APPENDIX 2

GENERAL METHODS OF INSTALLATION OF CABLES:

TABLE 2.1

Methods of Installation

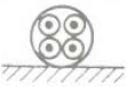
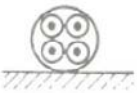
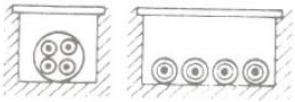
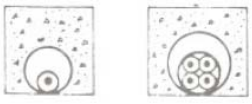
Type	Description	Examples
1	**Single core PVC** insulated cable with or without sheath in conduit buried in concrete or block work.	
2	**Single core PVC** insulated cable with or without sheath in conduit run on surface of wall or structure.	
3	**Single core PVC** insulated cable with or without sheath in trunking.	
4	**Single core PVC** insulated and sheathed cable or **Multi-core PVC/XLPE** insulated armoured and non-armoured cable run on trays.	
5	**Multi-core PVC/XLPE** armoured and non-armoured cable fixed to the surface of wall or structure.	
6	**Single core PVC** insulated non-magnetic armoured cable or **Multi-core PVC/XLPE** armoured and non-armoured cable run in trench.	
7	**Single core PVC** insulated non-magnetic armoured cable or **Multi-core PVC/XLPE** armoured/non-armoured cable run in duct.	
8	**Multi-core PVC/XLPE** insulated armoured and non-armoured cable directly buried in ground.	

TABLE 2.2

Correction factors for groups of more than three single-core cables

Type of Installation method	Number of Conductors and Correction Factor											
	4	6	8	10	12	16	20	24	28	32	36	40
1,2,3,6 & 7	0.80	0.69	0.62	0.59	0.55	0.51	0.48	0.43	0.41	0.39	0.38	0.36

NOTE–In case of one three phase circuit employing 4 wires, no correction factor is applicable and the ratings given in tables 2.6 and 2.7 shall be adopted. Where more than one three phase circuit is bunched in a conduit or trunking, then appropriate grouping factors shall be taken into consideration.

TABLE 2.3

Correction factors for groups of more than one multi-core and non-armoured cables

Type of Installation method	Number of Cables and Correction Factor											
	2	3	4	5	6	8	10	12	14	16	18	20
4,5,6 & 7	0.80	0.70	0.65	0.60	0.57	0.52	0.48	0.45	0.43	0.41	0.39	0.38

NOTE– Where spacing between adjacent cables exceeds twice their overall diameter, no reduction factor need be applied.

TABLE 2.4

Correction factors for groups of more than one multi-core armoured and non- armoured cable buried in ground

Type of Installation method — 8	No. of Cables and Correction Factor				
	2	3	4	5	6
Cables laid touching each other	0.81	0.70	0.63	0.59	0.55
Cables laid 15 cms apart	0.87	0.78	0.74	0.70	0.68

TABLE 2.5

Correction factors for ambient temperatures higher than 40ºC to be applied to the current carrying capacity shown in various tables

Ambient Temperature	Type of Insulation			
	PVC	XLPE	Mineral	
			PVC covered	Bare
45ºC	0.91	0.94	0.89	0.98
50ºC	0.85	0.89	0.80	0.96
55ºC	0.70	0.82	0.69	0.91
60ºC	0.57	0.74	0.54	0.88

TABLE 2.6

Current carrying capacity of PVC insulated single core copper cables with or without sheath at 40ºC ambient temperature and for installation method 1, 2 and 3

Nominal cross-sectional of conductor mm^2	Single-Phase A.C. (Amperes)	Three-Phase A.C. (Amperes)
1.5	15	14
2.5	21	18
4.0	28	24
6.0	36	31
10.0	50	44
16.0	66	59
25.0	88	77
35.0	109	97
50.0	131	117
70.0	167	149
95.0	202	180
120.0	234	208

TABLE 2.7

Current carrying capacity of single core PVC insulated and sheathed copper cables at 40ºC ambient temperature and for installation method 4

Nominal cross-sectional of conductor mm2	Single-Phase A.C. (Amperes)	Three-Phase A.C. (Amperes)
1.5	17	15
2.5	23	21
4.0	31	28
6.0	40	36
10.0	55	50
16.0	74	66
25.0	97	88
35.0	120	109
50.0	146	131
70.0	185	167
95.0	225	202
120.0	260	234
150.0	299	269
185.0	341	307
240.0	401	361

TABLE 2.8

Current carrying capacity of PVC insulated multi-core copper cables at 40°C ambient temperature and for installation method 4, 5, 6 and 7

Nominal cross-sectional area of conductor mm^2	Armoured (Amperes)	Non-Armoured (Amperes)
4.0	28	28
6.0	36	35
10.0	49	47
16.0	64	62
25.0	84	78
35.0	104	100
50.0	128	122
70.0	157	153
95.0	191	187
120.0	224	218
150.0	257	250
185.0	290	287
240.0	347	341
300.0	392	391
400.0	455	452

TABLE 2.9

Current carrying capacity of multi-core cross-linked polyethylene (XLPE) copper cables at 40°C ambient temperature and for installation method 4, 5, 6 and 7

Nominal cross-sectional of conductor mm^2	Armoured (Amperes)	Non-Armoured (Amperes)
4.0	36	33
6.0	47	43
10.0	64	59
16.0	87	80
25.0	115	106
35.0	139	128
50.0	168	155
70.0	214	197
95.0	263	242
120.0	304	280
150.0	353	325
185.0	402	370
240.0	476	438
300.0	542	499

TABLE 2.10

Current carrying capacity of single core and multi-core mineral insulated copper cables at 40°C ambient temperature

(a) Having the sheath covered overall with PVC
(b) Having the sheath bare and not exposed to touch

NOTE: Where cables of type (a) are installed bunched, the appropriate grouping factors given in Tables 2.2 and 2.3 shall be applied for the particular installation condition. For cables of type (b) no grouping factor is necessary.

Nominal cross-sectional area of conductor	Single Core				Multi Core					
	Single Phase A.C. (Amperes)		Three Phase A.C. (Amperes)		Single Phase A.C. 2 Core (Amperes)		Three Phase A.C. 4 Core (Amperes)		7 Core (Amperes)	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
1.0	19	24	15	24	15	20	12	17	9	12
1.5	23	31	20	31	19	25	15	21	11	14
2.5	31	41	26	41	25	35	20	29	15	21
4.0	39	54	35	54	32	45	28	38		
6.0	50	70	44	70	42	58				
10.0	68	94	60	94						
1.0	20	28	17	28	16	22	14	18	9	13
1.5	25	35	22	35	20	28	17	23	12	16
2.5	33	45	29	45	27	37	22	31	16	22
4.0	43	60	37	60	35	49	29	40	20	29
6.0	54	74	48	74	45	62	37	52		
10.0	72	101	64	101	60	84	50	70		
16.0	94	134	84	134	80	110	66	94		
25.0	128	173	111	173	105	149	89	120		
35.0	153	211	136	211						
50.0	191	264	170	264						
70.0	234	322	204	322						
95.0	281	389	247	389						
120.0	323	451	285	451						
150.0	374	518	327	518						

TABLE 2.11

Current carrying capacity of multi-core copper cable at 30ºC ground temperature and for installation method 8

(a) PVC insulated and armoured.
(b) XLPE insulated and armoured.

Nominal cross-sectional area of conductor mm^2	**PVC insulated and armoured (Amperes)**	**XLPE insulated and armoured (Amperes)**
4.0	37	43
6.0	47	54
10.0	62	73
16.0	81	100
25.0	108	125
35.0	129	150
50.0	154	176
70.0	185	217
95.0	222	261
120.0	255	300
150.0	284	331
185.0	321	375
240.0	375	435
300.0	420	490

TABLE 2.12

Current carrying capacity and mass supportable for flexible copper cords insulated with Silicone rubber

Nominal cross-sectional area of conductor mm^2	Current carrying capacity Single or Three Phase a.c. (Amperes)	Maximum mass supportable By twin flexible cord (Kg.)
0.5	3	2
0.75	6	3
1.0	10	5
1.25	13	5
1.5	15	5
2.5	20	5
4.0	25	5

NOTE -- These ratings apply up to an ambient temperature of 120ºC.

TABLE 2.13

NUMBER OF CABLES THAT MAY BE INSTALLED IN CABLE TRAYS

1. SINGLE CORE INSULATED AND SHEATHED CABLES AND SINGLE CORE INSULATED NON-MAGNETIC ARMOURED CABLES.

(a) Where single core cables are installed in ventilated cable trays, the sum of the combined cross-sectional area of all cables installed in the tray shall not exceed 50 per cent of the interior cross sectional area of the cable tray.

(b) Where single core cables are installed in solid bottom cable trays, the sum of the combined cross-sectional area of all cables installed in the tray shall not exceed 40 percent of the interior cross sectional area of the cable tray.

2. MULTI-CORE ARMOURED OR NON-ARMOURED CABLES.

(a) Where multicore cables are installed in ventilated cable trays, the sum of the diameters of all cables installed in the tray shall not exceed 90 percent of the cable tray width and the cables shall be installed in a single layer.

(b) Where multicore cables are installed in solid bottom cable trays, the sum of the diameters of all cables installed shall not exceed 80 percent of the cable tray width and the cables shall be installed in a single layer.

NOTE— For grouping refer to Table 2.3.

APPENDIX 3

CAPACITY OF CONDUITS, TRUNKING AND UNDERFLOOR DUCTS:

TABLE 3.1

Capacity of conduits for simultaneous drawing of single core PVC insulated cable for a straight run upto 10 meters without bends

Nominal cross-sectional area of conductor	Size of Conduit (mm)					
	16	20	25	32	38	50
1.5	6	11	—	—	—	—
2.5	5	8	—	—	—	—
4.0	3	5	10	—	—	—
6.0	2	4	7	13	—	—
10.0	—	2	4	7	10	—
16.0	—	2	3	6	9	—
25.0	—	—	2	4	5	10
35.0	—	—	—	3	4	7
50.0	—	—	—	2	3	5
70.0	—	—	—	—	2	4

TABLE 3.2

Capacity of conduits for simultaneous drawing of single core PVC insulated cables for a run upto 10 meters with one bend

Nominal cross-sectional area of conductor	Size of Conduit (mm)					
	16	20	25	32	38	50
1.5	5	8	—	—	—	—
2.5	4	6	—	—	—	—
4.0	2	4	8	—	—	—
6.0	2	3	6	11	—	—
10.0	—	—	3	6	8	—
16.0	—	—	2	5	7	12
25.0	—	—	—	3	4	8
35.0	—	—	—	2	3	6
50.0	—	—	—	—	2	4
70.0	—	—	—	—	—	3

TABLE 3.3

Capacity of conduits for simultaneous drawing of single core PVC insulated cables for a run upto 10 meters with 2 bends

Nominal cross-sectional area of conductor	Size of Conduit (mm)					
	16	20	25	32	38	50
1.5	3	6	11	—	—	—
2.5	2	4	8	—	—	—
4.0	2	3	6	—	—	—
6.0	—	2	4	8	11	—
10.0	—	—	2	4	6	10
16.0	—	—	2	3	5	9
25.0	—	—	—	2	3	5
35.0	—	—	—	—	2	4
50.0	—	—	—	—	—	3
70.0	—	—	—	—	—	2

NOTE: 1. Tables 3.1, 3.2 and 3.3 apply to both steel and PVC conduits.

TABLE 3.4

Capacity of conduits for simultaneous drawing of different sizes of single core PVC insulated copper conductor in runs upto 10 meters without bends, with one bend and two bends

For each size of cable it is intended to use, obtain the appropriate factor from Table 3.4A.

Add all the cable factors so obtained and compare with the conduit factor given in table 3.4B.

The conduit size which will satisfactorily accommodate the cables is that size having a factor equal to or exceeding the sum of the cable factor.

TABLE 3.4A

CABLE FACTOR

Nominal cross-sectional area of conductor mm^2	1.5	2.5	4.0	6.0	10.0	16.0	25.0	35.0	50.0	70.0
Cable Factor	22	30	43	58	105	121	193	253	342	451

TABLE 3.4B

CONDUIT FACTOR

Conduit size	16 mm	20 mm	25 mm	32 mm	38 mm	50 mm
Upto 10 meters Run without bend	150	244	442	783	1092	1943
Upto 10 meters Run with ONE Bend	120	196	358	643	883	1571
Upto 10 meters Run with TWO Bends	86	141	260	474	646	1149

TABLE 3.5

Maximum number of single core PVC insulated cables in trunking of various sizes

For each size of cable it is intended to use, obtain the appropriate factor from Table 3.5A.

Add all the cable factors so obtained and compare with the trunking factor given in table 3.5B.

The trunking size which will satisfactorily accommodate the cables is that size having a factor equal to or exceeding the sum of the cable factor.

TABLE 3.5A

CABLE FACTOR

Size of Cable mm^2	**1.5**	**2.5**	**4.0**	**6.0**	**10.0**	**16.0**	**25.0**	**35.0**	**50.0**	**70.0**
Cable Factor	8	11	15	22	36	45	68	90	121	158

TABLE 3.5B

TRUNKING FACTOR

Trunking Size mm × mm	**50×50**	**75×50**	**75×75**	**100×50**	**100×75**	**100×100**	**150×50**	**150×75**	**150×100**
Trunking Factor	1037	1555	2371	2091	3189	4252	3147	4718	6294

TABLE 3.6

Maximum number of single core PVC insulated cables in underfloor ducts of various sizes

For each size of cable it is intended to use, obtain the appropriate factor from Table 3.6A.

Add all the cable factors so obtained and compare with the underfloor ducts factor given in table 3.6B.

The underfloor duct size which will satisfactorily accommodate the cables is that size having a factor equal to or exceeding the sum of the cable factor.

TABLE 3.6A

CABLE FACTOR

Size of Cable mm^2	1.5	2.5	4.0	6.0	10.0	16.0
Cable Factor	8	11	15	22	36	45

TABLE 3.6B

UNDER FLOOR DUCTS FACTORS

Underfloor Ducts mm	75×25	100×25	150×25	75×38	100×38	150×38
Underfloor Ducts Factor	660	875	1312	990	1312	1970

APPENDIX 4

MISCELLANEOUS TABLES AND DETAILS

TABLE 4.1

SIZE OF EARTH CONTINUITY CONDUCTORS AND EARTHING LEADS

Nominal Cross-Sectional Area of Largest Associated Copper Circuit (mm²)	Nominal Cross-Sectional Area of Copper Earth Continuity Conductor (mm²)	Nominal Cross-Sectional Area of Copper Earthing Lead (mm²)
1.5 mm²	1.0 mm²	6.0 mm²
2.5 mm²	1.0 mm²	6.0 mm²
4.0 mm²	2.5 mm²	6.0 mm²
6.0 mm²	2.5 mm²	6.0 mm²
10.0 mm²	6.0 mm²	6.0 mm²
16.0 mm²	6.0 mm²	6.0 mm²
25.0 mm²	16.0 mm²	16.0 mm²
35.0 mm²	16.0 mm²	16.0 mm²
50.0 mm²	16.0 mm²	16.0 mm²
70.0 mm²	50.0 mm²	50.0 mm²
95.0 mm²	50.0 mm²	50.0 mm²
120.0 mm²	50.0 mm²	50.0 mm²
150.0 mm²	50.0 mm²	50.0 mm²
185.0 mm²	70.0 mm²	70.0 mm²
240.0 mm²	70.0 mm²	70.0 mm²
300.0 mm²	70.0 mm²	70.0 mm²
400.0 mm²	70.0 mm²	70.0 mm²

NOTE – P.V.C. insulation of earth continuity conductor should be coloured green / yellow.