and concentric bonding conductor must be isolated from ground at one end and along the route (i.e., jacketed cable should be used). This isolation is usually done at the load end of the circuit.



- Armour and concentric bonding conductor isolation is accomplished by mounting the armour connectors on a non-conducting entry plate. The cable is terminated using an approved connector which is mounted on a non-conducting (insulating) plate. In addition, the concentric bonding conductor is cut off just as it emerges from the connector. This prevents the bonding conductor from coming in contact with ground or other bonding conductors. A separate bonding conductor (sized in accordance with Table 16 of the Canadian Electrical Code) may be required to bond the enclosures together.

RECOMMENDED CONFIGURATIONS

For installation of single conductor cables *IN FREE AIR*

ATTENTION

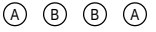
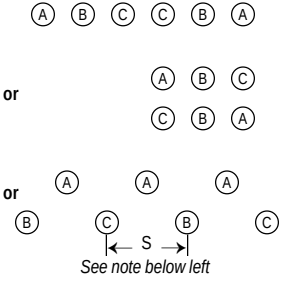
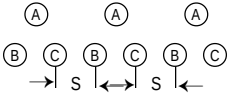
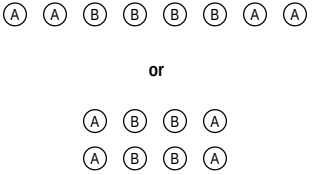
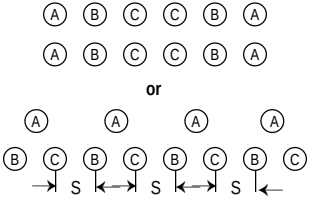
Only these configurations are recommended by Nexans Canada Inc. to obtain satisfactory load sharing.

Spacing between cables is one cable diameter (2 diameters centre to centre) for Canadian Electrical Code Table 1 or 3 ratings. For 1/C cables direct buried, embedded in concrete or plaster, see page 61. For 1/C cables in underground or embedded duct, see page 62.

The installation of more than four conductors in parallel per phase without engineering analysis is not recommended.

Neutral conductors to be located outside of the above groups in the most convenient manner.

S – Spacing between groups to be equal to width of group.

	Single Phase	Three Phase
Two Conductors per Phase		 *See note below left*
Three Conductors per Phase	Not recommended	
Four Conductors per Phase		

AMPACITY RATING AND RECOMMENDED CONFIGURATIONS
For installation of single conductor cables IN DIRECT BURIAL

ATTENTION: Only these configurations are recommended by Nexans Canada Inc. to obtain satsifactory load sharing and ampacity. See C.E.C. Code Rules 4-004, 12-012, Appendix B, Appendix D8 and Appendix D10.

Single Conductor Ampacities, Directly Buried Cables Types RWU90, RA90, TECK 90, ACWU90, 0 to 5 kV

Size	1 Cable/Phase A B C → | |← 7.5" 0 0 0		2 Cables/Phase A B C C B A 0 0 0 0 0 0		2 Cables/Phase A B C C B A → | |← 24" 0 0 0 0 0 0		4 Cables/Phase A B C C B A 0 0 0 0 0 0 0 0 0 0 0 0		4 Cables/Phase A B C C B A → | |← 24" 0 0 0 0 0 0 0 0 0 0 0 0		6 Cables/Phase A B C C B A 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		6 Cables/Phase A B C C B A → | |← 24" 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
	CU	AL	CU	AL	CU	AL	CU	AL	CU	AL	CU	AL	CU	AL
1/0	295	230	267	208	275	215	203	158	220	171	165	129	179	140
2/0	335	265	302	235	310	245	229	178	248	193	186	145	202	157
3/0	385	300	341	266	355	275	258	201	280	218	210	163	228	178
4/0	435	340	386	301	400	310	291	227	315	246	236	183	256	200
250	470	370	421	328	435	340	317	247	343	267	256	200	278	217
350	570	445	500	390	520	410	375	292	408	318	304	237	331	258
500	690	540	605	471	630	495	452	352	489	383	365	284	396	309
600	752	590	659	513	682	541	491	382	534	419	397	308	433	340
750	845	665	745	580	775	610	554	431	596	469	447	348	482	379
1000	980	780	846	659	890	710	627	488	683	542	505	393	551	437
1250	1083	868	935	750	985	790	691	554	753	604	556	446	607	487
1500	1176	952	1011	821	1068	865	746	605	813	660	600	487	655	531
1750	1257	1027	1078	880	1140	932	793	647	865	706	637	520	696	568
2000	1325	1094	1133	934	1200	991	832	686	909	749	669	552	730	602

Notes. The above ampacities are based on the following conditions: 100% load factor • Ambient soil temperature of 20°C • Soil resistivity of 90°C-cm/W • Conductor temperature of 90°C • Spacing between conductor centres of 7.5" and 24" between groups • Burial depth of 36" to centre of top cable layer • Open circuit sheath/shield operation. Neutral conductors to be located outside of the above groups in the most convenient manner.

AMPACITY RATING AND RECOMMENDED CONFIGURATIONS

For installation of single conductor cables IN UNDERGROUND DUCTS

ATTENTION: Only these configurations are recommended by Nexans Canada Inc. to obtain satisfactory load sharing and ampacity. See C.E.C. Code Rules 4-004, 12-012, Appendix B, Appendix D9 and Appendix D11.

Single Conductor Ampacities in Underground Ducts Types RW90, RWU90 cable rated 0 to 5 kV

Size	1Cable/Phase A B C 0 0 0		2 Cables/Phase A B C 0 0 0 0 0 0		4 Cables/Phase A B C 0 0 0 0 0 0 0 0 0 0 0 0		6 Cables/Phase A B C C B A 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
	CU	AL	CU	AL	CU	AL	CU	AL
1/0	231	180	201	157	159	123	146	114
2/0	264	205	228	178	180	140	164	128
3/0	301	235	260	203	204	158	186	145
4/0	345	269	296	231	231	180	211	164
250	379	296	325	253	252	197	230	179
350	461	360	391	306	303	236	275	213
500	564	442	475	372	364	283	330	257
600	621	488	521	409	404	314	365	284
750	706	556	589	464	448	349	406	315
1000	823	653	682	541	526	409	474	370
1250	920	738	759	608	571	457	515	413
1500	1004	813	824	667	618	501	556	452
1750	1077	880	880	719	659	538	592	484
2000	1139	940	928	766	692	571	622	513

Notes

The above ampacities are based on the following conditions:

– 100% load factor
– Ambient soil temperature of 20°C
– Concrete thermal resistivity of 85 C-cm/W
– Conductor temperature of 90°C
– Spacing between duct centres of 7.5" (i.e. one cable per duct)
– Top of ductbank at 30" below surface
– 5" duct

Neutral conductors to be located outside of the above groups in the most convenient manner.

CONDUCTORS IN CABLE TRAYS

Cable tray means a raceway consisting of troughing and fittings therefore, so formed and constructed that insulated conductors and cables may be readily installed or removed after the cable tray has been completely installed, without injury either to conductors or their covering;

Ladder cable tray means a prefabricated structure consisting of two longitudinal side rail(s) connected by individual transverse members, with openings exceeding 50mm in a longitudinal direction;

Non-ventilated cable tray means a prefabricated structure without openings within the integral or separate longitudinal side rails;

Ventilated cable tray means a prefabricated structure consisting of a ventilated bottom within integral longitudinal side rails with no openings exceeding 50mm in a longitudinal direction;

Cellular floor means an assembly of cellular metal or cellular concrete floor mernbers, consisting of units with hollow spaces (cells) suitable for use as raceways and in some cases, non-cellular units.

CABLE TRAYS

12-2200 Restriction of Use.
Cable trays shall not be used in any hazardous location except as permitted by Rule 18-068.

12-2202 Method of Installation. (See Appendix B).
(1) Cable trays shall be installed as a complete system using fittings or other acceptable means to provide adequate cable support and bending radius before the conductors are installed.

(2) The maximum design load and associated support spacing shall not exceed the values specified in Table 42.

(3) Cable trays shall not pass through walls except were the walls are constructed of noncombustible material.

(4) Cable trays may extend vertically through floors in dry locations, if provided with acceptable fire stops, and if totally enclosed where passing through and for a minimum distance of 2m above the floor, to provide adequate protection from mechanical injury.

(5) Cable trays shall be adequately supported by noncombustible supports.

(6) Dead-ends of cable trays shall be closed by the use of end fittings.

(7) The minimum clearances for cable trays shall be:

(a) 150mm vertical clearance, excluding depth of cable trays, between cable trays installed in tiers except where cables of 2-inch diameter or greater may be installed, the clearance shall be 300mm; and

(b) 300mm vertical clearance from the top of the cable tray to all ceilings, heating ducts and heating equipment and 150mm for short length obstructions; and

(c) 600mm horizontal clearance on one side of cable trays mounted adjacent to one another or to walls or other obstructions.

12-2204 Conductors in Cable Trays. (see Appendix B)
(1) Conductors for use in cable trays shall be listed in Table 19 and except as permitted in Subrules (2) and (3) shall have a continuous metal sheath or interlocking armour.

(2) Type TC tray cable shall be permitted in cable trays in areas of industrial establishments which are inaccessible to the public provided the cable is:

(a) Installed in conduit or other suitable raceway when not in cable tray; and

(b) Provided with mechanical protection where subject to damage either during or after installation; and

(c) No smaller than 1/0 AWG if single conductor is used; and

(d) Installed only where qualified persons service the installation.

(3) Conductors having moisture-resistant insulation and flame tested non-metal coverings or sheaths of a type listed in Table 19 shall be permitted in ventilated or non-ventilated cable trays where not subject to damage during or after installation in:

(a) Electrical equipment vaults and service rooms; and

(b) In other locations which are inaccessible to the public and are constructed as a service room where a deviation has been allowed in accordance with Rule 2-030.

(4) Single conductors shall be fastened to prevent excessive movement due to fault-current magnetic forces.

(5) Where single conductors are fastened to cable trays, precautions shall be taken to prevent overheating of the fasteners due to induction.

12-2206 Joints and Splices Within Cable Trays.
Where joints and splices are made on feeders or branch circuits within cable trays, they shall be made and insulated by acceptable methods and shall be in accessible locations.

12.2208 Connection to Other Wiring Methods.
Where cables trays are connected to other wiring methods, the arrangement shall be such that the conductors will not be subject to mechanical damage or abrasion, and such that effective bonding will be maintained.

12-2210 Provision for Bonding.
(1) Where metal supports for cable trays are bolted to the tray and are in good electrical contact with the grounded structural metal frame of a building, the tray shall be deemed to be bonded to ground.

(2) Where the conditions of Subrule (1) do not apply, the cable tray shall be adequately bonded at intervals not exceeding 15m and the size of bonding conductors shall be based on the maximum rating or setting of an overcurrent device in the circuits carried by the cable tray in accordance with the requirements of Rule 10-814.

12-2212 Ampacities of Conductors in Cable Trays.
(1) In ventilated and ladder-type cable trays, where the airspace between conductors, cables, or both is maintained at greater than 100 per cent of the largest conductor or cable diameter, the ampacity of the conductors or cables shall be the value specified in Paragraph (a) or (b):

(a) Single conductors, single-conductor metal sheathed or armoured cable and single-conductor mineral-insulated cable, as specified in Tables 1 and 3; and

(b) Multi-conductor cables as specified in Tables 2 and 4, multiplied by the correction factor in Table 5C for the number of conductors in each cable.

(2) In ventilated and ladder-type, cable trays, where the air space between conductors, cables or both is maintained at not less than 25 per cent nor more than 100 per cent of the largest conductor or cable diameter, the ampacity of the conductors or cables shall be the value specified in Subrule (1), multiplied by the correction factor specified in Table 5D for the arrangement and number of conductors or cables involved, unless a deviation has been allowed in accordance with Rule 2-030 for other correction factors.

(3) In ventilated and ladder-type cable trays, where the air space between conductors, cables, or both is less than 25 per cent, and for any spacing in a non-ventilated cable tray, the ampacity of the conductors or cables shall be the value as specified in Tables 2 or 4 multiplied by the correction factor specified in Table 5C for the total number of conductors in the cable tray.

(4) In determining the total number of conductors in the cable tray in Subrule (3), Rule 4-004(7) shall apply.

(5) Where cable trays are located in room temperatures above 30°C, the temperature correction factor of Table 5A shall be applied to the ampacities determined from Subrules (1), (2) and (3) as applicable.

VOLTAGE DROP

The “K” FACTOR TABLE gives voltage drop per 1000 ampere-metres for wire in non-magnetic (e.g. aluminum, PVC, etc.) conduits.

The table is based on **Three Phase Line-to-Neutral Voltage**. For circuits operating on other systems the following CORRECTION FACTOR (*f*) should be included in the calculation:

SystemType	*Correction factor (f)*
1 PHASE 2 WIRE (120 V branch circuits)	2
1 PHASE 3 WIRE (240 V residenticil circuits)	2
1 PHASE 3 WIRE Line to Line	2
3 PHASE 3 WIRE Line to Line	1.73
3 PHASE 4 WIRE Line to Line	1.73
3 PHASE 4 WIRE Line to Neutral	1

VOLTAGE DROP ESTIMATING TABLE

"K" Factor-voltage drop per ampere per circuit kilometre. For three conductor cables or three single conductor cables in conduit. K factors are calculated for 60–75°C wire temperature since this is an estimate of the average temperature at which a circuit operates in service.

For circuits known to be operating at 90°C, multiply the voltage drop by 1.102 for copper and 1.105 for aluminum.

To correct voltage drop per 1000 metres to voltage drop per 1000 feet, multiply by 0.3048.

	COPPER						ALUMINUM					
Size AWG or MCM	*Magnetic Conduit or Armour*			*Non-Magnetic Conduit or Armour*			*Magnetic Conduit or Armour*			*Non-Magnetic Conduit or Armour*		
	80% P.F.	*90% P.F.*	*100% P.F.*	*80% P.F.*	*90% P.F.*	*100% P.F.*	*80% P.F.*	*90% P.F.*	*100% P.F.*	*80% P.F.*	*90% P.F..*	*100% P.F.*
14	8.329	9.341	10.320	8.296	9.304	10.280						
12	5.265	5.896	6.496	5.244	5.873	6.470						
10	3.335	3.726	4.087	3.322	3.711	4.070						
8	2.134	2.374	2.582	2.118	2.355	2.562	3.453	3.858	4.231	3.440	3.843	4.214
6	1.368	1.512	1.625	1.357	1.500	1.612	2.198	2.445	2.662	2.191	2.438	2.654
4	0.882	0.966	1.021	0.875	0.959	1.013	1.410	1.561	1.682	1.403	1.553	1.674
3	0.711	0.775	0.810	0.706	0.769	0.804	1.130	1.246	1.334	1.125	1.241	1.328
2	0.575	0.623	0.642	0.573	0.620	0.639	0.908	0.997	1.058	0.903	0.992	1.053
1	0.469	0.503	0.509	0.467	0.501	0.507	0.733	0.800	0.839	0.729	0.796	0.835
1/0	0.383	0.407	0.404	0.381	0.405	0.402	0.592	0.642	0.665	0.592	0.642	0.665

VOLTAGE DROP ESTIMATING TABLE *(continued)*

	COPPER						ALUMINUM					
Size AWG or MCM	*Magnetic Conduit or Armour*			*Non-Magnefic Conduit or Armour*			*Magnefic Conduit or Armour*			*Non-Magnefic Conduit or Armour*		
	80% P.F.	*90% P.F.*	*100% P.F.*	*80% P.F.*	*90% P.F.*	*100% P.F.*	*80% P.F.*	*90% P.F.*	*100% P.F.*	*80% P.F.*	*90% P.F..*	*100% P.F.*
2/0	0.314	0.330	0.320	0.314	0.330	0.320	0.480	0.517	0.527	0.480	0.517	0.527
3/0	0.260	0.270	0.254	0.260	0.270	0.254	0.392	0.418	0.418	0.392	0.418	0.418
4/0	0.218	0.223	0.203	0.217	0.222	0.201	0.321	0.339	0.332	0.321	0.339	0.332
250	0.193	0.195	0.172	0.192	0.194	0.171	0.280	0.293	0.281	0.280	0.293	0.281
300	0.171	0.170	0.145	0.169	0.169	0.144	0.242	0.250	0.234	0.242	0.250	0.234
350	0.155	0.153	0.127	0.153	0.151	0.124	0.216	0.221	0.203	0.214	0.220	0.201
400	0.142	0.139	0.112	0.141	0.137	0.110	0.195	0.198	0.177	0.193	0.196	0.176
500	0.126	0.121	0.093	0.123	0.118	0.089	0.167	0.168	0.145	0.165	0.165	0.142
600	0.115	0.109	0.080	0.112	0.105	0.076	0.148	0.146	0.122	0.146	0.144	0.119
750	0.101	0.094	0.064	0.105	0.098	0.069	0.131	0.127	0.101	0.132	0.129	0.102
1000	0.096	0.088	0.058	0.090	0.082	0.051	0.114	0.108	0.081	0.110	0.104	0.076

Notes: In general the voltage drop on an Aluminum conductor is approximately the same size as that for a Copper conductor two gauge sizes smaller. For non-metallic sheathed cables, use K factor for non-magnetic conduit or armour. For other than 3 phase, 4 wire line to neutral voltage drop multiply “K” factors shown by the (*f*) factor shown on page 67.

EXAMPLES OF VOLTAGE DROP CALCULATIONS

$$\text{Voltage Drop (volts)} = \frac{K \text{ (from table)} \times f \text{ (factor)} \times \text{Current (amps)} \times \text{length of run (metres)}}{1000}$$

$$\%\ \text{Voltage Drop (volts)} = \frac{\text{Actual voltage drop (volts)}}{\text{Actual circuit voltage}} \times 100$$

Example 1: It is required to run a 120 volts, single phase circuit 70 m long, carrying 20 amps.

What size of copper NMD90 cable should be used if maximum voltage drop required is 3%?

$$\text{Allowable Vd} = 3\% \times 120$$
$$= 3.6 \text{ volts.}$$
$$\text{Required K} = \frac{\text{Voltage drop} \times 1000}{f \times \text{amps} \times \text{metres}}$$
$$= \frac{3.6 \times 1000}{2.0 \times 20 \times 70} = 1.28$$

From the table for copper conductors in non-magnetic conduit (assuming 100% power factor), the smallest conductor size that does not exceed K = 1.28 volts/1000 amp m. is a No. 4 AWG (k = 1.013).

Example 2: A single phase line to neutral circuit from a 600/347 V 3 phase, 4 wire system is required to carry 170 amps a total run of 180 m. #2/0 AWG copper RW90 in aluminum conduit is proposed.

What would be the resulting voltage drop, assuming a 90% power factor?

$$\text{Voltage drop} = \frac{K \times f \times \text{amps} \times \text{metres}}{1000}$$
$$= \frac{0.330 \times 1.0 \times 170 \times 180}{1000}$$
$$= 10.1 \text{ volts to ground.}$$

As a percentage, this voltage drop is $\frac{10.1}{347} \times 100 = 2.9\%$

What size of wire would be required to give a 2% drop?

$$\text{Allowable Vd} = 2\% \times 347$$
$$6.9 \text{ volts.}$$

$$\text{Maximum K} = \frac{\text{Voltage drop} \times 1000}{f \times \text{amps} \times \text{metres}}$$
$$= \frac{6.9 \times 1000}{1.0 \times 170 \times 180} = 0.23$$

From the table, select #4/0 AWG copper wire (k = .222).

TABLE D3

(See Rule 8-102 and Appendix B, Rule 4-004)

DISTANCE TO CENTRE OF DISTRIBUTION FOR A 1 PER CENT DROP IN VOLTAGE ON NOMINAL 120 V, 2-CONDUCTOR COPPER CIRCUITS

Current	*Copper Conductor Size in AWG*														
	18	*16*	*14*	*12*	*10*	*8*	*6*	*4*	*3*	*2*	*1*	*1/0*	*2/0*	*3/0*	*4/0*
Amps	*Distance in Metres to Centre of Distribution Measured along the Conductor Run, Calculated for Conductor Temperature of 60°C*														
1.00	24.2	38.5	61.4												
1.25	19.4	30.8	49.1												
1.6	15.1	24.1	38.4	61.0											
2.0	12.1	19.3	30.7	48.8											
2.5	9.7	15.4	24.6	39.0	62.0										
3.2	7.6	12.0	19.2	30.5	48.5										
4.0	6.1	9.6	15.3	24.4	38.8	61.7									
5.0	4.8	7.7	12.3	19.5	31.0	49.3									
6.3	3.8	6.1	9.7	15.5	24.6	39.1	62.2								
8.0	3.0	4.8	7.7	12.2	19.4	30.8	49.0								
10.0	2.4	3.9	6.1	9.8	15.5	24.7	39.2	62.4							
12.5		3.1	4.9	7.8	12.4	19.7	31.4	49.9	62.9						
16		2.4	3.8	6.1	9.7	15.4	24.5	39.0	49.1	62.0					
20			3.1	4.9	7.8	12.3	19.6	31.2	39.3	49.6	62.5				
25				3.9	6.2	9.9	15.7	24.9	31.4	39.7	50.0	63.1			
32					4.8	7.7	12.2	19.6	24.6	31.0	39.1	49.3	62.1		
40					3.9	6.2	9.8	15.6	19.7	24.8	31.3	39.4	49.7	62.7	
50						4.9	7.8	12.5	15.7	19.8	25.0	31.5	39.8	50.1	63.2
63						3.9	6.2	9.9	12.5	15.7	19.8	25.0	31.6	39.8	50.2
80						3.1	4.9	7.8	9.8	12.4	15.6	19.7	24.8	31.3	39.5

(continued)

TABLE D3 *(continued)*

Current Amps	Copper Conductor Size in AWG														
	18	*16*	*14*	*12*	*10*	*8*	*6*	*4*	*3*	*2*	*1*	*1/0*	*2/0*	*3/0*	*4/0*
	Distance in Metres to Centre of Distribution Measured along the Conductor Run, Calculated for Conductor Temperature of 60°C														
100							3.9	6.2	7.9	9.9	12.5	15.8	19.9	25.1	31.6
125								5.0	6.3	7.9	10.0	12.6	15.9	20.1	25.3
160									4.9	6.2	7.8	9.9	12.4	15.7	19.8
200										5.0	6.3	7.9	9.9	12.5	15.8
250												6.3	8.0	10.0	12.6
320													6.2	7.8	9.9

NOTES: (1) Table D3 is calculated for copper wire sizes No. 18 AWG to No. 4/0 AWG and gives, for each size specified, the approximate distance in metres to the centre of distribution measured along the conductor run for a 1 per cent drop in voltage at a given current, with the conductor at a temperature of 60°C. Inductive reactance has not been included since it is a function of conductor size and spacing.

(2) The distances for a 3 per cent or 5 per cent voltage drop are 3 or 5 times those for a 1 per cent voltage drop,

(3) Since the distances in Table D3 are based on conductor resistances at 60°C, these distances must be multiplied by the correction factors on the following page according to the temperature rating of the conductor used and the percentage load with respect to the allowable ampacity determined in accordance with Rule 4-004 and Tables 1 to 5B.

(continued)

Rated Conductor Temperature	*Distance Correction Factor – Per Cent of Allowable Ampacity*						
	100	*90*	*80*	*70*	*60*	*50*	*40*
60°C	1.00	1.02	1.04	1.06	1.07	1.09	1.10
75°C	0.96	1.00	1.00	1.03	1.06	1.07	1.09
85–90°C	0.91	0.95	1.00	1.00	1.04	1.06	1.08
110°C	0.85	0.90	0.95	1.00	1.02	1.05	1.07
125°C	0.82	0.87	0.92	0.97	1.00	1.04	1.07
200°C	0.68	0.76	0.83	0.90	0.96	1.00	1.04

(4) For other nominal voltages multiply the distances in metres by the other nominal voltage (in volts) and divide by 120.

(5) Aluminum conductors have equivalent resistance per unit length to copper conductors which are smaller in area by two AWG sizes. Table D3 may be used for aluminum conductors because of this relationship, i.e., for No. 6 AWG aluminum use the distances listed for No. 8 AWG copper in Table D3. Similarly, for No. 2/0 AWG aluminum use the distances for No. 1 AWG copper.

(6) The distances and currents listed in Table D3 follow a pattern. When the current, for any conductor size, is increased by a factor of 10, the corresponding distance decreases by a factor of 10.
This relationship can be used when no value is shown in the Table. In that case, look at a 10 times larger current. The distance to the centre of distribution is then 10 times larger than the listed value.

(7) For multi-conductor cables, ensure wire size obtained from this Table is suitable for ampacity from Table 2 or 4, and Rule 4-004.

(8) For currents intermediate to listed values use the next higher current value.

(9) Example on use of Table:
Consider a two conductor circuit of No. 12 AWG copper NMD90 carrying 16A at nominal 240V under maximum ambient of 30°C. The maximum run distance from the centre of distribution to the load without exceeding a 3 per cent voltage drop is: Maximum run length for No. 12 AWG, 16A, 1 per cent voltage drop at nominal 120V from Table is: 6.1 m

(continued)

Distance Correction Factor to be used is:
From Table 2, allowable ampacity for 2 conductor No. 12 AWG NMD90 (90°C rating per Table 19) is 20A. The given current is 16A or 80 per cent $\left(\frac{16}{20}\right)$ of the allowable ampacity. The Distance Correction Factor to

be used, from Note (3), 90°C row, 80 percent column, is 1.00.

The maximum run length is:

$$6.1\ \text{m} \times 3(\%) \times 1.00 \times \frac{240\text{V}}{120\text{V}} = 37\text{m}$$

Beyond this distance a larger size of conductor is required, i.e., No. 10 AWG (30A allowable ampacity) beyond 37m up to and including 62m.

$$9.7\ \text{m} \times 3(\%) \times 1.06 \times \frac{240\text{V}}{120\text{V}} = 62\text{m}$$

SPLICING AND TERMINATING ALUMINUM CONDUCTOR

While aluminum conductor features easy handling during installation due to its light weight, care must be exercised during splicing and terminating in order to attain service continuity. The following procedure is to be followed during splicing and terminating:

(a) Compatibility of Fitting
Ensure that CSA-approved devices, terminal lugs or connectors are used with aluminum conductors. If the cable is to be terminated in a panelboard or switchgear, the terminal lug must be compatible with aluminum.

(b) Stripping of Insulation
Remove insulation from cable end by pencilling, either with a special tool or with a knife. Avoid ringing of insulation since the conductor may be nicked.

(c) Cleaning of Strands
The oxide film on aluminum conductor shall be removed by abrading with a wire brush before joining or terminating. The surface shall be cleaned and coated with a suitable compound. The purpose of sealing compound is twofold:
1. It assists in reducing the electrical resistance in the joint.
2. It seals the contact surfaces from air or moisture.

(d) Installation of Fitting
Insert cable onto connector or terminal lug and peform a secure connection. If a compression fitting is to be used, ensure that adequate tool and die are used. If a bolted connector is used, ensure that the appropriate amount of torque is applied. See Tables D6 and D7 in 1994 C.E. code.

(e) Solid Conductors
When solid conductors are used with a binding head screw make a 3/4 loop under the screw head and tighten securely. See Table D6 in 1994 C.E. code.

Note: The following rule is extracted from the 1994 C.E. code.

12-118 Termination and Splicing of Aluminum Conductors

(1) Adequate precaution shall be given to the termination and splicing of aluminum conductors including the removal of insulation and separators, the cleaning (wire brushing) of stranded conductors, and the compatibility and installation of fittings.

(2) A joint compound, capable of penetrating the oxide film and preventing its reforming, shall be used for terminating or splicing all sizes of stranded aluminum conductors,

unless the termination or splice is approved for use without compound and is so marked.

(3) Equipment connected to aluminum conductors shall be specifically approved for the purpose and be so marked except:
(a) where the equipment has only leads for connection to the supply; and
(b) equipment such as outlet boxes having only grounding terminals.

(4) Aluminum conductors shall not be terminated or spliced in wet locations unless the termination or splice is adequately protected against corrosion.

(5) Field-assembled connections between aluminum lugs and aluminum or copper bus bars or lugs, involving bolts or studs 3/8-inch diameter or larger, shall include as part of the joint any of the following means of allowing for expansion of the parts:
(a) a conical spring washer; or
(b) a helical spring washer of the heavy series, provided that a flat steel washer of thickness not less than one-sixth of the nominal diameter of the bolt or stud is interposed between the helical washer and any aluminum surface against which it would bear; or
(c) aluminum bolts or studs, provided that all the elements in the assembled connection are of aluminum.

(6) Connection of aluminum conductors to wiring devices having wire binding terminal screws, about which conductors can be looped under the head of the screw, shall be made by forming the conductor in a clockwise direction around the screw into three-fourths of a complete loop and only one conductor shall be connected to any one screw.

SHIELDING OF INSULATED CONDUCTORS

Purpose of Shielded Cable

(1) To protect personnel through reduction of shock hazard

(2) To prevent arcing from sheath to ground

(3) To provide uniform distribution of electrical stresses through the insulation

(4) To conform to C.E. Code, Part 1, Rule 36-104.

36-104 Shielding of Thermoset Insulated Conductors (see Appendix B)

(1) Except as permitted in Subrules (2), (3), and (4), shielding shall be provided over the insulation of each permanently installed conductor with or without fibrous covering or non-metallic jacket, operating at circuit voltages above 2000 V phase-to-phase.

(2) Shielding need not be provided for conductors having thermoset insulation where they are directly buried in the soil and operating at circuit voltages not exceeding 3000 V phase-to-phase, provided that insulation or the non-metallic jacket, if provided, is of ozone- and discharge-resistant type.

(3) Shielding need not be provided for conductors having thermoset insulation where the circuit voltage does not exceed 5000 V phase-to-phase, where the conductors are installed on insulators or in metal raceways and bound together, in switch rooms, transformer vaults, metal-enclosed switchgear assemblies and similar permanently dry locations where the conductor run does not exceed 15 m.

(4) Shielding need not be provided for conductors having thermoset insulations which are:
   (a) intended for operation at not more than 5000 V phase-to-phase; and
   (b) intended and installed for permanent duty; and
   (c) provided in either single- or multi-conductor cable construction with
      (i) a metal sheath; or
      (ii) metal armour of the interlocking type, the wire type of the flat tape type.

(5) Subject to Rule 10-302, metal sheaths, shielding, armour, conduit and fittings shall be bonded together and connected to ground.

HANDLING OF SHIELD

WARNING Any semi-conducting material over the insulation MUST be removed completely with the metal shielding tape. Underlying insulation surface MUST be thoroughly cleaned for jointing and terminating.

TERMINATIONS Shield should be terminated in a stress relief device, and adequate leakage distance provided from the live terminal.

JOINTS Electrical continuity of the metallic shield should be maintained by completely shielding the insulated joints.

GROUNDING Shield MUST be grounded at one, and preferably at several, convenient points. Ground shield at cable terminations wherever feasible. Use flexible grounding wire, ensure low resistance bond to shield, and watertight seal.

NOTE: Detailed instructions on request from Nexans Canada Inc.

TABLE 16

(See Rules 10-518, 10-814, 10-816, 10-906, 12-1814, 24-104, 24-202, 66-202, 68-058 and 68-406)
MINIMUM SIZE CONDUCTORS FOR BONDING RACEWAYS AND EQUIPMENT

Rating or Setting of Overcurrent Device in Circuit Ahead of Equipment, Conduit, etc. Not Exceeding . . . Amperes	*Size of Bonding Conductor*	
	Copper Wire, AWG	*Aluminum Wire, AWG*
20	14	12
30	12	10
40	10	8
60	10	8
100	8	6
200	6	4
300	4	2
400	3	1
500	2	0
600	1	00
800	0	000
1000	00	0000
1200	000	250 kcmil
1600	0000	350 kcmil
2000	250 kcmil	400 kcmil
2500	350 kcmil	500 kcmil
3000	400 kcmil	600 kcmil
4000	500 kcmil	800 kcmil
5000	700 kcmil	1000 kcmil
6000	800 kcmil	1250 kcmil

TABLE 17

(See Rules 10-204, 10-206 and 10-812)

MINIMUM SIZE OF GROUNDING CONDUCTOR FOR AC SYSTEMS OR COMMON GROUNDING CONDUCTOR

Ampacity of Largest Service Conductor or Equivalent for Multiple Conductors	*Size of Copper Grounding Conductor AWG*
100 or less	8
101 to 125	6
126 to 165	4
166 to 200	3
201 to 260	2
261 to 355	0
356 to 475	00
Over 475	000

NOTE: The ampacity of the largest service conductor, or equivalent if multiple conductors are used, is to be determined from the appropriate Code Table taking into consideration the number of conductors in the conduit and the type of insulation.

TABLE 18

(See Rule 10-812)

MINIMUM SIZE OF GROUNDING CONDUCTOR FOR SERVICE RACEWAY AND SERVICE EQUIPMENT

Ampacity of Largest Service Conductors or Equivalent for Multiple Conductors Not Exceeding . . . Amperes	*Size of Grounding Conductor*		
	Copper Wire AWG	*Metal Conduit or Pipe Inches*	*Electrical Metallic Tubing Inches*
60	8	¾	1
100	8	1	1¼
200	6	1¼	1½
400	3	2½	2½
600	1	3	4
800	0	4	4
Over 800	00	6	

4-010 Uses of Flexible Cord

(1) Flexible cord shall be of the types specified in Table 11 for each specific condition of use.

(2) Flexible cord may be used for:
   (a) electrical equipment for household or similar use having a rating of 15 A or less at voltages not exceeding 250 V and which is intended to be:
      (i) moved from place to place; or
      (ii) detachably connected according to a Part II Standard; and
   (b) electrical equipment for industrial use which must be capable of being moved from place to place for operation; and
   (c) pendants; and
   (d) wiring of cranes and hoists; and
   (e) the connection of stationary equipment to facilitate its interchange, where a deviation is allowed in accordance with Rule 2-030; and
   (f) the prevention of transmission of noise and vibration; and
   (g) the connection of electrical components between which relative motion is necessary; and
   (h) the connection of appliances such as ranges and clothes dryers; and
   (i) both connection, using an attachment plug, and interconnection of data processing systems, provided the cord is of the extra-hard usage type.

(3) Flexible cord shall not be used:
   (a) as a substitute for the fixed wiring of structures and shall not be:
      (i) permanently secured to any structural member; or
      (ii) run through holes in walls, ceilings, or floors; or
      (iii) run through doorways, windows, or similar openings;
   (b) at temperatures above the temperature rating of the cord or at temperatures sufficiently low as to be liable to result in damage to the insulation or overall covering;
   (c) for the suspension of any device weighing more than 2.3 kg, unless the cord and device assembly are marked as capable of supporting a weight up to 11 kg.

(4) Flexible cord shall be protected by an insulating bushing or in some other acceptable manner where it enters or passes through the enclosure wall or the partitioning of a device or enters a lampholder.

(5) Where a flexible cord is used as an extension cord or to plug into an appliance or other device, no live parts shall be exposed when one end is connected to a source of supply and the other end is free.

4-014 Ampacity of Flexible Cords

(1) The maximum current which two or more copper conductors of given size contained in a flexible cord may carry shall be as follows:
   (a) 2 or 3 conductors, as specified in Table 12; and
   (b) 4, 5, or 6 conductors, 80% of that specified in Table 12; and
   (c) 7 to 24 conductors inclusive, 70% of that specified in Table 12; and
   (d) 25 to 42 conductors inclusive, 60% of that specified in Table 12; and
   (e) 43 or more conductors, 50%, of that specified in Table 12.

(2) Conductors used for bonding equipment to ground and a conductor used as a neutral conductor, which carries only the unbalanced current from other conductors, as in the case of a normally balanced circuit of three or more conductors, are not counted in determining ampacities.

TABLE 12

(See Rules 4-014 and 4-018)

ALLOWABLE AMPACITY OF FLEXIBLE CORD AND EQUIPMENT WIRE

(Based on Ambient Temperature of 30°C) (See Appendix B)

Size AWG	Allowable Ampacity								
	Flexible Cord							Equipment Wire	
	Tinsel Cords	Christmas-Tree Cord		Elevator Cable	Types PXWT, SV, SVO, SVOO, SJ‡, SJO‡, SJOO‡, SJOW, SJOOW, S‡, SO‡, SOO‡, SOW, SOOW, SPT-1, SPT-2, SPT-3, SVT**, SVTO**, SVTOO**, SJT‡, SJTO‡, SJTOO‡, ST‡, STO‡, STOO‡, SJTW, SJTOW, SJTOOW, STW, STOW, STOOW		Types HSJO‡* HPN, DRT	Types TXF, TXFW	Types GTF*, TEW*, SEW*, REW*, TEWN*, SEWF*, TBS*, SIS*
	Types TPT, TST	Type CXWT	Type PXT	Types E, EO, ETT, ETP	2 Current. Carrying Conductors	3 Current-Carrying Conductors*			
27	0.5	—	—	—	—	—	—	—	—
26	—	—	—	—-	—	—	—	—	1
24	—	—	—	—	—	—	—	—	2
22	—	—	—	—	—	—	—	—	3
20	—	—	2	—	2	—	—	2	4
18	—	5	—	5	10	7	10	5	6
16	—	7	—-	7	13	10	15	7	8
14	—	—	—	15	18	15	20	—	17
12	—	—	—	20	25	20	25	—	23
10	—	—	—	25	30	25	30†	—	28

(continued)

TABLE 12 *(continued)*

8	—	—	—	35	40	35	40†	—	40
6	—	—	—	45	55	45	50†	—	55
4	—	—	—	60	70	60	60†	—	70
3	—	—	—	—	—	—	—	—	80
2	—	—	—	80	95	80	—	—	95
1	—	—	—	—	—	—	—	—	110
1/0	—	—	—	—	—	—	—	—	125
2/0	—	—	—	—	—	—	—	—	145
3/0	—	—	—	—	—	—	—	—	165
4/0	—	—	—	—	—	—	—	—	195

* The derating factors of Rule 4-014(1)(b), (c), (d), and (e) are to be applied to these values for the types listed in this column.
† These current ratings are for Type DRT household dryer and range cables only.

‡ Types HSJO, SJ, SJO, SJOO, SJT, SJTO, SJTOO, S, SO, SOO, ST, STO, and STOO flexible cords are now recognied only as components of equipment.

** Type SVT, SVTO, SVTOO, SV, SVO, or SVOO 2 conductor No. 17 AWG is recognized with an ampacity of 12 A as a component of vacuum cleaners with retractable power supply cords.

NOTES: (1) It is intended that this table be used in conjunction with applicable end-use product standards to ensure selection of the proper size and type.

(2) TXF is recognized in No. 20 AWG only. TXFW is recognized in size No. 16 and 18 AWG.

TABLE 44

(See Rules 28-010 and 28-704)

THREE PHASE AC MOTOR FULL-LOAD CURRENT IN AMPERES (see notes (1), (2), (3) and (5))

Motor Rating	*Induction Type, Squirrel-Cage and Wound Rotor Amperes*					*Synchronous Type, Unity Power Factor (see note (4)) Amperes*			
HP	*115V*	*230V*	*460V*	*575V*	*2300V*	*230V*	*460V*	*575V*	*2300V*
½	4	2	1	.8	—	—	—	—	—
¾	5.6	2.8	1.4	1.1	—	—	—	—	—
1	7.2	3.6	1.8	1.4	—	—	—	—	—
1½	10.4	5.2	2.6	2.1	—	—	—	—	—
2	13.6	6.8	3.4	2.7	—	—	—	—	—
3	—	9.6	4.8	3.9	—	—	—	—	—
5	—	15.2	7.6	6.1	—	—	—	—	—
7½	—	22	11	9	—	—	—	—	—
10	—	28	14	11	—	—	—	—	—
15	—	42	21	17	—	—	—	—	—
20	—	54	27	22	—	—	—	—	—
25	—	68	34	27	—	54	27	22	—
30	—	80	40	32	—	65	33	26	—
40	—	104	52	41	—	86	43	35	—
50	—	130	65	52	—	108	54	44	—
60	—	154	77	62	16	128	64	51	12
75	—	192	96	77	20	161	81	65	15
100	—	248	124	99	26	211	106	85	20
125	—	312	156	125	31	264	132	106	25
150	—	360	180	144	37	—	158	127	30
200	—	480	240	192	49	—	210	168	40

(continued)

Notes to Table 44

1. For full-load currents of 208 and 200 V motors, increase the corresponding 230 V motor full-load current by 10% and 15%, respectively.
2. These values of motor full-load current are to be used as guides only. Where exact values are required (e.g., for motor protection), always use those appearing on the motor nameplate.
3. These values of motor full-load current are for motors running at speeds usual for belted motors and motors with normal torque characteristics. Motors built for especially Iow speeds or high torques may require more running current, and multi-speed motors will have full load current varying with speed, in which case the nameplate current rating shall be used.
4. For 90% and 80% P.F. the above figures shall be multiplied by 1.1 and 1.25 respectively.
5. The voltages listed are rated motor voltages. Corresponding Nominal System Voltages are 120, 240, 480 and 600 V. Refer to CSA Standard CAN3-C235-83. Preferred Voltage Levels for AC Systems, 0 to 50,000 Volts.

TABLE 45

(See Rules 28-010 and 28-704)

SINGLE PHASE AC MOTORS FULL-LOAD CURRENT IN AMPERES (see notes 1 to 4)

HP Rating	*115V*	*230V*
1/6	4.4	2.2
1/4	5.8	2.9
1/3	7.2	3.6
1/2	9.8	4.9
3/4	13.8	6.9
1	16	8
1-1/2	20	10
2	24	12
3	34	17
5	56	28
7-1/2	80	40
10	100	50

Notes to Table 45

1. For full-load currents of 208 and 200 volt motors, increase the corresponding 230 volt motor full-load current by 10% and 15% respectively
2. These values of motor full-load current are to be used as guides only. Where exact values are required (eg, for motor protection), always use those appearing on the motor nameplate.
3 These values of full-load current are for motors running at usual speeds and motors with normal torque characteristics. Motors built for especially low speeds or high torques may have higher full-load currents, and multi-speed motors will have full-load current varying with speed, in which case the nameplate current ratings shall be used.
4 The voltages listed are rated motor voltages. Corresponding Nominal System Voltages are 120 and 240 volts.

Refer to CSA Standard CAN3-C235-83. Preferred Voltage Levels for AC Systems 0-50,000 Volts.

ALTERNATING AND DIRECT CURRENT FORMULAE

To Find	*Direct Current*	*Alternating Current*		
		Single Phase	**Two Phase, Four Wire*	*Three Phase*
Amperes (**I**) When Horsepower (hp) is known	$\mathbf{I} = \frac{746 \times hp}{E \times eff}$	$\mathbf{I} = \frac{746 \times hp}{E \times eff \times pf}$	$\mathbf{I} = \frac{746 \times hp}{2 \times E \times eff \times pf}$	$\mathbf{I} = \frac{746 \times hp}{1.73 \times E \times eff \times pf}$
Amperes (**I**) When Kilowatts (kw) is known	$\mathbf{I} = \frac{1000 \times kw}{E}$	$\mathbf{I} = \frac{1000 \times kw}{E \times pf}$	$\mathbf{I} = \frac{1000 \times kw}{2 \times E \times pf}$	$\mathbf{I} = \frac{1000 \times kw}{1.73 \times E \times pf}$
Amperes (**I**) When Kilovolt-amperes (kva) is known		$\mathbf{I} = \frac{1000 \times kva}{E}$	$\mathbf{I} = \frac{1000 \times kva}{2 \times E}$	$\mathbf{I} = \frac{1000 \times kva}{1.73 \times E}$
Kilowatts (kw) Input	$kw = \frac{\mathbf{I} \times E}{1000}$	$kw = \frac{\mathbf{I} \times E \times pf}{1000}$	$kw = \frac{\mathbf{I} \times E \times 2 \times pf}{1000}$	$kw = \frac{\mathbf{I} \times E \times 1.73 \times pf}{1000}$
Kilovolt-amperes (kva)		$kva = \frac{\mathbf{I} \times E}{1000}$	$kva = \frac{2 \times \mathbf{I} \times E}{1000}$	$kva = \frac{1.73 \times \mathbf{I} \times E}{1000}$
Horsepower (hp) Output	$hp = \frac{\mathbf{I} \times E \times eff}{746}$	$hp = \frac{\mathbf{I} \times E \times eff \times pf}{746}$	$hp = \frac{\mathbf{I} \times E \times 2 \times eff \times pf}{746}$	$hp = \frac{\mathbf{I} \times E \times 1.73 \times eff \times pf}{746}$

*For two phase, three wire, balanced circuits the amperes in common conductor = 1.41 × that in either of the other two.

I = Amperes
E = Volts (line to line)
pf = Power Factor in decimals
eff = Efficiency in decimals
kw = Kilowatt Input
kva = Kilovolt–Ampere Input
hp = Horsepower Output

CSA WIRE AND CABLE STANDARDS

C22.2 No. 0-M91	General Requirements-Canadian Electrical Code Part 11
C22.2 No. 0.8-M1986	Safety Functions Incorporating Electronic Technology
C22.2 No. 0.12-M1985	Wiring Space and Wiring Bending Space in Enclosures for Equipment Rated 750 Volts or less
C22.2 No. 0.3-92	Test Methods for Electrical Wires and Cables
C22.2 No. 16-M1986	Insulated Conductors for Power-Operated Electronic Devices
C22.2 No. 17-1973(R1992)	Cable for Luminous-Tube Signs and for Oil and Gas-Burner Ignition Equipment
C22.2 No. 18-M92	Outlet Boxes, Conduit Boxes, and fittings
C22.2 No. 21-90	Cord Sets and Power Supply Cords
C22.2 No. 26-1952(R1993)	Wireways, Auxiliary Gutters, and Associated Fittings
C22.2 No. 35-M1987(R1993)	Extra-Low-Voltage Control Circuit Cables, Low-Energy Control Cable, and Extra-Low-Voltage Control Cable
C22.2 No. 38-95	Thermoset Insulated Wires and Cables
C22.2 No. 41-M1987(R1993)	Grounding and Bonding Equipment
C22.2 No. 42-M1984	General Use Receptacles, Attachment Plugs, and Similar Wiring Devices
C22.2 No. 48-M90	Non-metallic Sheathed Cable
C22.2 No. 49-92	Flexible Cords and Cable
C22.2 No. 51-M95	Armoured Cables
C22.2 No. 52-96	Underground Service-Entrance Cables
C22.2 No. 56-M1977(R1992)	Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit
C22.2 No. 62-93	Surface Raceways and Lighting Fixture Raceways and Fittings
C22.2 No. 65-93	Wire Connectors
C22.2 No. 75-M1983(R1992)	Thermoplastic-Insulated Wires and Cables
C22.2 No. 96-M92	Portable Power Cables

(continued)

CSA WIRE AND CABLE STANDARDS *(continued)*

C22.2 No. 116-1980(R1992)	Coil-Lead Wires
C22.2 No. 123-96	Aluminum Sheathed Cables
C22.2 No. 124-M1986(R1992)	Mineral-Insulated Cables
C22.2 No. 126-M91	Cable Tray Systems
C22.2 No. 127-95	Equipment/Lead Wires
C22.2 No. 129-M1976(R1994)	Neutral Supported Cable
C22.2 No. 131-M89(R1994)	Type TECK90 Cable
C22.2 No. 138-M1989(R1994)	Heat Tracing Cable and Cable Sets for Use in Hazardous Locations
C22.2 No. 174-M1984(R1992)	Cables and Cable Glands for Use in Hazardous Locations
C22.2 No. 179-M1987(R1993)	Airport Series Lighting Cables
C22.2 No. 188-M1983(R1983)	Splicing Wire and Cable Connectors
C22.2 No. 197-M1983(R1992)	PVC Insulating Tape
C22.2 No. 198.2-M1986(R1992)	Underground Cable Splicing Kits
C22.2 No. 208-M1986(R1992)	Fire Alarm and Signal Cable
C22.2 No. 210.2-M90	Appliance Wiring Material Products
C22.2 No. 211.1-M1984(R1992)	Rigid Types EBI and DB2/ES2 PVC Conduit
C22.2 No. 211.2-M1984(R1992)	Rigid PVC (unplasticized) Conduit
C22.2 No. 214-94	Communication Cables
C22.2 No. 230-M1988(R1993)	Tray Cables
C22.2 No. 232-M1988(R1994)	Optical Fibre Cables
C22.2 No. 239-M91	Control and Instrumentation Cables

CABLE PRODUCTS

ALUMINUM SHEATHED CABLE
APPLIANCE CORDS
ARMOURED CABLE
BARE CONDUCTOR, COPPER, COPPERPLY, ALUMINUM, ALUMINUM ALLOY, ACSR (aluminum conductor steel reinforced)
BLASTING WIRE
BUILDING WIRES
BURIED DISTRIBUTION WIRE
CANADEX* (NMD90)
CATEGORY 3 & 5 P.W.C.
CHRISTMAS TREE WIRE
COAXIAL CABLE (& TWIN AXIAL)
COIL LEAD WIRE
COMPUTER CABLE
CONCENTRIC (neutral) CABLE
CONDUIT WIRE (RW90, TW, TWH, T90/ TWN75/THHN/THWN)
CONTROL CABLE
CORFLEX* CONNECTORS
CORFLEX* (corrugated aluminum sheathed)
DATA CONTROL CABLE
DATATRANS*
DISTRIBUTION FRAME WIRE
ELECTRONIC INSTRUMENTATION CABLE
EQUIPMENT WIRE
EXELENE* (cross linked polyethylene)
FIBER OPTIC CABLES & ACCESSORIES
FIGURE 8 SELF SUPPORTING
FIXTURE WIRE
FLEXIBLE CORDS
HEATER CORDS (HPN)
HEATEX* (NMD90)
HIGH VOLTAGE CABLE
HPOF (high pressure oil filled) PIPE TYPE CABLE
LAMP CORD
LINE WIRE
LOCOMOTIVE CABLE
LOW VOLTAGE CONTROL WIRES
MACHINE TOOL WIRE
MAGNET WIRE
MERCHANT MARINE CABLES
MOTOR LEAD WIRE
NAVY CABLES
NEUTRAL SUPPORTED SERVICE DROP CABLES
NON-METALLIC SHEATHED
NMD90 CANADEX*
PILC (paper insulated lead covered) CABLE
PORTABLE POWER CORDS
POTHEADS
POWER CABLE ACCESSORIES, OIL HANDLING, ETC.
POWER SUPPLY CABLES
RAILWAY SIGNAL CABLES
RH/RHH/RHW/XHHW
RURAL DISTRIBUTION WIRE
SELF-C0NTAINED OIL FILLED CABLES
SELF-DAMPING CONDUCTOR
SIGNAL CABLE
SPLICES
STATION WIRE
SUBMERSIBLE PUMP CABLE
SUPERVEX* (NMWU)
SWITCHBOARD WIRE
TECK CABLE
TERMINATORS
THERMOCOUPLE WIRE
TRANSFORMER LEAD PAPER INSULATED
TRAY CABLE
TROLLEY WIRE
UNDERGROUND SERVICE ENTRANCE CABLE
WELDING CABLE

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SI PREFIXES

Multiplying factor		*Prefix*	*Symbol*
1 000 000 000 000	$= 10^{12}$	tera	T
1 000 000 000	$= 10^{9}$	giga	G
1 000 000	$= 10^{6}$	mega	M
1 000	$= 10^{3}$	kilo	k
100	$= 10^{2}$	hecto	h
10	$= 10^{1}$	deca	da
0.1	$= 10^{-1}$	deci	d
0.01	$= 10^{-2}$	centi	c
0.001	$= 10^{-3}$	milli	m
0.000 001	$= 10^{-6}$	micro	m
0.000 000 001	$= 10^{-9}$	nano	n
0.000 000 000 001	$= 10^{-12}$	pico	p
0.000 000 000 000 001	$= 10^{-15}$	femto	f
0.000 000 000 000 000 001	$= 10^{-18}$	atto	a

TEMPERATURE CONVERSION

°F to °C: °C = (°F minus 32) x $^{5}/_{9}$

°C to °F: °F = (°C x $^{9}/_{5}$) plus 32

WIRE AND CABLE METRIC CONVERSIONS

DIMENSIONS

Length
mils × 0.0254 = mm (millimetres)
inches × 25.4 = mm
feet × 0.3048 = m (metres)
miles × 1.609344 = km (kilometres)

Area
circular mils × 0.0005067 = mm^2
(square millimetres)
sq. in × 645.16 = mm^2
sq. ft. × 0.092903 = m^2
(square metres)
sq. yd. × 0.836127 = m^2
sq. mi. × 2.58999 = km^2
(square kilometres)

Volume
cu. in. × 16.387 = cm^3
(cubic centimetres)
cu. ft. × 0.028317 = m^3
(cubic metres)
gallons × 4.54609 = L (litres)
U.S. gal. × 3.7854 = L (litres)

MASS

pounds × 0.45359 = kg (kilograms)
tons (2000 lb) × 0.907185 = t
(metric tonnes)

Mass per unit length
lb/1000 ft. × 1.48816 = kg/km
(kilograms per kilometre)
lb/mi × 0.28185 = kg/km

Solid wire weight
mm^2 × 8.89 = kg/km (for copper)
mm^2 × 2.70 = kg/km (for aluminum)
mm^2 × 7.83 = kg/km (for steel)

FORCE or TENSION

pounds (force) × 4.448 = N
(newtons)
mass (in kg) × 9.8066 = N
(weight at or near sea level)

Force per unit area
(stress, pressure, tensile strength, etc.)
lbf/in^2 = (psi) × 6.895 = kPa
(kilopascals)
lbf/in^2 × 0.006895 = MPa
(megapascals)
N/mm^2 = MPa

Note
Kilopascals are used generally for fluid pressures. Megapascals are used generally for stresses in materials, i.e. for tensile stress, modulus of elasticity, etc.

STRANDED BARE COPPER AND ALUMINUM CONDUCTORS

Conductor				Wire			Nominal Conductor Diameter					
Size	Area			No.	Diameter		Class B Standard		Compressed Round		Compact Round	
AWG	Circ. Mils	mm^2	sq. in.		mm	in.	mm	in.	mm	in.	mm	in.
20	1020	0.519	.00080	7	0.31	.0121	0.92	.036				
18	1620	0.823	.00128	7	0.39	.0152	1.16	.046				
16	2580	1.31	.00203	7	0.49	.0192	1.46	.058				
14	4110	2.08	.00323	7	0.61	.0242	1.84	.073	1.78	.071		
12	6530	3.31	.00513	7	0.77	.0305	2.32	.092	2.25	.089		
10	10380	5.26	.00816	7	0.98	.0385	2.95	.116	2.86	.113		
8	16510	8.37	.01297	7	1.23	.0486	3.71	.146	3.60	.142	3.40	.134
6	26240	13.30	.02061	7	1.55	.0612	4.67	.184	4.53	.179	4.29	.169
4	41740	21.15	.03278	7	1.96	.0772	5.89	.232	5.71	.225	5.41	.213
3	52620	26.66	.04133	7	2.30	.0867	6.60	.260	6.40	.252	6.05	.238
2	66360	33.62	.05212	7	2.47	.0974	7.42	.292	7.20	.282	6.87	.268
1	83690	42.41	.06573	19(18)*	1.69	.0664	8.43	.332	8.18	.322	7.60	.299
1/0	105600	53.51	.08291	19(18)*	1.89	.0745	9.47	.373	9.19	.362	8.55	.336
2/0	133100	67.44	.1045	19(18)*	2.13	.0837	10.64	.418	10.32	.406	9.57	.376
3/0	167800	85.02	.1318	19(18)*	2.39	.0940	11.94	.470	11.58	.456	10.8	.423
4/0	211600	107.22	.1662	19(18)*	2.68	.1055	13.41	.528	13.00	.512	12.1	.475

(continued)

STRANDED BARE COPPER AND ALUMINUM CONDUCTORS *(continued)*

Conductor				Wire			Nominal Conductor Diameter					
Size	Area			No.	Diameter		Class B Standard		Compressed Round		Compact Round	
MCM	Circ. Mils	mm^2	sq. in.		mm	in.	mm	in.	mm	in.	mm	in.
250		126.68	.1963	37(36)*	2.09	.0822	14.60	.575	14.16	.558	13.2	.520
300		152.01	.2356	37(36)*	2.31	.0900	16.00	.630	15.52	.611	14.5	.570
350		177.34	.2749	37(36)*	2.47	.0973	17.30	.681	16.78	.661	15.7	.616
400		202.68	.314	37(36)*	2.64	.1040	18.49	.728	17.94	.706	16.7	.659
500		253.36	.3927	37(36)*	2.95	.1162	20.65	.813	20.03	.789	18.7	.736
600		304.02	.4712	61(58)*	2.52	.0992	22.68	.893	22.00	.866	20.7	.813
750		380.03	.5890	61(58)*	2.82	.1109	25.35	.998	24.59	.968	23.0	.908
1000		506.70	.7854	61(58)*	3.25	.1280	29.26	1.152	23.38	1.117	26.9	1.060
1250		633.38	.9817	91	2.98	.1172	32.47	1.289	31.76	1.250		
1500		760.05	1.178	91	3.26	.1284	35.86	1.412	34.78	1.370		
1750		866.73	1.374	127	2.98	.1174	38.76	1.526	37.60	1.479		
2000		1013.40	1.571	127	3.19	.1255	41.45	1.632	40.21	1.583		

* Reduced number of wires for compact strandings shown in parentheses.

STRANDED BARE COPPER AND ALUMINUM CONDUCTORS *(continued)*

Conductor Size AWG	*APPROXIMATE NET WEIGHT**				*AVERAGE D.C. RESISTANCE* –25°C*			
	Kg per 1000 m		*Lbs per 1000 ft.*		*Ohms per 1000 m*		*Ohms per 1000 ft.*	
	Copper	*Aluminum*	*Copper*	*Aluminum*	*Copper*	*Aluminum*	*Copper*	*Aluminum*
20	4.70		3.15		34.6		10.5	
18	7.46		5.02		21.8		6.64	
16	11.9		7.97		13.7		4.18	
14	18.9		12.7		8.61		2.63	
12	30.0	9.12	20.2	6.13	5.42	8.89	1.65	2.71
10	47.7	14.5	32.1	9.75	3.41	5.59	1.04	1.70
8	75.9	23.1	51.0	15.5	2.14	3.52	.653	1.07
6	121	36.7	81.0	24.6	1.35	2.21	.411	.674
4	192	58.3	129	39.2	0.848	1.39	.258	.424
3	242	73.5	162	49.4	0.673	1.10	.205	.336
2	305	92.7	205	62.3	0.553	0.875	.163	.267
1	385	117	259	78.6	0.423	0.694	.129	.211
1/0	485	147	326	99.1	0.335	0.550	.102	.168
2/0	611	186	411	125	0.266	0.436	.0811	.133
3/0	771	234	518	157	0.211	0.436	.0643	.105
4/0	972	296	653	199	0.167	0.274	.0510	.0836

(continued) 94

STRANDED BARE COPPER AND ALUMINUM CONDUCTORS *(continued)*

Conductor Size MCM	*APPROXIMATE NET WEIGHT**				*AVERAGE D.C. RESISTANCE* –25°C*			
	Kg per 1000 m		*Lbs per 1000 ft.*		*Ohms per 1000 m*		*Ohms per 1000 ft.*	
	Copper	*Aluminum*	*Copper*	*Aluminum*	*Copper*	*Aluminum*	*Copper*	*Aluminum*
250	1150	349	772	235	0.142	0.232	.0432	.0708
300	1380	419	925	282	0.118	0.194	.0360	.0590
350	1610	489	1080	329	0.101	0.166	.0308	.0506
400	1840	559	1240	376	0.0885	0.145	.0270	.0442
500	2300	699	1540	469	0.0708	0.116	.0216	.0354
600	2760	838	1850	563	0.0590	0.0967	.0180	.0295
750	3450	1050	2320	704	0.0472	0.0774	.0144	.0236
1000	4590	1400	3090	939	0.0354	0.0580	.0108	.0177
1250	5740	1750	3860	1170	0.0283	0.0464	.00863	.0142
1500	6890	2100	4630	1410	0.0236	0.0387	.00719	.0118
1750	8040	2440	5400	1640	0.0202	0.0332	.00616	.0101
2000	9091	2790	6180	1880	0.0177	0.0290	.00539	.00885

* Approximate weights and average D.C. resistances are considered to apply to all types of strands.
Conductor data and metric equivalents in these tables are based where possible on E-FC recommendations current at time of compilation, otherwise on published ICEA standards.

FIRE RATED CABLES FT1 & FT4

The Canadian Electrical Code, published by the Canadian Standards Association, is the national safety code for electrical installations that is adopted into law by each province and territory with amendments or local rules. The 1998 edition of the Code includes references to a stringent series of tests developed for flame testing of wires and cables.Cables will in future be marked from “FT1” to “FT4”,depending on which of the specified flame test requirements they fulfill.

“FT1” Testing

The FT1 test procedure is known as the “Vertical Test” (published in CSA Standard C22.2 No. 0.3 Test Methods for Electrical Wires and Cables, para 4.11.1).

Cables are subjected to 5-15 second applications of a specified flame. Burning shall cease within 60 s,and not more than 25% of the extended portion of the indicator shall be burned.

“FT4” Testing

The FT4 test procedure is known as the Vertical Flame Test-Cables in trays (published in CSA Standard C22.2 No. 0.3 Test Methods for Electrical Wires and Cables para 4.11.4).

Cables are mounted on a vertical tray and exposed for 20 minutes to a 70,000 Btu/h flame.The resulting char distance must not be greater than 1.5 metres from the point of flame application.

An extract from Appendix “B” of the 1998 Canadian Electrical Code follows.It explains the application of cables bearing the FT1 and FT4 designations.

2-126 The flame spread requirements for wiring and cables in buildings are located in the 1995 Edition of the National Building Code as follows:

Combustible building construction	ARTICLE 3.1.4.3
Noncombustible building construction	ARTICLE 3.1.5.17
Plenum spaces in buildings	ARTICLE 3.5.4.3

The markings for wires and cables meeting the flame spread requirements of the National Building Code of Canada (without additional fire protection) are:

*FT1 – Wires and cables that are suitable for installation in buildings of combustible construction; and

**FT4 – Wires and cables that are suitable for installation in:

(a) Buildings of noncombustible and combustible construction; and

(b) Spaces between a ceiling and floor, or ceiling and roof, that may be used as a plenum in buildings of combustible or noncombustible construction.

*Communication and optical fibre cables marked MPP, CMP, MPR, CMR, MPG, CMG, MP, CM, CMX, CMH, OFNP, OFCP, OFNR, OFCR, OFNG, OFCG, OFN, OFC, OFNH, OFCH, and communications and optical fibre cables marked FT4 have been found to meet the standard criteria for FT1.

**Communication and optical fibre cables marked MPP, CMP, MPR, CMR, MPG, CMG, OFNP, OFCP, OFNR, OFCR, OFNG, and OFCG have been found to meet the standard criteria of FT4.

Wires and cables with combustible outer jackets or sheaths that do not meet the above classifications should be located in noncombustible raceways, masonry walls, or concrete slabs.