

Table (1)

Current Rating

PVC Insulated Cables
Single-Core, Unarmoured

Single-Core Cables with PVC Insulation, Unarmoured, with or without Sheath 450/750V or 0.6/1kV

Table 2 : Current-Carrying Capacities (Amp) [CU/PVC or CU/PVC/PVC Cables]

BS EN 50525-2-31 (BS 6004)

IEC 60502-1 (BS 6346)

SS 358-3

Conductor Operating Temperature :70°C

Ambient Temperature :30°C

Conductor cross-sectional area	Reference Method 4 (enclosed in conduit in thermally insulating wall etc.)		Reference Method 3 (enclosed in conduit on a wall or in trunking etc.)		Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray horizontal or vertical)		Reference Method 12 (free air)		
	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three phase a.c.	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	2 cables, single-phase a.c. or d.c. or flat and touching	3 or 4 cable three-phase a.c. flat and touching or trefoil	Horizontal flat spaced	Vertical flat spaced	Trefoil
	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three phase a.c.	2 cables, single-phase a.c. or d.c.	3 or 4 cables, three-phase a.c.	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, three-phase a.c. flat and touching or trefoil	2 cables, single-phase a.c. or d.c. or flat and touching	3 or 4 cable three-phase a.c. flat and touching or trefoil	Horizontal flat spaced	Vertical flat spaced	Trefoil
mm ²	2	3	4	5	6	7	8	9	10	11	12
BS 6004											
1	11	10.5	13.5	12	15.5	14	*	*	*	*	*
1.5	14.5	13.5	17.5	15.5	20	18	*	*	*	*	*
2.5	19.5	18	24	21	27	25	*	*	*	*	*
4	26	24	32	28	37	33	*	*	*	*	*
6	34	31	41	36	47	43	*	*	*	*	*
10	46	42	57	50	65	59	*	*	*	*	*
16	61	56	76	68	87	79	*	*	*	*	*
25	80	73	101	89	114	104	126	112	146	130	110
35	99	89	125	110	141	129	156	141	181	162	137
BS 6346											
50	119	108	151	134	182	167	191	172	219	197	167
70	151	136	192	171	234	214	246	223	281	254	216
95	182	164	232	207	284	261	300	273	341	311	264
120	210	188	269	239	330	303	349	318	394	362	308
150	240	216	300	262	381	349	404	369	456	419	356
185	273	245	341	296	436	400	463	424	521	480	409
240	320	286	400	346	515	472	549	504	615	569	485
300	367	328	458	394	594	545	635	584	709	659	561
400	*	*	546	467	694	634	732	679	852	795	656
500	*	*	626	533	792	723	835	778	982	920	749
630	*	*	720	611	904	824	953	892	1138	1070	855
800	*	*	*	*	1030	943	1086	1020	1265	1188	971
1000	*	*	*	*	1154	1058	1216	1149	1420	1337	1079

Note : For rating factors of ambient temperature other than 30°C please refer to Table 25

Table (2)

Current Rating

XLPE (or LSZH) Insulated Cables
Single-Core, Unarmoured

Single-Core Cables with XLPE (or LSZH) Insulation, with or without PVC (or LSZH) Outersheath 450/750V or 0.6/1kV

Table 12 : Current-Carrying Capacities (Amp)

[CU/LSZH, CU/XLPE/PVC, CU/XLPE/LSZH, CU/MT/LSZH or CU/MT/XLPE/LSZH Cables]

Conductor Operating Temperature :90°C

BS EN 50525-3-41 (BS 7211)

Ambient Temperature :30°C

IEC60502-1

Conductor cross-sectional area	Reference Method 4 (enclosed in conduit in thermally insulating wall etc)		Reference Method 3 (enclosed in conduit on a wall or in trunking etc)		Reference Method 1 (clipped direct)		Reference Method 11 (on a perforated cable tray, horizontal or vertical)		Reference Method 12 (free air)		
	2 cables, single-phase a.c. or d.c.	3 or 4 cables, 3-phase a.c.	2 cables, single-phase a.c. or d.c.	3 or 4 cables, 3-phase a.c.	2 cables, single-phase a.c. or d.c. flat and touching	3 or 4 cables, 3-phase a.c. flat and touching or trefoil	2 cables, single-phase a.c. or d.c. or flat and touching	3 or 4 cables, 3-phase a.c. flat and touching or trefoil	Horizontal flat spaced	Vertical flat spaced	Trefoil
1	2	3	4	5	6	7	8	9	10	11	12
mm ²	A	A	A	A	A	A	A	A	A	A	A
1.5	18	17	22	19	25	23	-	-	-	-	-
2.5	24	23	30	26	34	31	-	-	-	-	-
4	33	30	40	35	46	41	-	-	-	-	-
6	43	39	51	45	59	54	-	-	-	-	-
10	58	53	71	63	81	74	-	-	-	-	-
16	76	70	95	85	109	99	-	-	-	-	-
25	100	91	126	111	143	130	158	140	183	163	138
35	125	111	156	138	176	161	195	176	226	203	171
50	149	135	189	168	228	209	239	215	274	246	209
70	189	170	240	214	293	268	308	279	351	318	270
95	228	205	290	259	355	326	375	341	426	389	330
120	263	235	336	299	413	379	436	398	495	453	385
150	300	270	375	328	476	436	505	461	570	524	445
185	341	306	426	370	545	500	579	530	651	600	511
240	400	358	500	433	644	590	686	630	769	711	606
300	459	410	573	493	743	681	794	730	886	824	701
400	-	-	684	584	868	793	915	849	1065	994	820
500	-	-	783	666	990	904	1044	973	1228	1150	936
630	-	-	900	764	1130	1033	1191	1115	1423	1338	1069
800	-	-	-	-	1288	1179	1358	1275	1580	1485	1214
1000	-	-	-	-	1443	1323	1520	1436	1775	1671	1349

Note : For rating factors of ambient temperature other than 30°C please refer to Table 27
For rating factors of ground temperature other than 15°C please refer to Table 30

Table (3)

Table 25 : Correction factor for ambient air temperature other than 30°C to be applied to the current-carrying capacities for cables in the air

Ambient temperature °C	Insulation				
	PVC (70°C)	XLPE (90°C)	HT-PVC (90°C)	Rubber (85°C)	Rubber (60°C)
10	1.22	1.15	-	-	-
15	1.17	1.12	-	-	-
20	1.12	1.08	-	-	-
25	1.06	1.04	1.03	1.02	-
30	1.00	1.00	1.00	1.00	1.00
35	0.94	0.96	0.97	0.95	0.91
40	0.87	0.91	0.94	0.90	0.82
45	0.79	0.87	0.91	0.85	0.71
50	0.71	0.82	0.87	0.80	0.58
55	0.61	0.76	0.84	0.74	0.41
60	0.50	0.71	0.80	0.67	-
65	0.35	0.65	0.76	0.60	-
70	-	0.58	0.71	0.52	-
75	-	0.50	0.61	0.43	-
80	-	0.41	0.50	0.30	-
85	-	0.29	0.35	-	-

Table (4)

Table 29 : Correction Factors for Ambient Temperature & Group Installation

Correction for groups of more than one circuit of single-core cables, or more than one multi-core cable

Reference Methods of Installation		Correction Factor (C _g)													
		Number of Circuits or Multi-Core Cables													
		2	3	4	5	6	7	8	9	10	12	14	16	18	20
Enclosed (Method 3 or 4) or bunched and clipped to a non-metallic surface (Method 1)		0.80	0.70	0.65	0.60	0.57	0.54	0.52	0.50	0.48	0.45	0.43	0.41	0.39	0.38
Single layer clipped to a non-metallic surface (Method 1)	Touching	0.85	0.79	0.75	0.73	0.72	0.72	0.71	0.70	-	-	-	-	-	-
	Spaced *	0.94	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Single layer multi-core on a perforated metal cable tray, vertical or horizontal (Method 11)	Touching	0.86	0.81	0.77	0.75	0.74	0.73	0.73	0.72	0.71	0.70	-	-	-	-
	Spaced *	0.91	0.89	0.88	0.87	0.87	-	-	-	-	-	-	-	-	-
Single layer single-core on a perforated metal cable tray, touching (Method 11)	Horizontal	0.90	0.85	-	-	-	-	-	-	-	-	-	-	-	-
	Vertical	0.85	-	-	-	-	-	-	-	-	-	-	-	-	-
Single layer multi-core touching on ladder supports		0.86	0.82	0.80	0.79	0.78	0.78	0.78	0.77	-	-	-	-	-	-

* Space means a clearance between adjacent surfaces of at least one cable Diam. (D_c). Where the horizontal clearance between adjacent cables exceeds 2 D_c, no correction factor need be applied.

Note : 1 The factors in the table are applicable to a group of cables all of the same sizes. The value of the current derived from application of the appropriate factors is the maximum continuous current to be carried by any of the cables in the group.

2 If, due to known operating conditions, a cable is expected to carry not more than 30% of its grouped rating, it may be ignored for the purpose of obtaining the rating factor for the rest of the group.

For example, a group of N loaded cables would normally require a group reduction factor of C_g applied to the tabulated I_t. However, if M cables in the group carry loads which are not greater than 0.3C_g I_t amperes, the other cables can be sized by using the group rating factor corresponding to (N-M) cables.

- Single Phase Load Current $I_B = MD \text{ (kW)} \div 230 \div \cos \theta$
- Three Phase Load Current $I_B = MD \text{ (kW)} \div \sqrt{3} \div 400 \div \cos \theta$
- Ambient temperature Correction factor, C_a
- Installation method correction factor , C_g
- Thermally Insulation wall , C_i
- Require minimum tabulated Cable, $I_{tmin} = I_B \div C_a \div C_g \div C_i$
- Select wire /Cable (I_t) (from current carrying Capacity table)

effective current of cable ($I_z = I_t \times C_a \times C_g \times C_i$)

t_c = conductor temperature

t_a = ambient temperature

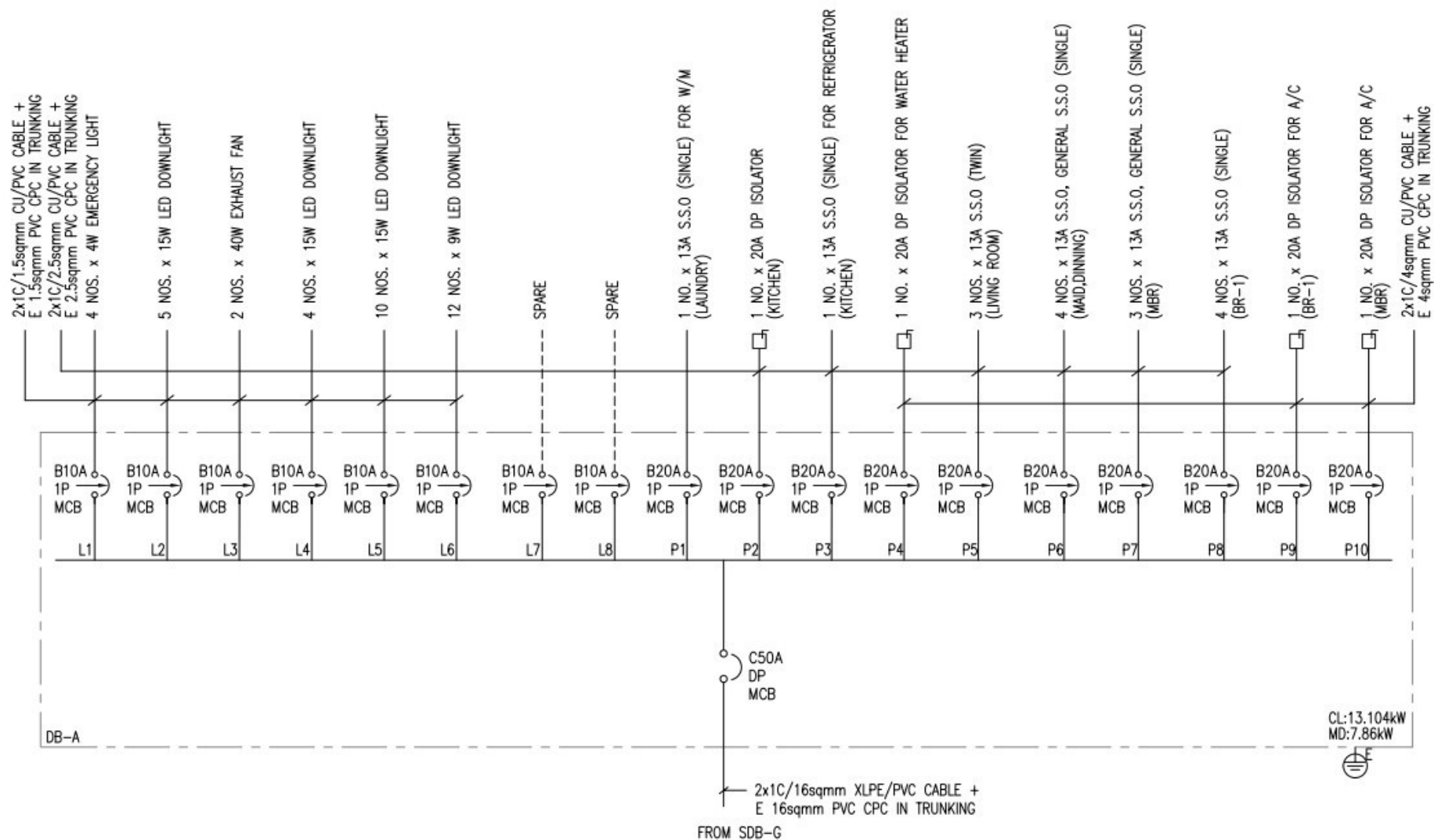
I_B = load current

t_p = rated temperature of wire /cable (70°C PVC / 90°C XLPE/PVC)

t_r = Reference temperature 30°C

I_z = Effective current of wire / cable

$$t_c = t_a + \frac{(I_B)^2}{(I_z)^2} \times (t_p - t_r) \quad (\text{Conductor Operating Temperature})$$



Panel Name: DB-A
Supply From: SDB-G

DB-A			W	I _B	I _N	C _a	C _g , C _i	I _{min}	Cable	REMARKS
S/N	DESCRIPTION	CIRCUIT								
1	4 NOS. x 4 W EMERGENCY LIGHT	L1	16	0.08	10					
2	5 NOS. x 15W LED DOWNLIGHT	L2	75	0.38	10					
3	2 NOS. x 40W EXHAUST FAN	L3	80	0.4	10					
4	4 NOS x 15W LED DOWNLIGHT	L4	75	0.38	10					
5	10 NOS x 15W LED DOWNLIGHT	L5	150	0.76	10					
6	12 NOS x 9W LED DOWNLIGHT	L6	108	0.55	10					
7	SPARE	L7								
8	SPARE	L8								
9	1NO. x 13A S.S.O (SINGLE) W/M (LAUNDRY)	P1	500	2.55	20					
10	1NO. x 20A DP ISO (KITCHEN)	P2	1500	13.0	20					
11	1NO. x 13A S.S.O (SINGLE) REFRIGERATOR (KITCHEN)	P3	500	2.55	20					
12	1NO. x 20A DP WATER HEATER	P4	2000	8.7	20					
13	3NOS. x 13A S.S.O (TWIN) (LIVING ROOM)	P5	1800	9.2	20					
14	4NOS. x 13A S.S.O(SINGLE), GENERAL S.S.O (MAID + DINING)	P6	1200	6.13	20					
15	3NOS. x 13A S.S.O (SINGLE), GENERAL S.S.O (MBR)	P7	900	4.6	20					
16	4NOS. x 13A S.S.O (SINGLE), (BR-1)	P8	1200	6.13	20					
17	1NO. x 20A DP ISOLATOR FOR A/C (BR-1)	P9	1000	5.11	20					
18	1NO. x 20A DP ISOLATOR FOR A/C (MBR)	P10	2000	10.23	20	0.94	0.48	22.67		

CL: 13.104 kW

DF 0.6

MD 7.86 kW

$I_B = 7.86 \div 0.23 \div 0.85 = 40.21$

Select MCB 50A DP.

DB FINAL CIRCUIT

S/N	FROM	To	MD (W)	I _B (Amp)	I _N	C _a 35°C	C _g (6 CKT-LTG) (10CKT -Power)	$I_{tmin} = \frac{I_B}{C_a \times C_g}$	Cable Cu/PVC + PVC (E)	I _t	I _z = I _t × C _a × C _g	$t_c = t_a + \frac{I_B^2}{I_z^2} (t_p - t_r)$
1	DB	L1	16	0.08	10	0.94	0.57	0.15	2 x 1C 1.5 mm ² Cu/PVC + 1.5 mm ² PVC (E)	17.5	9.38	$t_c = 35 + \frac{0.08^2}{9.38^2} (70 - 30)$
												= 35 + 0.0029 = 35.0029°C

DB FINAL CIRCUIT

S/N	FROM	To	MD (W)	I _B (Amp)	I _N	Ca 35°C	C _g (6 CKT-LTG) (10CKT -Power)	$I_{tmin} = \frac{I_B}{C_a \times C_g}$	Cable Cu/PVC + PVC (E)	I _t	I _z = I _t × C _a × C _g	$t_c = t_a + \frac{I_B^2}{I_z^2} (t_p - t_r)$
2	DB	L2	75	0.38	10	0.94	0.57	0.7	2 x 1C 1.5 mm ² Cu/PVC + 1.5 mm ² PVC (E)	17.5	9.38	$t_c = 35 + \frac{0.38^2}{9.38^2} \times 40$
												= 35 + 0.066 = 35.066°C

DB FINAL CIRCUIT

S/N	FROM	To	MD (W)	I _B (Amp)	I _N	C _a 35°C	C _g (6 CKT-LTG) (10CKT -Power)	$I_{tmin} = \frac{I_B}{C_a \times C_g}$	Cable Cu/PVC + PVC (E)	I _t	I _z = I _p × C _a × C _g	$t_c = t_a + \frac{I_B^2}{I_z^2} (t_p - t_t)$
3	DB	L5	150	0.77	10	0.94	0.57	1.43	2 x 1C 1.5 mm ² Cu/PVC + 1.5 mm ² PVC (E)	17.5	9.38	$t_c = 35 + \frac{0.77^2}{9.38^2} \times 40$
												= 35 + 0.269 = 35.269°C

DB FINAL CIRCUIT

S/N	FROM	To	MD (W)	I_B (Amp)	I_N	Ca 35°C	C_g (6 CKT-LTG) (10CKT -Power)	$I_{tmin} = \frac{I_B}{C_a \times C_g}$	Cable Cu/PVC + PVC (E)	I_t	$I_z = I_t \times C_a \times C_g$	$t_c = t_a + \frac{I_B^2}{I_z^2} (t_p - t_r)$
4	DB	P2 (Kitchen)	1500	7.67	20	0.94	0.48	17.00	2 x 1C 2.5 mm ² Cu/PVC + 2.5 mm ² PVC (E)	24	10.83	$t_c = 35 + \frac{7.67^2}{10.83^2} \times 40$
												$= 35 + 20.063 = 55.063^\circ\text{C}$

DB FINAL CIRCUIT

S/N	FROM	To	MD (W)	I _B (Amp)	I _N	Ca 35°C	C _g (6 CKT-LTG) (10CKT -Power)	$I_{tmin} = \frac{I_B}{C_a \times C_g}$	Cable Cu/PVC + PVC (E)	I _t	I _z = I _t × C _a × C _g	$t_c = t_a + \frac{I_B^2}{I_z^2} (t_p - t_r)$
5	DB	P4 (W/H)	2000	8.69	20	0.94	0.48	19.26	2 x 1 C 4 mm ² Cu/PVC + 4 mm ² PVC (E)	32	14.44	$t_c = 35 + \frac{8.69^2}{14.44^2} \times 40$
												$= 35 + 14.487 = 49.487^\circ\text{C}$

DB FINAL CIRCUIT

S/N	FROM	To	MD (W)	I_B (Amp)	I_N	Ca 35°C	C_g (6 CKT-LTG) (10CKT -Power)	$I_{tmin} = \frac{I_B}{C_a \times C_g}$	Cable Cu/PVC + PVC (E)	I_t	$I_z = I_t \times C_a \times C_g$	$t_c = t_a + \frac{I_z^2}{I_z^2} (t_p - t_r)$
6	DB	P10 (A/C)	2000	10.23	20	0.94	0.48	22.67	2 x 1C 4 mm ² Cu/PVC + 4 mm ² PVC (E)	32	14.44	$t_c = 35 + \frac{10.23^2}{14.44^2} \times 40$
												$= 35 + 20.076 = 55.076^\circ\text{C}$

DB FINAL CIRCUIT

S/N	FROM	To	MD (W)	I _B (Amp)	I _N	Ca 35°C	C _g (6 CKT-LTG) (10CKT -Power)	I _{tmin} = $\frac{I_B}{C_a \times C_g}$	Cable Cu/PVC + PVC (E)	I _t	I _z = I _p × C _a × C _g	t _c = t _a + $\frac{I_z^2}{I_r^2} (t_p - t_r)$
1	DB	L1	16	0.08	10	0.94	0.57	0.15	2 x 1C 1.5 mm ² Cu/PVC + 1.5 mm ² PVC (E)	17.5	9.38	t _c = 35 + $\frac{0.08^2}{9.38^2} (70 - 30)$
												= 35 + 0.0029 = 35.0029°C
2	DB	L2	75	0.38	10	0.94	0.57	0.7	2 x 1C 1.5 mm ² Cu/PVC + 1.5 mm ² PVC (E)	17.5	9.38	t _c = 35 + $\frac{0.38^2}{9.38^2} \times 40$
												= 35 + 0.066 = 35.066°C
3	DB	L5	150	0.77	10	0.94	0.57	1.43	2 x 1C 1.5 mm ² Cu/PVC + 1.5 mm ² PVC (E)	17.5	9.38	t _c = 35 + $\frac{0.77^2}{9.38^2} \times 40$
												= 35 + 0.269 = 35.269°C
4	DB	P2 (Kitchen)	1500	7.67	20	0.94	0.48	17.00	2 x 1C 2.5 mm ² Cu/PVC + 2.5 mm ² PVC (E)	24	10.83	t _c = 35 + $\frac{7.67^2}{10.83^2} \times 40$
												= 35 + 20.063 = 55.063°C
5	DB	P4 (W/H)	2000	8.69	20	0.94	0.48	19.26	2 x 1C 4 mm ² Cu/PVC + 4 mm ² PVC (E)	32	14.44	t _c = 35 + $\frac{8.69^2}{14.44^2} \times 40$
												= 35 + 14.487 = 49.487°C
6	DB	P10 (A/C)	2000	10.23	20	0.94	0.48	22.67	2 x 1C 4 mm ² Cu/PVC + 4 mm ² PVC (E)	32	14.44	t _c = 35 + $\frac{10.23^2}{14.44^2} \times 40$
												= 35 + 20.076 = 55.076°C

I_B Load Current

I_N Protective Device current rating MCB/MCCB

C_a Ambient temperature correction factor

C_g Installation method correction factor

C_i Thermally Insulation wall

Require minimum tabulated cable $I_{tmin} = I_N \div C_a \div C_g \div C_i$

Select wire/cable (I_t) from Current Carrying Capacity table effective current of wire / cable I_z

$$I_z = I_t \times C_a \times C_g \times C_i$$

MCB Tripping Current $I_2 = 1.45I_N$

MCCB Tripping Current $I_2 = 1.3I_N$

Check $I_z > I_2$ (or)

$$I_z < I_2 \quad (\text{not protected small overload})$$

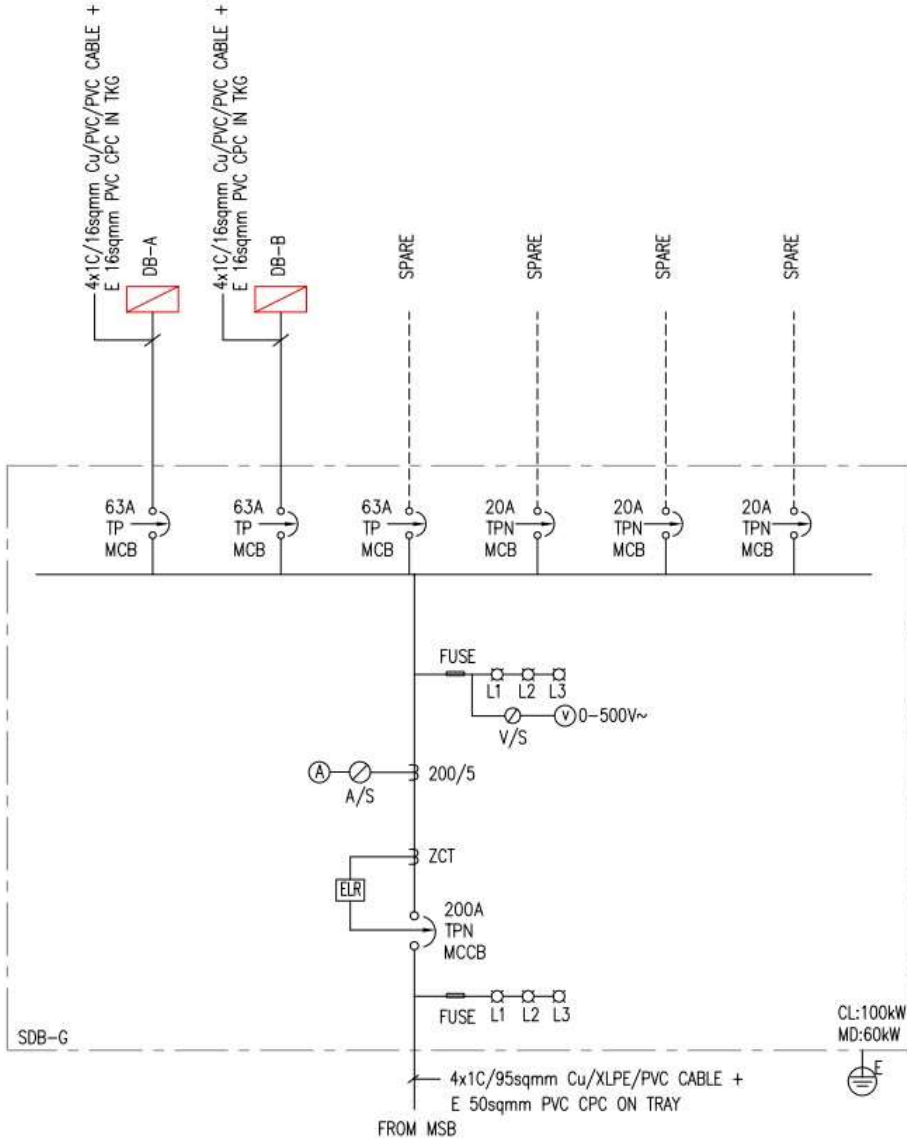
Calculate Conductor Temperature

$$t_c = t_a + \frac{(I_B)^2}{(I_z)^2} \times (t_p - t_r) \quad \text{(a) at Full Load Current, } I_B$$

$$t_c = t_a + \frac{(I_N)^2}{(I_z)^2} \times (t_p - t_r) \quad \text{(b) at MCB Rated Current, } I_N$$

$$t_c = t_a + \frac{(I_2)^2}{(I_z)^2} \times (t_p - t_r) \quad \text{(c) at } I_2 = \text{MCB / MCCB tripping Current}$$

Application example (3)



OVER LOAD AND WIRE SHOCK

S/N	DB	MD (kW) 3Ø pf 0.85	I _B (Amp)	I _N	C _a 35°C PVC	C _g , C _i = 1 (2 CKT) (TKG)	$I_{tmin} = \frac{I_N}{C_a \times C_g \times C_i}$	Cable Cu/PVC/PVC + Cu/PVC (E)	I _t	I _z = I _t x C _a x C _g	I _z > I _B	I _z > I _N	I ₂ = 1.45I _N	I _z > I ₂	$t_c = t_a + \frac{I_z^2}{I_2^2} (t_p - t_r)$
1	DB A	30	51	63	0.94	0.8	83.8	4 x 1C 16 mm ² Cu/PVC/PVC + 1C x 16 mm ² Cu/PVC (E)	68	51.14	51.14>51				$t_c = 35 + \frac{51^2}{51.14^2} (70 - 30)$
															= 35 + 0.99 x 40
															= 35 + 39.6 = 74.6°C > 70°C
2	Cable effective current Iz is less than protective device current rating											51.14<63			$t_c = 35 + \frac{63^2}{51.14^2} \times 40$
															= 35 + 1.51 x 40
															= 35 + 60.4 = 95.4 °C > 70°C

OVER LOAD AND WIRE SHOCK

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OVER LOAD AND WIRE SHOCK

[illegible]

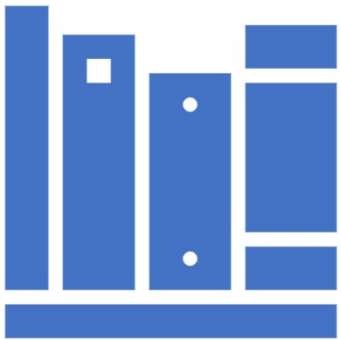
OVER LOAD AND WIRE SHOCK

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Table (5) - Rated Conductor Temperature

Cable Type	Rated Temperature (°C)	Overload Temperature (°C)	Critical Temperature (°C)
PVC- insulated	70	95	150
Cross-linked	90	130	250

It should be noted that operations at the overload temperature are acceptable provided that such operations shall not exceed 100hrs per year and such 100-hr period shall not exceed five times.



Presentation End