भारतीय मानक
Indian Standard

IS 3961 (Part 2) : 2017
(Reaffirmed 2024)

केबलों के लिए अनुशंसित करेंट रेटिंग

भाग 2 पी वी सी उष्मारोधित एवं पी वी सी आवरित हैवी डयूटी केबलें

(पहला पुनरीक्षण)

Recommended Current Ratings for Cables

Part 2 PVC Insulated and PVC Sheathed Heavy Duty Cables

(First Revision)

ICS 29.080.20

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Power Cables Sectional Committee, ETD 09

FOREWORD

This Indian Standard (Part 2) (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Power Cables Sectional Committee had been approved by the Electrotechnical Division Council.

This standard was first published in 1967. This standard has been revised to take into account the changes made in subsequent revision of IS 1554 (Part 1) : 1988 'PVC insulated (heavy duty) electric cables : Part 1 For working voltages upto and including 1 100 B (*third revision*)'. The current ratings of general purpose 70°C PVC insulated cables as well as heat resisting 85°C PVC insulated cables are covered in this revision.

This standard has been drawn up to provide to the users general guidance for loading of cables. The over-loading of cables will reduce the life expectancy of cable and at the same time under-loading it will mean uneconomic utilization of its capacity. Depending upon the loading cycle met with in practice, the installation engineer may decide the economic loading of cables.

The current ratings have been calculated using the methods set out in IEC 60287. The conductor temperature limit of 70°C and 85°C for the calculation of current ratings has been taken from the IS 1554 (Part 1).

The permissible current ratings have been specified for three commonly adopted conditions of installations, namely, laid direct in ground, laid in ducts, and for cables in air.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded value should be the same as that of the specified value in this standard.

Indian Standard

RECOMMENDED CURRENT RATINGS FOR CABLES

PART 2 PVC INSULATED AND PVC SHEATHED HEAVY DUTY CABLES

(First Revision)

1 SCOPE

This standard (Part 2) covers recommended current ratings for PVC insulated and PVC sheathed heavy duty cables covered by IS 1554 (Part 1) : 1988 PVC insulated (heavy duty) electric cables : Part 1 For working voltages up to and including 1 100 V (*Third Revision*), either laid in ground, in ducts or in air.

2 BASIC ASSUMPTIONS

The current ratings given in Tables 1 to 12 in the standard are based on the following assumptions:

a) Maximum conductor temperature:
   1) General purpose PVC insulation : 70°C
   2) Heat resisting PVC insulation : 85°C
b) Thermal resistivity of soil : 1.5 K.m/W
c) Ground temperature : 30°C
d) Ambient air temperature : 40°C
e) Depth of laying (measured the cable axis or centre of the trefoil group) : 750 mm to

3 METHODS OF INSTALLATION

The current ratings given in this standard are for methods of installation as given in the following table:

Type of Cable (1)	*Type of Installation* (2)	*Method of Installation* (3)
Single-core	a) Laid direct in the ground	1) Three cables in trefoil groups touching
		2) Two cables laid flat touching
	b) In ducts	1) Three cables in trefoil ducts touching
		2) Two cables laid flat ducts touching
	c) In air	1) Three cables in trefoil groups touching
		2) Two cables flat touching.
Multi-core		Installed singly

4 CABLES IN BURIED TROUGHS FILLED WITH SAND

Where cables are installed in sand-filled troughs, either completely buried or with cover flush with the ground surface, there is danger that the sand shall dry out and remain dry for long periods. The cable external thermal resistance may then be very high and the cable may reach undesirably high temperatures. It is advisable to adopt the current ratings for cables buried direct using a value of 2.5 K.m/W for the thermal resistivity of the sand filling unless a specially selected filling has been used for which the dry resistivity is known.

5 CABLES IN UNVENTILATED FORMED TRENCHES/ TUNNELS

When cables are installed in unventilated formed trenches or tunnels, it is advisable to adopt the current ratings for cables laid in ducts.

6 SIZES OF THE DUCTS

The current ratings specified in the tables apply to cables laid in earthenware ducts with a thermal resistivity of 1.2 K.m/W. The ratings are based on the assumption that the ducts are air filled. If the ducts have been filled with a material such as bentonite, then it is usual to adopt the current ratings for cables buried direct.

The combinations of duct and cable dimensions assumed are shown below:

Overall Cable Diameter mm	*Inside Duct Diameter* mm	*Outside Duct Diameter* mm
Up to and including 65	100	130
Above 65 and up to and including 90	125	160
Above 90 and up to and including 115	150	190

7 CABLES IN AIR

Single core cables are assumed to be spaced at least 0.5 times the cable diameter from any vertical surface and installed on brackets or ladder racks. Multi-core

cables installed in air spaced at least 0.3 times the cable diameter from any vertical surface.

8 RATING FACTORS

The current ratings given in the respective tables apply to continuous loading of cables at a rated frequency of 50 Hz under the specific conditions of installation mentioned in **3** and **4**. For the various rating factors which may have to be used under different conditions, reference shall be made to appropriate from Tables 13 to 35.

When a number of circuits are installed in close proximity the current rating should be reduced by the appropriate factor from Tables 18 to 35.

These factors should also be applied to groups of parallel cables forming the same circuit. In such cases, attention should also be given to the arrangement of the cables to ensure that the load current is shared equally between the parallel cables.

Table 1 Current Ratings (a.c.) for Two Single-Core General Purpose 70°C PVC Insulated Cables, 1 100 V

(*Clause* 2)

Sl No.	Nominal Area of Conductor	Buried Direct in the Ground		In Single-Way Ducts		In Air	
		Copper	Aluminium	Copper	Aluminium	Copper	Aluminium
	mm²	A	A	A	A	A	A
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	1.5	26	21	23	18	21	17
ii)	2.5	35	27	29	23	28	21
iii)	4	45	35	38	30	37	29
iv)	6	56	46	47	39	46	38
v)	10	74	57	63	48	63	48
vi)	16	95	74	80	62	82	63
vii)	25	123	95	103	80	109	85
viii)	35	147	114	123	96	133	103
ix)	50	173	134	145	113	160	124
x)	70	213	165	178	138	202	157
xi)	95	259	201	213	165	254	198
xii)	120	295	230	242	188	295	230
xiii)	150	329	256	269	210	335	261
xiv)	185	371	290	303	237	386	302
xv)	240	427	335	348	274	454	357
xvi)	300	477	377	389	307	518	409
xvii)	400	538	430	437	349	600	479
xviii)	500	600	486	486	395	684	554
xix)	630	662	547	535	443	773	638
xx)	800	718	609	579	492	859	727
xxi)	1 000	763	667	613	536	935	816

Table 2 Current Ratings (a.c.) for Two Single-Core Heat Resisting 85°C PVC Insulated Cables, 1 100 V

(*Clause* 2)

Sl No.	Nominal Area of Conductor	Buried Direct in the Ground		In Single-Way Ducts		In Air	
		Copper	Aluminium	Copper	Aluminium	Copper	Aluminium
	mm²	A	A	A	A	A	A
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	1.5	30	25	27	22	26	21
ii)	2.5	40	31	35	27	34	26
iii)	4	51	40	45	36	45	36
iv)	6	64	52	57	46	57	47

Table 2 — (*Concluded*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
v)	10	85	65	75	58	78	60
vi)	16	109	85	96	74	102	79
vii)	25	141	109	123	96	135	105
viii)	35	168	130	147	114	165	128
ix)	50	198	154	173	134	199	154
x)	70	244	189	213	165	252	195
xi)	95	297	231	255	198	316	246
xii)	120	338	263	289	225	367	286
xiii)	150	377	293	322	251	416	324
xiv)	185	425	332	363	284	481	376
xv)	240	490	384	418	328	566	444
xvi)	300	548	432	467	368	646	509
xvii)	400	619	493	526	419	749	596
xviii)	500	692	559	586	474	856	691
xix)	630	766	630	647	532	969	795
xx)	800	834	703	703	592	1 081	908
xxi)	1 000	889	772	746	648	1 181	1 023

Table 3 Current Ratings (a.c.) for Three Single-Core General Purpose 70°C PVC Insulated Cables, 1 100 V

(*Clause* 2)

Sl No.	**Nominal Area of Conductor**	**Buried Direct in the Ground**		**In Single-Way Ducts**		**In Air**	
		Copper	Aluminium	Copper	Aluminium	Copper	Aluminium
	mm²	A	A	A	A	A	A
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	1.5	23	19	21	17	18	14
ii)	2.5	30	23	27	21	24	18
iii)	4	39	31	35	28	32	25
iv)	6	48	39	44	36	40	33
v)	10	64	49	58	45	55	42
vi)	16	82	64	75	58	72	56
vii)	25	105	82	95	74	96	74
viii)	35	125	97	114	88	117	91
ix)	50	148	115	133	103	142	110
x)	70	181	141	163	127	180	140
xi)	95	217	169	194	151	228	177
xii)	120	246	192	220	172	265	207
xiii)	150	275	214	245	191	302	235
xiv)	185	309	242	275	216	349	274
xv)	240	355	280	315	248	412	324
xvi)	300	397	314	350	277	472	373
xvii)	400	446	358	392	314	547	438
xviii)	500	496	404	434	354	625	508
xix)	630	547	454	477	395	708	587
xx)	800	594	503	516	437	790	668
xxi)	1 000	635	550	548	474	868	750

Table 4 Current Ratings (a.c.) for Three Single-Core Heat Resisting 85°C PVC Insulated Cables, 1 100 V

(*Clause* 2)

Sl No.	Nominal Area of Conductor	Buried Direct in the Ground		In Single-Way Ducts		In Air	
		Copper	Aluminium	Copper	Aluminium	Copper	Aluminium
	mm²	A	A	A	A	A	A
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	1.5	26	21	25	21	22	18
ii)	2.5	34	27	33	25	30	23
iii)	4	44	35	42	33	39	31
iv)	6	55	45	53	43	50	41
v)	10	73	56	70	54	68	52
vi)	16	94	73	90	69	90	70
vii)	25	120	93	114	88	119	92
viii)	35	144	111	136	105	146	113
ix)	50	169	131	160	124	176	137
x)	70	207	161	195	151	224	174
xi)	95	249	193	233	181	284	221
xii)	120	282	220	263	205	331	258
xiii)	150	315	245	293	228	376	293
xiv)	185	355	278	330	258	436	341
xv)	240	408	321	378	297	515	404
xvi)	300	456	360	421	332	589	465
xvii)	400	513	410	471	377	684	546
xviii)	500	572	464	523	425	783	635
xix)	630	633	523	576	476	890	733
xx)	800	690	581	625	527	995	837
xxi)	1 000	738	636	665	574	1 096	942

Table 5 Current Ratings (a.c.) for Two-Core General Purpose 70°C PVC Insulated Cables, 1 100 V

(*Clause* 2)

Sl No.	Nominal Area of Conductor	Buried Direct in the Ground		In a Buried Duct		In Air	
		Copper	Aluminium	Copper	Aluminium	Copper	Aluminium
	mm²	A	A	A	A	A	A
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	1.5	25	21	22	18	20	16
ii)	2.5	33	26	28	22	26	21
iii)	4	43	34	37	29	36	28
iv)	6	54	44	46	38	45	37
v)	10	72	56	61	47	61	47
vi)	16	94	73	79	61	79	61
vii)	25	121	94	102	79	106	82
viii)	35	145	113	122	95	129	100
ix)	50	172	133	144	112	157	122
x)	70	210	163	176	137	197	153
xi)	95	250	195	210	164	241	188
xii)	120	281	220	237	185	275	215
xiii)	150	313	245	264	207	313	245
xiv)	185	351	276	297	234	358	282
xv)	240	401	318	340	270	420	333
xvi)	300	445	356	378	303	477	381
xvii)	400	495	402	421	342	543	440
xviii)	500	545	450	464	384	612	504
xix)	630	595	503	517	437	688	578

Table 6 Current Ratings (a.c.) for Two-Core Heat Resisting 85°C PVC Insulated Cables, 1 100 V

(*Clause* 2)

Sl No.	Nominal Area of Conductor	Buried Direct in the Ground		In a Buried Duct		In Air	
		Copper	Aluminium	Copper	Aluminium	Copper	Aluminium
	mm²	A	A	A	A	A	A
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	1.5	29	24	25	20	25	20
ii)	2.5	38	30	32	25	33	26
iii)	4	50	39	42	33	44	35
iv)	6	62	51	53	43	56	46
v)	10	83	64	70	54	76	58
vi)	16	108	83	90	70	98	76
vii)	25	139	108	117	91	131	102
viii)	35	166	129	139	108	160	124
ix)	50	197	153	165	128	194	151
x)	70	240	187	201	157	244	190
xi)	95	286	223	241	188	299	233
xii)	120	322	252	271	212	341	267
xiii)	150	359	281	303	237	388	303
xiv)	185	402	317	340	268	444	349
xv)	240	460	365	390	309	522	413
xvi)	300	512	408	434	347	592	472
xvii)	400	570	462	485	393	675	545
xviii)	500	629	518	535	441	762	625
xix)	630	689	579	597	503	858	718

Table 7 Current Ratings (a.c.) for Three-, Four-, and Five-Core General Purpose 70°C PVC Insulated Cables, 1 100 V

(*Clause* 2)

Sl No.	Nominal Area of Conductor	Buried Direct in the Ground		In a Buried Duct		In Air	
		Copper	Aluminium	Copper	Aluminium	Copper	Aluminium
	mm²	A	A	A	A	A	A
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	1.5	21	18	18	15	17	14
ii)	2.5	28	22	24	19	23	18
iii)	4	37	29	31	25	30	24
iv)	6	46	38	39	32	39	32
v)	10	61	47	51	40	53	40
vi)	16	78	61	66	51	67	52
vii)	25	101	78	85	66	90	70
viii)	35	121	94	102	79	110	85
ix)	50	143	111	120	93	134	104
x)	70	175	136	147	115	169	131
xi)	95	210	163	177	138	209	162
xii)	120	237	185	200	156	238	186
xiii)	150	265	206	224	175	272	212
xiv)	185	300	234	254	198	314	245
xv)	240	345	271	293	230	371	291
xvi)	300	387	305	330	260	425	335
xvii)	400	436	348	372	297	490	390
xviii)	500	488	395	424	343	560	452
xix)	630	544	447	473	389	640	525

Table 8 Current Ratings (a.c.) for Three-, Four-, and Five-Core Heat Resisting 85°C PVC Insulated Cables, 1 100 V

(*Clause* 2)

Sl No.	Nominal Area of Conductor	Buried Direct in the Ground		In a Buried Duct		In Air	
		Copper	Aluminium	Copper	Aluminium	Copper	Aluminium
	mm²	A	A	A	A	A	A
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	1.5	25	20	21	17	21	17
ii)	2.5	32	25	27	21	28	22
iii)	4	42	33	36	28	38	30
iv)	6	52	43	44	36	48	39
v)	10	70	53	59	45	65	50
vi)	16	90	69	75	58	83	65
vii)	25	116	90	97	75	111	86
viii)	35	139	108	116	90	137	106
ix)	50	164	127	138	107	166	129
x)	70	201	156	169	131	209	163
xi)	95	241	187	203	157	259	201
xii)	120	272	212	229	178	296	230
xiii)	150	304	236	257	200	337	262
xiv)	185	343	268	291	227	389	304
xv)	240	396	310	336	264	459	360
xvi)	300	445	350	379	298	527	415
xvii)	400	502	399	428	340	608	483
xviii)	500	563	453	489	394	696	560
xix)	630	629	514	547	447	796	650

Table 9 Current Ratings (d.c.) for Two Single-Core General Purpose 70°C PVC Insulated Cables, 1 100 V

(*Clause* 2)

Sl No.	Nominal Area of Conductor	Buried Direct in the Ground		In Single-Way Ducts		In Air	
		Copper	Aluminium	Copper	Aluminium	Copper	Aluminium
	mm²	A	A	A	A	A	A
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	1.5	26	21	23	18	21	17
ii)	2.5	35	27	29	23	28	21
iii)	4	45	35	38	30	37	29
iv)	6	56	46	47	39	46	38
v)	10	74	57	63	48	63	48
vi)	16	96	74	81	63	83	64
vii)	25	123	95	103	80	109	85
viii)	35	147	114	123	96	133	103
ix)	50	173	134	145	113	160	124
x)	70	213	165	178	138	202	157
xi)	95	261	202	214	166	256	198
xii)	120	298	231	244	189	298	231
xiii)	150	333	258	273	211	339	262
xiv)	185	378	293	309	240	393	305
xv)	240	439	340	359	278	467	362
xvi)	300	498	385	406	314	539	417
xvii)	400	572	443	465	361	636	493
xviii)	500	656	509	533	413	746	579
xix)	630	756	586	612	474	877	680
xx)	800	869	673	701	543	1 031	798
xxi)	1 000	990	768	796	618	1 202	933

Table 10 Current Ratings (d.c.) for Two Single-Core Heat Resisting 85°C PVC Insulated Cables, 1 100 V

(*Clause* 2)

Sl. No.	Nominal Area of Conductor	Buried Direct in the Ground		In Single-Way Ducts		In Air	
		Aluminium	Copper	Aluminium	Copper	Aluminium	Copper
	mm²	A	A	A	A	A	A
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	1.5	30	25	27	22	26	21
ii)	2.5	40	31	35	27	34	26
iii)	4	51	40	45	36	45	36
iv)	6	64	52	57	46	57	47
v)	10	85	65	75	58	78	60
vi)	16	110	85	97	75	103	80
vii)	25	141	109	123	96	135	105
viii)	35	168	131	148	114	165	128
ix)	50	198	154	174	134	199	154
x)	70	244	189	213	165	252	195
xi)	95	299	231	256	198	318	246
xii)	120	341	264	292	226	371	287
xiii)	150	382	295	326	253	421	326
xiv)	185	433	335	370	287	489	379
xv)	240	503	390	429	332	580	450
xvi)	300	570	440	485	375	670	518
xvii)	400	654	507	556	431	789	612
xviii)	500	751	583	637	494	926	718
xix)	630	865	671	732	567	1 088	843
xx)	800	995	770	839	649	1 278	989
xxi)	1 000	1 133	879	952	739	1 491	1 157

Table 11 Current Ratings (d.c.) for Two-Core General Purpose 70°C PVC Insulated Cables, 1 100 V

(*Clause* 2)

Sl No.	Nominal Area of Conductor	Buried Direct in the Ground		In a Buried Duct		In Air	
		Copper	Aluminium	Copper	Aluminium	Copper	Aluminium
	mm²	A	A	A	A	A	A
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	1.5	25	21	22	18	20	16
ii)	2.5	33	26	28	22	27	21
iii)	4	43	34	37	29	36	28
iv)	6	54	44	46	38	45	37
v)	10	72	56	61	47	61	47
vi)	16	94	73	79	61	79	62
vii)	25	122	94	102	79	106	82
viii)	35	146	113	122	95	130	100
ix)	50	173	134	145	112	158	122
x)	70	212	164	178	138	198	154
xi)	95	254	197	214	165	245	190
xii)	120	287	223	242	188	281	218
xiii)	150	322	250	272	211	321	249
xiv)	185	364	283	309	239	371	288
xv)	240	424	329	360	279	443	343
xvi)	300	481	372	409	316	512	396
xvii)	400	551	427	470	364	599	465
xviii)	500	632	490	540	419	702	545
xix)	630	730	566	636	493	830	643

Table 12 Current Ratings (d.c.) for Two-Core Heat Resisting 85°C PVC Insulated Cables, 1 100 V

(*Clause* 2)

Sl No.	Nominal Area of Conductor	Buried Direct in the Ground		In a Buried Duct		In Air	
		Copper	Aluminium	Copper	Aluminium	Copper	Aluminium
	mm²	A	A	A	A	A	A
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	1.5	29	24	25	20	25	20
ii)	2.5	38	30	32	25	33	26
iii)	4	50	39	42	33	44	35
iv)	6	62	51	53	43	56	46
v)	10	83	64	70	54	76	58
vi)	16	108	84	91	70	99	76
vii)	25	139	108	117	91	131	102
viii)	35	167	129	140	108	161	124
ix)	50	198	153	166	129	195	151
x)	70	242	188	203	158	246	191
xi)	95	290	225	244	189	304	235
xii)	120	329	255	277	215	348	270
xiii)	150	369	286	312	241	398	308
xiv)	185	417	323	353	274	459	356
xv)	240	486	376	412	319	548	424
xvi)	300	550	426	468	362	633	489
xvii)	400	631	489	538	417	741	574
xviii)	500	723	561	618	479	866	672
xix)	630	836	647	728	564	1 023	793

Table 13 Rating Factors for Variation in Ambient Air Temperature for Cables in Free Air

(*Clause* 8)

Air Temperature, °C	25	30	35	40	45	50	55	60
Rating Factor for 70 °C **PVC**	1.22	1.15	1.08	1.00	0.91	0.82	0.71	0.58
Rating Factor for 85 °C **PVC**	1.15	1.11	1.05	1.00	0.94	0.88	0.82	0.75

Table 14 Rating Factors for Variation in Ground Temperature for Direct Buried Cables

(*Clause* 8)

Ground Temperature, °C	15	20	25	30	35	40	45	50
Rating Factor for 70 °C **PVC**	1.17	1.12	1.06	1.00	0.94	0.87	0.79	0.71
Rating Factor for 85 °C **PVC**	1.13	1.09	1.04	1.00	0.95	0.90	0.85	0.80

Table 15 Rating Factors for Variation in Ground Temperature for Cables in Ducts

(*Clause* 8)

Ground Temperature, °C	15	20	25	30	35	40	45	50
Rating Factor for 70 °C **PVC**	1.17	1.12	1.06	1.00	0.94	0.87	0.79	0.71
Rating Factor for 85 °C **PVC**	1.13	1.09	1.04	1.00	0.95	0.90	0.85	0.80

Table 16 Rating Factors for Depths of Laying for Direct Buried Cables

(*Clause* 8)

Sl No.	Depth of Laying mm	Up to 25 mm²		Above 25 mm² and Up to 300 mm²		Above 300 mm²	
		Single-core	Multi-core	Single-core	Multi-core	Single-core	Multi-core
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	750	1.00	1.00	1.00	1.00	1.00	1.00
ii)	900	0.98	0.99	0.98	0.98	0.98	0.98
iii)	1 050	0.97	0.97	0.96	0.97	0.96	0.96
iv)	1 200	0.96	0.96	0.95	0.95	0.94	0.95
v)	1 500	0.95	0.95	0.93	0.94	0.92	0.93
vi)	1 800	0.93	0.94	0.91	0.92	0.90	0.91
vii)	2 000	0.93	0.93	0.91	0.91	0.89	0.90
viii)	2 500	0.91	0.92	0.89	0.89	0.87	0.89
ix)	3 000	0.90	0.91	0.87	0.88	0.86	0.87

Table 17 Rating Factors for Depths of Laying for Cables in Ducts

(*Clause* 8)

Sl No.	Depth of Laying mm	Up to 25 mm²		Above 25 mm² and Up to 300 mm²		Above 300 mm²	
		Single-core	Multi-core	Single-core	Multi-core	Single-core	Multi-core
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	750	1.00	1.00	1.00	1.00	1.00	1.00
ii)	900	0.98	0.99	0.98	0.99	0.98	0.98
iii)	1 050	0.97	0.98	0.96	0.98	0.96	0.97
iv)	1 200	0.96	0.97	0.95	0.97	0.94	0.96
v)	1 500	0.94	0.96	0.93	0.95	0.92	0.95
vi)	1 800	0.93	0.95	0.91	0.94	0.90	0.93
vii)	2 000	0.92	0.95	0.90	0.93	0.89	0.92
viii)	2 500	0.90	0.94	0.88	0.92	0.87	0.91
ix)	3 000	0.89	0.93	0.87	0.91	0.86	0.90

Table 18 Rating Factors for Variations in Soil Thermal Resistivity for Two Single-Core Cables Laid Direct in Ground

(*Clause* 8)

Sl No.	Nominal Area of Conductor mm²	Values of Soil Thermal Resistivity K.m/W					
		1.0	1.2	1.5	2.0	2.5	3.0
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	1.5	1.14	1.08	1.00	0.90	0.83	0.77
ii)	2.5	1.15	1.08	1.00	0.90	0.82	0.76
iii)	4	1.15	1.08	1.00	0.90	0.82	0.76
iv)	6	1.16	1.09	1.00	0.89	0.82	0.75
v)	10	1.16	1.09	1.00	0.89	0.81	0.75
vi)	16	1.17	1.09	1.00	0.89	0.81	0.75
vii)	25	1.17	1.09	1.00	0.89	0.81	0.74
viii)	35	1.18	1.09	1.00	0.89	0.80	0.74
ix)	50	1.18	1.10	1.00	0.88	0.80	0.74
x)	70	1.18	1.10	1.00	0.88	0.80	0.74
xi)	95	1.18	1.10	1.00	0.88	0.80	0.73
xii)	120	1.19	1.10	1.00	0.88	0.80	0.73
xiii)	150	1.19	1.10	1.00	0.88	0.80	0.73
xiv)	185	1.19	1.10	1.00	0.88	0.80	0.73
xv)	240	1.19	1.10	1.00	0.88	0.79	0.73

Table 18 — (*Concluded*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
xvi)	300	1.19	1.10	1.00	0.88	0.79	0.73
xvii)	400	1.19	1.10	1.00	0.88	0.79	0.73
xviii)	500	1.19	1.10	1.00	0.88	0.79	0.73
xix)	630	1.19	1.10	1.00	0.88	0.79	0.73
xx)	800	1.19	1.10	1.00	0.88	0.79	0.73
xxi)	1 000	1.19	1.10	1.00	0.88	0.79	0.73

Table 19 Rating Factors for Variations in Soil Thermal Resistivity for Two Single-Core Cables Laid in Buried Duct

(*Clause* 8)

Sl No.	Nominal Area of Conductor mm²	Values of Soil Thermal Resistivity K.m/W					
		1.0	1.2	1.5	2.0	2.5	3.0
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	1.5	1.06	1.04	1.00	0.95	0.90	0.87
ii)	2.5	1.06	1.04	1.00	0.95	0.90	0.86
iii)	4	1.07	1.04	1.00	0.94	0.90	0.86
iv)	6	1.07	1.04	1.00	0.94	0.89	0.85
v)	10	1.07	1.04	1.00	0.94	0.89	0.85
vi)	16	1.07	1.04	1.00	0.94	0.89	0.84
vii)	25	1.08	1.04	1.00	0.94	0.88	0.84
viii)	35	1.08	1.05	1.00	0.93	0.88	0.84
ix)	50	1.08	1.05	1.00	0.93	0.88	0.83
x)	70	1.09	1.05	1.00	0.93	0.87	0.83
xi)	95	1.09	1.05	1.00	0.93	0.87	0.82
xii)	120	1.09	1.05	1.00	0.93	0.87	0.82
xiii)	150	1.10	1.05	1.00	0.93	0.87	0.82
xiv)	185	1.10	1.06	1.00	0.92	0.86	0.81
xv)	240	1.10	1.06	1.00	0.92	0.86	0.81
xvi)	300	1.10	1.06	1.00	0.92	0.86	0.81
xvii)	400	1.11	1.06	1.00	0.92	0.85	0.80
xviii)	500	1.11	1.06	1.00	0.92	0.85	0.80
xix)	630	1.11	1.06	1.00	0.92	0.85	0.80
xx)	800	1.12	1.07	1.00	0.91	0.85	0.79
xxi)	1 000	1.12	1.07	1.00	0.91	0.84	0.79

Table 20 Rating Factors for Variations in Soil Thermal Resistivity for Three Single-Core Cables Laid Direct in Ground

(*Clause* 8)

Sl No.	Nominal Area of Conductor mm²	Values of Soil Thermal Resistivity K.m/W					
		1.0	1.2	1.5	2.0	2.5	3.0
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	1.5	1.16	1.09	1.00	0.89	0.81	0.75
ii)	2.5	1.16	1.09	1.00	0.89	0.81	0.75
iii)	4	1.17	1.09	1.00	0.89	0.81	0.74
iv)	6	1.17	1.09	1.00	0.89	0.80	0.74
v)	10	1.18	1.10	1.00	0.88	0.80	0.74
vi)	16	1.18	1.10	1.00	0.88	0.80	0.73
vii)	25	1.19	1.10	1.00	0.88	0.80	0.73
viii)	35	1.19	1.10	1.00	0.88	0.79	0.73
ix)	50	1.19	1.10	1.00	0.88	0.79	0.73

Table 20 — (*Concluded*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
x)	70	1.19	1.10	1.00	0.88	0.79	0.73
xi)	95	1.19	1.10	1.00	0.88	0.79	0.73
xii)	120	1.20	1.11	1.00	0.88	0.79	0.72
xiii)	150	1.20	1.11	1.00	0.88	0.79	0.72
xiv)	185	1.20	1.11	1.00	0.88	0.79	0.72
xv)	240	1.20	1.11	1.00	0.88	0.79	0.72
xvi)	300	1.20	1.11	1.00	0.88	0.79	0.72
xvii)	400	1.20	1.11	1.00	0.88	0.79	0.72
xviii)	500	1.20	1.11	1.00	0.87	0.79	0.72
xix)	630	1.20	1.11	1.00	0.87	0.79	0.72
xx)	800	1.20	1.11	1.00	0.87	0.79	0.72
xxi)	1 000	1.20	1.11	1.00	0.87	0.79	0.72

Table 21 Rating Factors for Variations in Soil Thermal Resistivity for Three Single-Core Cables Laid in Buried Duct

(*Clause* 8)

Sl No.	**Nominal Area of Conductor** mm²	**Values of Soil Thermal Resistivity** K.m/W					
		1.0	1.2	1.5	2.0	2.5	3.0
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	1.5	1.08	1.04	1.00	0.94	0.89	0.84
ii)	2.5	1.08	1.05	1.00	0.94	0.88	0.84
iii)	4	1.08	1.05	1.00	0.93	0.88	0.83
iv)	6	1.09	1.05	1.00	0.93	0.88	0.83
v)	10	1.09	1.05	1.00	0.93	0.87	0.82
vi)	16	1.09	1.05	1.00	0.93	0.87	0.82
vii)	25	1.10	1.05	1.00	0.93	0.86	0.82
viii)	35	1.10	1.06	1.00	0.92	0.86	0.81
ix)	50	1.10	1.06	1.00	0.92	0.86	0.81
x)	70	1.11	1.06	1.00	0.92	0.86	0.80
xi)	95	1.11	1.06	1.00	0.92	0.85	0.80
xii)	120	1.11	1.06	1.00	0.92	0.85	0.80
xiii)	150	1.11	1.06	1.00	0.91	0.85	0.79
xiv)	185	1.12	1.07	1.00	0.91	0.85	0.79
xv)	240	1.12	1.07	1.00	0.91	0.84	0.79
xvi)	300	1.12	1.07	1.00	0.91	0.84	0.79
xvii)	400	1.13	1.07	1.00	0.91	0.84	0.78
xviii)	500	1.13	1.07	1.00	0.91	0.84	0.78
xix)	630	1.13	1.07	1.00	0.91	0.83	0.78
xx)	800	1.14	1.08	1.00	0.90	0.83	0.77
xxi)	1 000	1.14	1.08	1.00	0.90	0.83	0.77

Table 22 Rating Factors for Variations in Soil Thermal Resistivity for Multi-Core Cables Laid Direct in Ground

(*Clause* 8)

Sl No.	**Nominal Area of Conductor** mm²	**Values of Soil Thermal Resistivity** K.m/W					
		1.0	1.2	1.5	2.0	2.5	3.0
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	1.5	1.13	1.07	1.00	0.91	0.84	0.78
ii)	2.5	1.13	1.07	1.00	0.90	0.83	0.78
iii)	4	1.14	1.08	1.00	0.90	0.83	0.77

Table 22 — (*Concluded*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
iv)	6	1.14	1.08	1.00	0.90	0.82	0.77
v)	10	1.15	1.08	1.00	0.90	0.82	0.76
vi)	16	1.16	1.09	1.00	0.89	0.81	0.75
vii)	25	1.16	1.09	1.00	0.89	0.81	0.75
viii)	35	1.17	1.09	1.00	0.89	0.81	0.75
ix)	50	1.17	1.09	1.00	0.89	0.81	0.75
x)	70	1.17	1.09	1.00	0.89	0.81	0.74
xi)	95	1.17	1.09	1.00	0.89	0.80	0.74
xii)	120	1.17	1.09	1.00	0.89	0.80	0.74
xiii)	150	1.17	1.09	1.00	0.89	0.80	0.74
xiv)	185	1.17	1.09	1.00	0.89	0.80	0.74
xv)	240	1.17	1.09	1.00	0.89	0.80	0.74
xvi)	300	1.17	1.09	1.00	0.89	0.80	0.74
xvii)	400	1.17	1.09	1.00	0.89	0.80	0.74
xviii)	500	1.17	1.09	1.00	0.89	0.80	0.74
xix)	630	1.18	1.09	1.00	0.89	0.80	0.74

Table 23 Rating Factors for Variations in Soil Thermal Resistivity for Multi-Core Cables Laid in Buried Duct

(*Clause* 8)

Sl No.	**Nominal Area of Conductor** mm²	**Values of Soil Thermal Resistivity** K.m/W					
		1.0	1.2	1.5	2.0	2.5	3.0
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	1.5	1.05	1.03	1.00	0.96	0.92	0.89
ii)	2.5	1.05	1.03	1.00	0.96	0.92	0.88
iii)	4	1.05	1.03	1.00	0.95	0.91	0.88
iv)	6	1.06	1.03	1.00	0.95	0.91	0.87
v)	10	1.06	1.03	1.00	0.95	0.91	0.87
vi)	16	1.06	1.04	1.00	0.95	0.90	0.87
vii)	25	1.06	1.04	1.00	0.95	0.90	0.86
viii)	35	1.07	1.04	1.00	0.94	0.90	0.86
ix)	50	1.07	1.04	1.00	0.94	0.89	0.85
x)	70	1.07	1.04	1.00	0.94	0.89	0.85
xi)	95	1.08	1.04	1.00	0.94	0.89	0.84
xii)	120	1.08	1.04	1.00	0.94	0.88	0.84
xiii)	150	1.08	1.05	1.00	0.94	0.88	0.84
xiv)	185	1.08	1.05	1.00	0.93	0.88	0.83
xv)	240	1.09	1.05	1.00	0.93	0.88	0.83
xvi)	300	1.09	1.05	1.00	0.93	0.87	0.82
xvii)	400	1.09	1.05	1.00	0.93	0.87	0.82
xviii)	500	1.09	1.05	1.00	0.93	0.87	0.82
xix)	630	1.10	1.05	1.00	0.93	0.87	0.82

Table 24 Group Rating Factors for Circuits of Two Single-Core Cables Laid Direct in the Ground, Horizontal Formation

(*Clause* 8)

Sl No.	Number of Circuits	Spacing Between Group Centre mm				
		Touching	150	300	450	600
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	2	0.80	0.85	0.90	0.92	0.95
ii)	3	0.70	0.78	0.85	0.88	0.91
iii)	4	0.64	0.73	0.81	0.86	0.89
iv)	5	0.59	0.70	0.79	0.84	0.88
v)	6	0.55	0.67	0.77	0.83	0.87
vi)	7	0.53	0.65	0.76	0.82	0.86
vii)	8	0.51	0.64	0.75	0.82	0.86
viii)	9	0.49	0.63	0.74	0.81	0.85
ix)	10	0.48	0.63	0.74	0.81	0.85
x)	11	0.47	0.62	0.73	0.80	0.84
xi)	12	0.46	0.61	0.73	0.80	0.84

Table 25 Group Rating Factors for Circuits of Three Single-Core Cables Laid Direct in the Ground, Horizontal Formation

(*Clause* 8)

Sl No.	Number of Circuits	Spacing Between Group Centre mm				
		Touching	150	300	450	600
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	2	0.77	0.81	0.86	0.88	0.89
ii)	3	0.67	0.71	0.78	0.81	0.83
iii)	4	0.61	0.64	0.72	0.76	0.80
iv)	5	0.57	0.60	0.69	0.74	0.77
v)	6	0.53	0.57	0.66	0.72	0.75
vi)	7	0.51	0.55	0.64	0.70	0.74
vii)	8	0.49	0.53	0.63	0.69	0.73
viii)	9	0.47	0.52	0.62	0.68	0.73
ix)	10	0.45	0.51	0.61	0.67	0.72
x)	11	0.44	0.50	0.60	0.66	0.72
xi)	12	0.43	0.49	0.59	0.65	0.71

Table 26 Group Rating Factors for Circuits of Three Single-Core Cables in Single-way Ducts

(*Clause* 8)

Sl No.	Number of Circuits	Spacing Between Group Centre mm				
		Touching	150	300	450	600
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	2	0.78	0.83	0.87	0.90	0.91
ii)	3	0.66	0.73	0.78	0.82	0.85
iii)	4	0.59	0.67	0.74	0.78	0.82
iv)	5	0.55	0.63	0.70	0.76	0.80
v)	6	0.51	0.61	0.68	0.74	0.78
vi)	7	0.48	0.58	0.66	0.73	0.77
vii)	8	0.46	0.57	0.65	0.72	0.76

Table 26 — (*Concluded*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
viii)	9	0.44	0.55	0.64	0.71	0.76
ix)	10	0.43	0.54	0.63	0.70	—
x)	11	0.42	0.53	0.62	0.69	—
xi)	12	0.40	0.51	0.61	0.69	—

Table 27 Group Rating Factors for Multi-Core Cables Laid Direct in the Ground, in Tier Formation

(*Clause* 8)

Sl No.	Number of Cables	Number of Tiers	Spacing Between Cable Centre mm				
			Touching	150	300	450	600
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	2	1	0.80	0.84	0.87	0.90	0.91
ii)	3	1	0.68	0.74	0.79	0.83	0.86
iii)	4	2	0.60	0.66	0.73	0.77	0.79
iv)	5	2	0.55	0.61	0.68	0.71	0.73
v)	6	2	0.51	0.57	0.63	0.67	0.69
vi)	7	3	0.48	0.54	0.59	0.63	0.64
vii)	8	3	0.46	0.51	0.56	0.60	0.61
viii)	9	3	0.44	0.48	0.53	0.57	0.58
ix)	10	4	0.42	0.47	0.52	0.55	0.56
x)	11	4	0.41	0.46	0.50	0.54	0.55
xi)	12	4	0.40	0.45	0.49	0.53	0.54

Table 28 Group Rating Factors for Multi-Core Cables Laid Direct in the Ground, in Horizontal Formation

(*Clause* 8)

Sl No.	Number of Cables	Spacing Between Group Centre mm				
		Touching	150	300	450	600
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	2	0.80	0.84	0.87	0.90	0.91
ii)	3	0.68	0.74	0.79	0.83	0.86
iii)	4	0.62	0.69	0.75	0.80	0.83
iv)	5	0.58	0.65	0.72	0.77	0.80
v)	6	0.55	0.62	0.69	0.75	0.78
vi)	7	0.52	0.59	0.67	0.73	0.77
vii)	8	0.50	0.57	0.66	0.72	0.75
viii)	9	0.48	0.55	0.65	0.71	0.75
ix)	10	0.46	0.54	0.64	0.70	0.74
x)	11	0.45	0.53	0.63	0.70	0.74
xi)	12	0.44	0.52	0.62	0.69	0.73

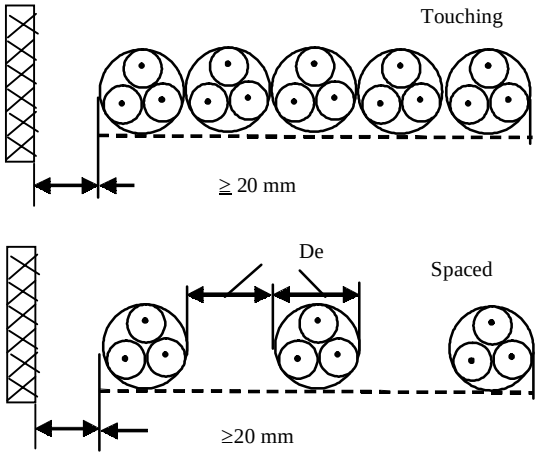
Table 29 Group Rating Factors for Three-Core Cables in Single Way Ducts in Horizontal Formation

(*Clause* 8)

Sl No.	Number of Cables	Spacing Between Group Centre mm				
		Touching	150	300	450	600
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	2	0.85	0.87	0.90	0.92	0.94
ii)	3	0.75	0.79	0.83	0.86	0.88
iii)	4	0.69	0.74	0.79	0.83	0.86
iv)	5	0.65	0.70	0.76	0.80	0.84
v)	6	0.62	0.67	0.73	0.79	0.83
vi)	7	0.59	0.65	0.72	0.78	0.82
vii)	8	0.57	0.63	0.70	0.77	0.81
viii)	9	0.55	0.62	0.69	0.76	0.80
ix)	10	0.54	0.61	0.68	0.75	%
x)	11	0.52	0.60	0.68	0.75	%
xi)	12	0.51	0.59	0.67	0.74	%

Table 30 Group Rating Factors for Multi-Core Cables in Air on Perforated Trays

(*Clause* 8)



Number of Trays	Number of Cables					
	1	2	3	4	6	9
1	1.00	0.88	0.82	0.79	0.76	0.73
2	1.00	0.87	0.80	0.77	0.73	0.68
3	1.00	0.86	0.79	0.76	0.71	0.66
1	1.00	1.00	0.98	0.95	0.91	—
2	1.00	0.99	0.96	0.92	0.87	—
3	1.00	0.98	0.95	0.91	0.85	—

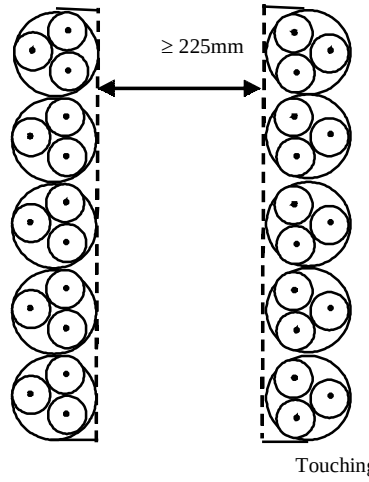
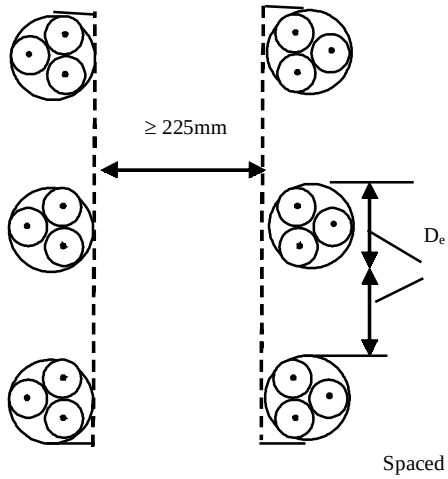
NOTES

1 Factors apply to single layer groups of cables as shown above. Factors for cables installed in more than one layer touching each other shall be significantly lower and must be determined by an appropriate method.

2 Factors are given for vertical spacing between trays of 300 mm and at least 20 mm between trays and wall. For closer spacing , the factors should be reduced.

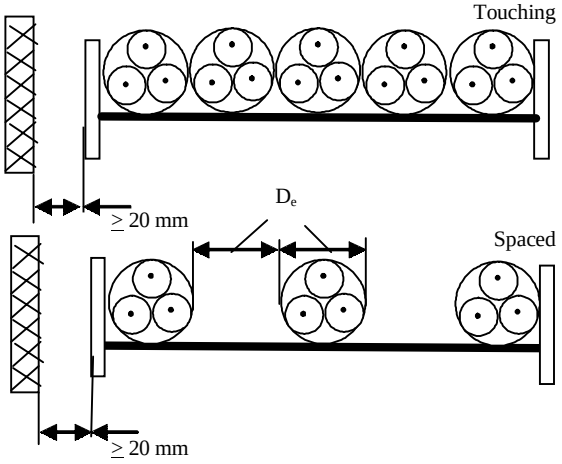
Table 31 Group Rating Factors for Multi-Core Cables in Air on Vertical Perforated Trays

(*Clause* 8)

	Number of Trays	Number of Cables					
		1	2	3	4	6	9
 Touching	1	1.00	0.88	0.82	0.78	0.73	0.72
	2	1.00	0.88	0.81	0.76	0.71	0.70
 Spaced	1	1.00	0.91	0.89	0.88	0.87	—
	2	1.00	0.91	0.88	0.87	0.85	—

NOTE — Factors are given for horizontal spacing between trays of 225 mm with trays mounted back to back. For closer spacing the factors should be reduced.

Table 32 Group Rating Factors for Multi-Core Cables in Air on Ladder Supports, Cleats, etc
(*Clause* 8)



	Number of Trays	Number of Cables					
		1	2	3	4	6	9
Touching	1	1.00	0.87	0.82	0.80	0.79	0.78
	2	1.00	0.86	0.80	0.78	0.76	0.73
	3	1.00	0.85	0.79	0.76	0.73	0.70
Spaced	1	1.00	1.00	1.00	1.00	1.00	—
	2	1.00	0.99	0.98	0.97	0.96	—
	3	1.00	0.98	0.97	0.96	0.93	

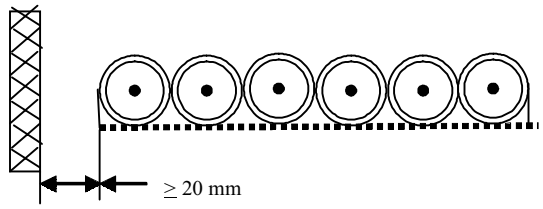
NOTES

1 Factors apply to single layer groups of cables as shown above. Factors for cables installed in more than one layer touching each other will be significantly lower and must be determined by an appropriate method.

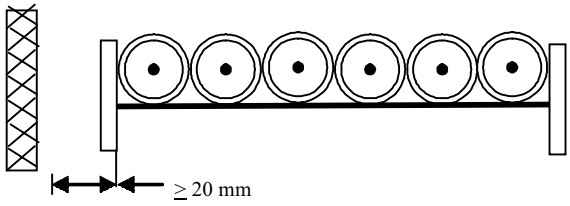
2 Factors are given for vertical spacing between trays of 300 mm and at least 20 mm between trays and wall. For closer spacing, the factors should be reduced.

Table 33 Group Rating Factors to be Applied for Circuits of Three Single Core Cables in Air Flat Touching
(*Clause* 8)

Cables on perforated trays



Cables on ladder supports, cleats, etc



Number of Trays	Number of Three-Phase Circuits		
	1	2	3
1	0.98	0.91	0.87
2	0.96	0.87	0.81
3	0.95	0.85	0.78
1	1.00	0.97	0.96
2	0.98	0.93	0.89
3	0.97	0.90	0.86

NOTES

1 Factors are given for single layers of cables as shown above. Factors for cables installed in more than one layer touching each other will be significantly lower and must be determined by an appropriate method.

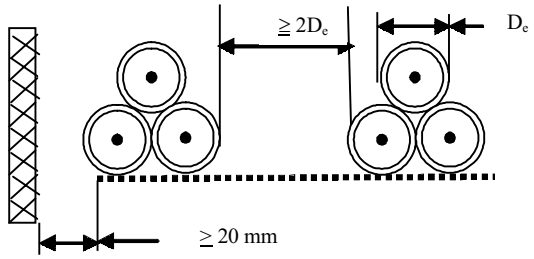
2 Factors are given for vertical spacing between trays of 300 mm and at least 20 mm between trays and wall. For closer spacing, the factors should be reduced.

3 For circuits having more than one cable in parallel per phase, each three phase set of conductors should be considered as a circuit for the purpose of this table.

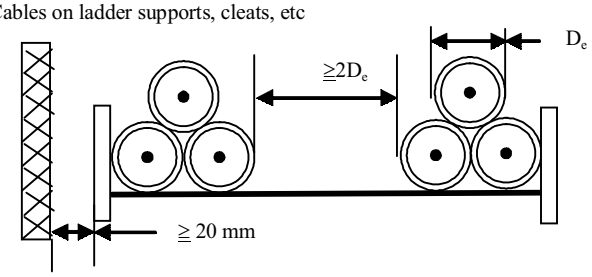
Table 34 Group Rating Factors to be Applied for Circuits of Three Single Core Cables in Air on Perforated Trays and Ladder Supports in Trefoil Formation

(*Clause* 8)

Cables on perforated trays



Cables on ladder supports, cleats, etc



Number of Trays	Number of Three-Phase Circuits		
	1	2	3
1	1.00	0.98	0.96
2	0.97	0.93	0.89
3	0.96	0.92	0.86
1	1.00	1.00	1.00
2	0.97	0.95	0.93
3	0.96	0.94	0.90

NOTES

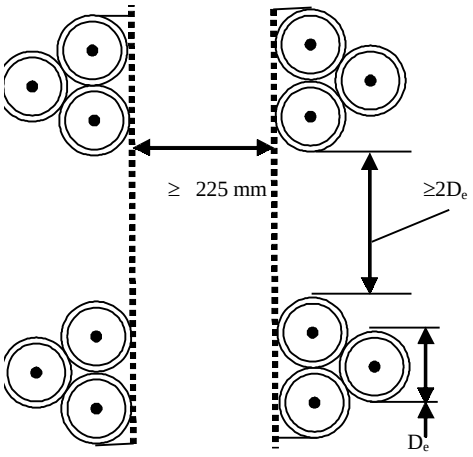
1 Factors are given for single layers of trefoil groups as shown above. Factors for trefoil groups installed in more than one layer touching each other will be significantly lower and must be determined by an appropriate method.

2 Factors are given for vertical spacing between trays of 300 mm and at least 20 mm between trays and wall. For closer spacing, the factors should be reduced.

3 For circuits having more than one cable in parallel per phase, each three phase set of conductors should be considered as a circuit for the purpose of this table.

Table 35 Group Rating Factors to be Applied for Circuits of Three Single Core Cables in Air on Vertical Perforated Trays in Trefoil Formation

(*Clause* 8)



Number of Trays	Number of Three-Phase Circuits		
	1	2	3
1	1.00	0.91	0.89
2	1.00	0.90	0.86

NOTES

1 Factors are given for single layers of trefoil groups as shown above. Factors for trefoil groups installed in more than one layer touching each other will be significantly lower and must be determined by an appropriate method.

2 Factors are given for horizontal spacing between vertical trays of 225 mm with trays mounted back to back. For closer spacing the factors should be reduced.

3 For circuits having more than one cable in parallel per phase, each three phase set of conductors should be considered as a circuit for the purpose of this table

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