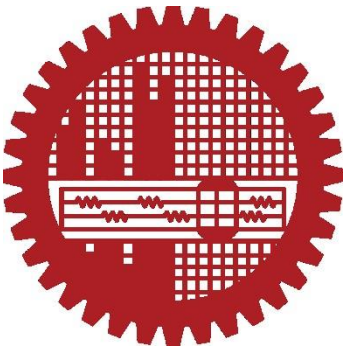
Bangladesh University of Engineering and Technology



Department of Electrical and Electronic Engineering

Course No: EEE 414

Final Project Report

Submitted by: Group-04

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Introduction:

Fixture: An electrical fixture is a product that is used for fitting various electrical devices like lights, fans etc. They can be thought of as "fixed" and not easily replaceable.

Example: wall brackets, switchboards, power sockets.

Fittings: An electrical fitting is any electrical appliances that fit in various fixtures. They are usually easily replaceable by users and are more prone to changes compared to fixtures.

Example: Tube lights, TV, electric fan etc.

Although fitting and fixtures do not mean the same thing, it can often be difficult to differentiate between them perfectly and there may be different definitions in the law in different countries. Thus, for all intents and purposes, we will mention them together to remove any ambiguity.

Conduit: Conduit means channel. An electrical conduit is a tube used to protect and route electrical wiring in a building. These can be made of metal, wood or plastic (PVC).

They can be primarily classified into two classes:

1) Surface/exposed conduits,

2) Concealed conduits

Switchboard: An apparatus consisting of a panel on which are mounted electric switches so arranged that a number of circuits may be connected, combined, and controlled.

An electric switchboard is a device that distributes electricity from one or more sources of supply to several smaller load circuits. It is an assembly of one or more panels, each of which contains switching devices for the protection and control of circuits fed from the switchboard. Several manufacturers make switchboards used in industry, commercial buildings, telecommunication facilities, oil and gas plants, data centers, health care, and other buildings, and onboard large ships. A switchboard is divided into different interconnected sections, generally consisting of a main section and a distribution section.

Distribution board: A distribution board (also known as panelboard, breaker panel, electric panel, DB board or DB box) is a component of an electricity supply system that divides an electrical power feed into subsidiary circuits while providing a protective fuse or circuit breaker for each circuit in a common enclosure.

Here we have designed a 3 storied apartment building's electrical services:

1.Floorplan

2.Fittings & Fixtures

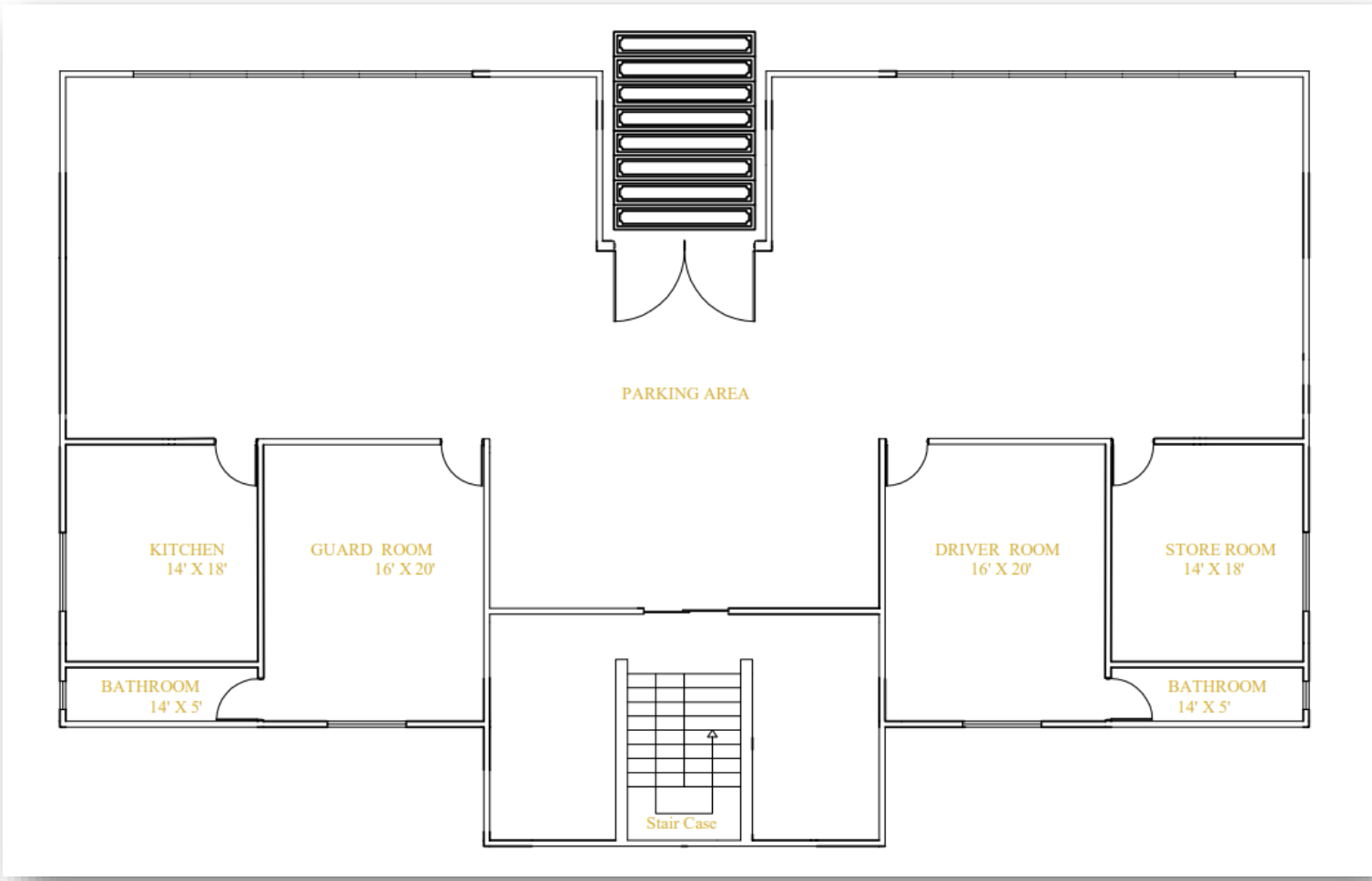
3.Conduit

4.Sub-Distribution board (SDB) & Emergency Sub-Distribution board (ESDB)

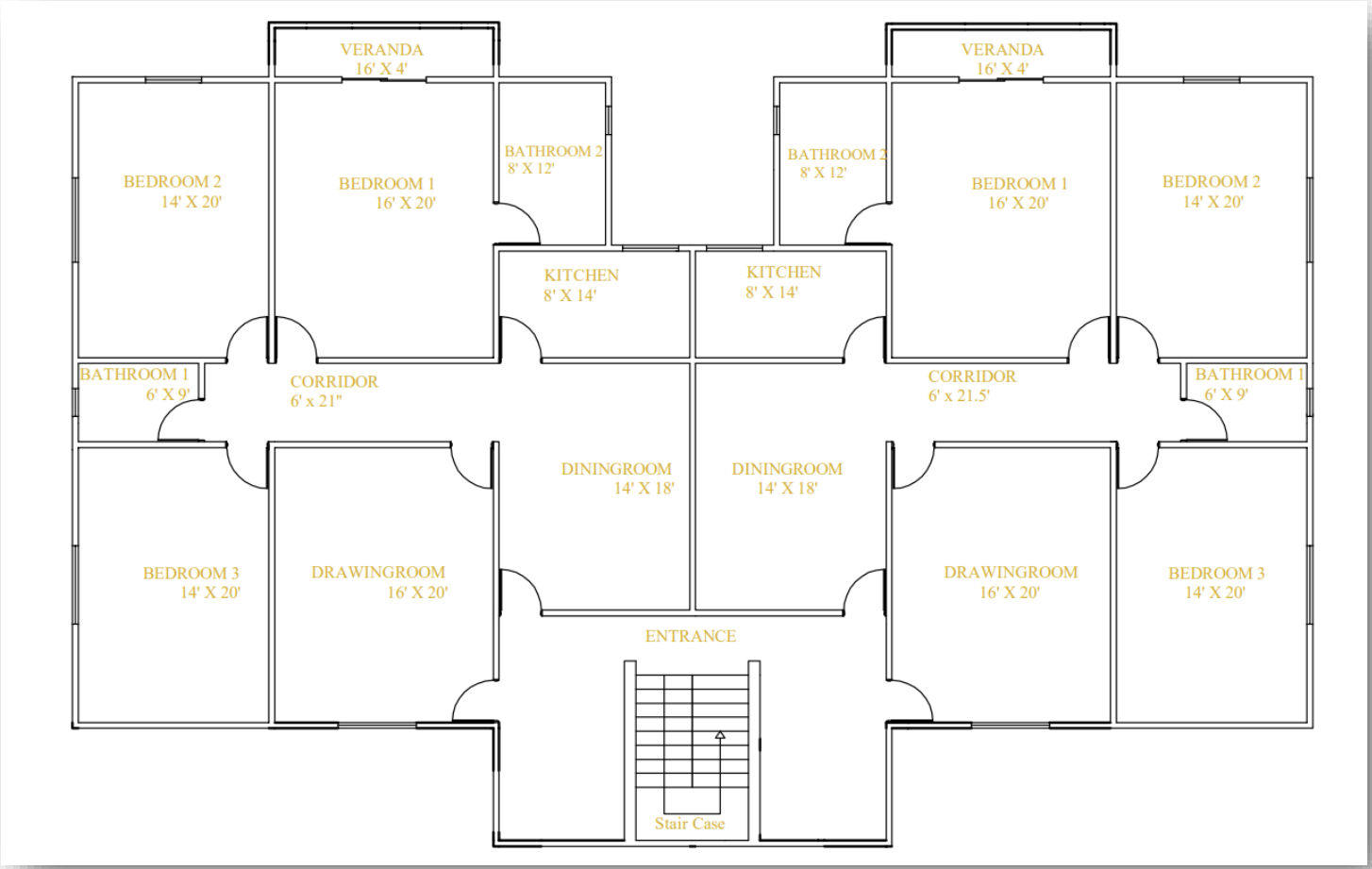
5.Main Distribution board (MDB) & Emergency Main Distribution board (EMDB)

FLOOR PLAN

Floorplan of Ground Floor:



Floor Plan of First and Second Floor:



Calculation of Fittings & Fixtures (1st and 2nd floor)

1.Bedroom 1 and Drawing room: (FB)

Area = (16 * 20) sqft. =320 sqft. = (320*0.0929) =29.729 m^2

Illuminance (LUX), E = 100 lumen/ m^2

Light loss factor*Utilization Factor, LLF x UF =0.8

Number of Lights per fixture, n = 1

Flux = 1300 lumen

From calculation, Number of Light, N = $\frac{29.729*100}{1*1300*0.8} = 2.86.$

So, we used 2TA (40 Watt each) and 1 LB (60 Watt)

One 42" diameter fan is needed every 150 sqft.

Number of Fans = $\frac{A\,(sqft)}{150}$ =$\frac{320}{150}$ = 2.133

Only 2 fan is considered. (2 FB)

2.Bedroom 2 and Bedroom 3: (FA)

Area = (14 *20) sqft = 280 sqft= (280*0.0929) =26.026 m^2

Illuminance (LUX), E = 100 lumen/ m^2

Light loss factor*Utilization Factor, LLF x UF =0.8

Number of Lights per fixture, n = 1

Flux = 1300 lumen

From calculation, N =$\frac{26.026*100}{1*1300*0.8}$ = 2.5**. So, we used 2 TA (40W) and 1 LB (30W)**

One 56" diameter fan is needed for every 180 sqft.

Number of Fans = $\frac{A\,(sqft)}{180}$ =$\frac{280}{180}$=1.56

So,1 Fan is enough. (Fan is big in diameter so 1 fan is enough) (1 FA)

3.Dining room:

Area = (14 * 18) sqft = 252 sqft= (252*0.0929) =23.42 m^2

Illuminance (LUX), E = 100 lumen/ m^2

Light loss factor*Utilization Factor, LLF x UF =0.8

Number of Light per fixture, n = 1

Flux = 1300 lumen

From calculation, N= $\frac{23.42*100}{1*1300*0.8}$ = = 2.25.

So, we used 2TA and 1 LB

One 56" diameter fan is needed for every 180 sqft.

Number of Fans = $\frac{A\,(sqft)}{180}$= $\frac{252}{180}$ =1.4

So ,1 Fan is enough.

4.Corridor:

Area = (6* 21.5) sqft =129 sqft= (129*0.0929) = 11.9 m^2

Illuminance (LUX), E = 100 lumen/ m^2

Light loss factor*Utilization Factor, LLF x UF =0.8

Number of Light per fixture, n = 1

Flux = 1300 lumen

From calculation, N = $\frac{11.9*100}{1*1300*0.8} = 1.144$

We used 1 LS (Ceiling light) (23 Watt) considering the cost.

5.Kitchen:

Area = (8*14) sqft = 112 sqft= (112*0.0929) =10.41 m^2

Illuminance (LUX), E = 100 lumen/ m^2

Light loss factor*Utilization Factor, LLF x UF =0.8

Number of Light per fixture, n = 1

Flux = 1300 lumen Flux = 1300 lumen

From calculation, N = $\frac{10.41*100}{1*1300*0.8} = 1$

We used 1 TS (60Watt)

6.Toilet 1:

Area = (6*9) sqft =54 sqft= (54*0.0929) = 5.0166 m^2

Illuminance (LUX), E = 100 lumen/ m^2

Light loss factor*Utilization Factor, LLF x UF =0.8

Number of Light per fixture, n = 1

Flux = 1300 lumen

From calculation, N = $\frac{5.019*100}{1*1300*0.8} = 0.4823$

We used 1 LB (30W)

7.Toilet 2:

Area = (8*12) sqft =96 sqft= (96*0.0929) = 8.9184 m^2

Illuminance (LUX), E = 100 lumen/ m^2

Light loss factor*Utilization Factor, LLF x UF =0.8

Number of Light per fixture, n = 1

Flux = 1300 lumen

From calculation, N =$\frac{8.9184*100}{1*1300*0.8} = 0.8575$

We used 1 LB (30 W)

8.Veranda:

Area = (16*4) sqft = (64*0.0929) =5.9456 m^2

Illuminance (LUX), E = 100 lumen/ m^2

Light loss factor*Utilization Factor, LLF x UF =0.8

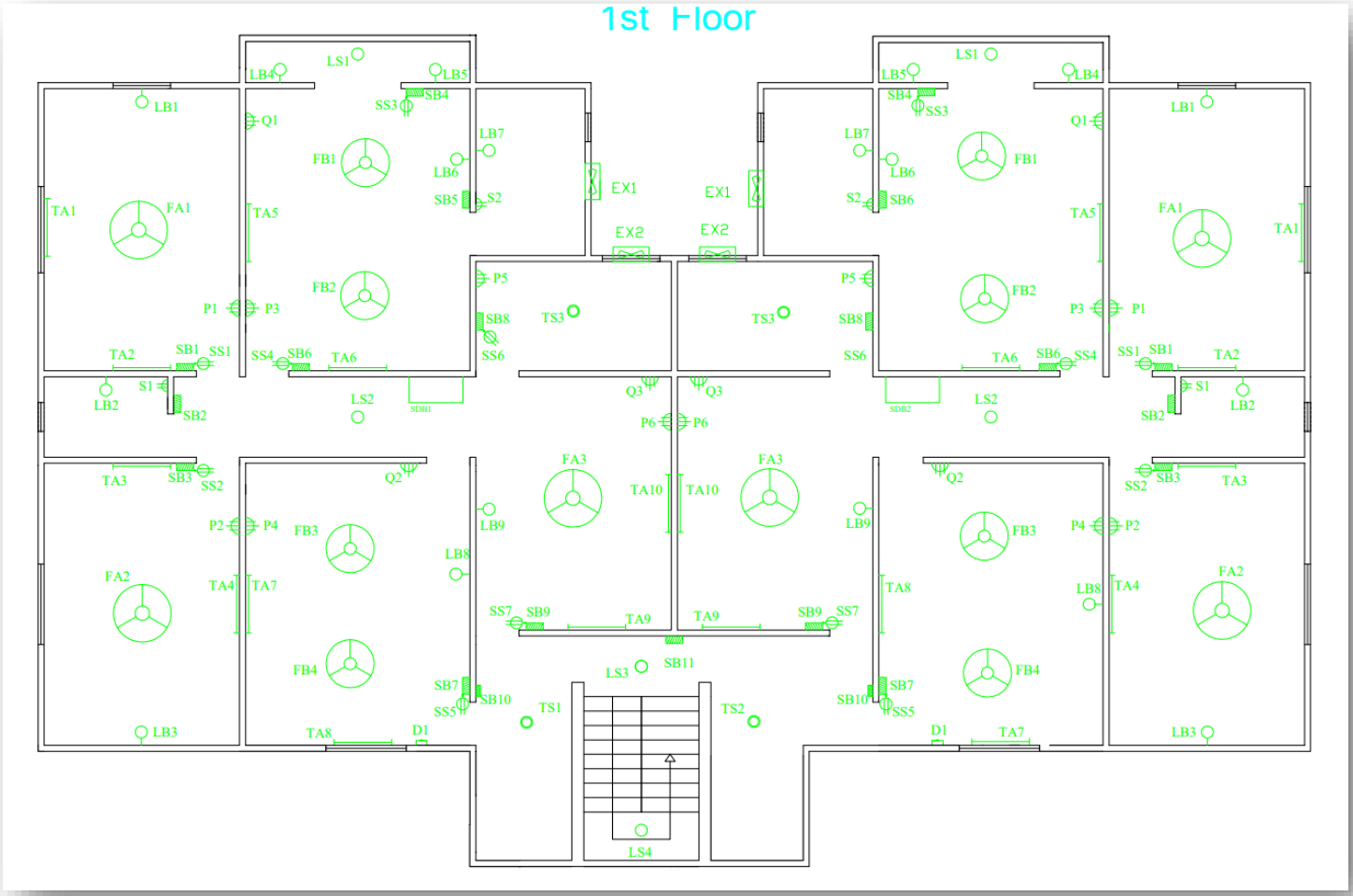
Number of Light per fixture, n = 1

Flux = 1300 lumen

From calculation, N = $\frac{5.9456*100}{1*1300*0.8}$ =0.5717

Here, though only 1 light is needed, we used 1 LS and 2 LB for decoration purposes.

First and Second Floor Fittings & Fixtures



First Floor:

LIGHTS	Power Ratings
TA (Tube light) [1-10 per unit]	40W
LS (ceiling light) [2 per unit,2 staircase]	23W
LB (bracket light/wall) [1-9 per unit]	30W

TS (double ceiling light) [1 per unit,2 staircase]	60W
FANS	
FA (56” diameter fan) [3 per unit]	100W
FB (42” diameter fan) [4 per unit]	75W
Socket	
SS (5 A 2 pin socket in SB)	100W
S1, S2 (5 A 2 pin socket) (bath room)	100W
P (15A) (3 pin socket) [6 per unit]	
Q (20A Socket) [1-3 per unit]	
D (Doorbell)	50W

Calculations for Fittings & Fixtures (Ground floor)

Formula for Light Bulbs, E = $\frac{n*N*F*UF*LLF}{A}$ (Lumen in m^2)

One 56’’ diameter fan is needed every 180 sqft.

Number of Fans = $\frac{A\ sqft}{180}$

1.Guard-room:

Area = 16’X20’ = 320 sqft = 29.729 m^2

Luminance, E= 80 Lumen/m^2

Light Loss Factor and Utilization Factor, LLF x UF = 0.8
Number of lights per fixture, n=1
Flux = 1300 Lumen

Number of Lights, N = 2.286
1 light bulb and 1 tube light are set.

One 56” diameter fan is needed for every 180 sqft.

Number of Fans = 320/180=1.78
So,1 ceiling fan is set. (FA1)

2.Driver-room:

Area = 16'X20' = 320 sqft = 29.729 m^2

Luminance, E= 80 Lumen/m^2

Light Loss Factor and Utilization Factor, LLF x UF = 0.8
Number of lights per fixture, n=1
Flux = 1300 Lumen
Number of Lights, N = 2.286
1 light bulb and 1 tube light are set.

One 56" diameter fan is needed for every 180 sqft.

Number of Fans = 320/180=1.78
So, one 56" diameter ceiling fan is set.

3.Kitchen:

Area = 14'X18' = 252 sqft = 23.4108 m^2

Luminance, E = 80 Lumen/m^2

Light Loss Factor and Utilization Factor, LLF x UF = 0.8
Number of lights per fixture, n=1;
Flux = 1300 Lumen
Number of Lights, N =1.8
So, 1 light bulb and 1 ceiling light is set.

4.Storeroom:

Area = 14'X18' = 252 sqft = 23.4116 m^2

Luminance, E = 80 Lumen/m^2

Light Loss Factor and Utilization Factor, LLF x UF = 0.8
Number of lights per fixture, n=1
Flux = 1300 Lumen
Number of Lights, N =1.8
So, 1 light bulb and 1 ceiling light is set.

5.Bathroom-1:

Area = 14'X5' = 70 sqft = 6.503m^2

Luminance, E = 80 Lumen/m^2

Light Loss Factor and Utilization Factor, LLF x UF = 0.8
Number of lights per fixture, n=1;
Flux = 1300 Lumen

Number of Lights, N =0.5
So, 1 Light Bulb is needed.

6.Bathroom-2

Area = 14'X5' = 70 sqft = 6.50321m^2

Luminance, E = 80 Lumen/m^2

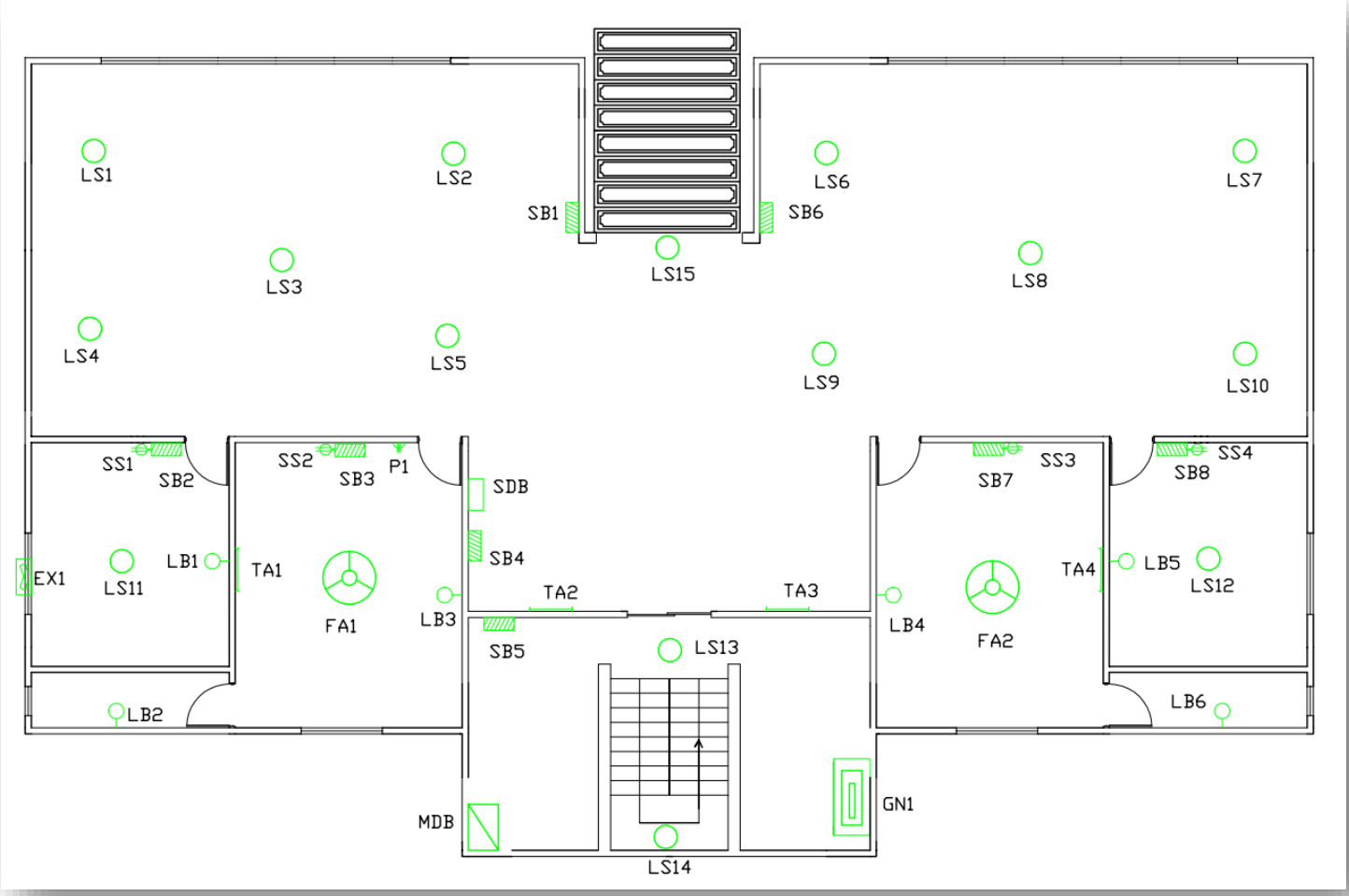
Light Loss Factor and Utilization Factor, LLF x UF = 0.8
Number of lights per fixture, n=1

Flux = 1300 Lumen

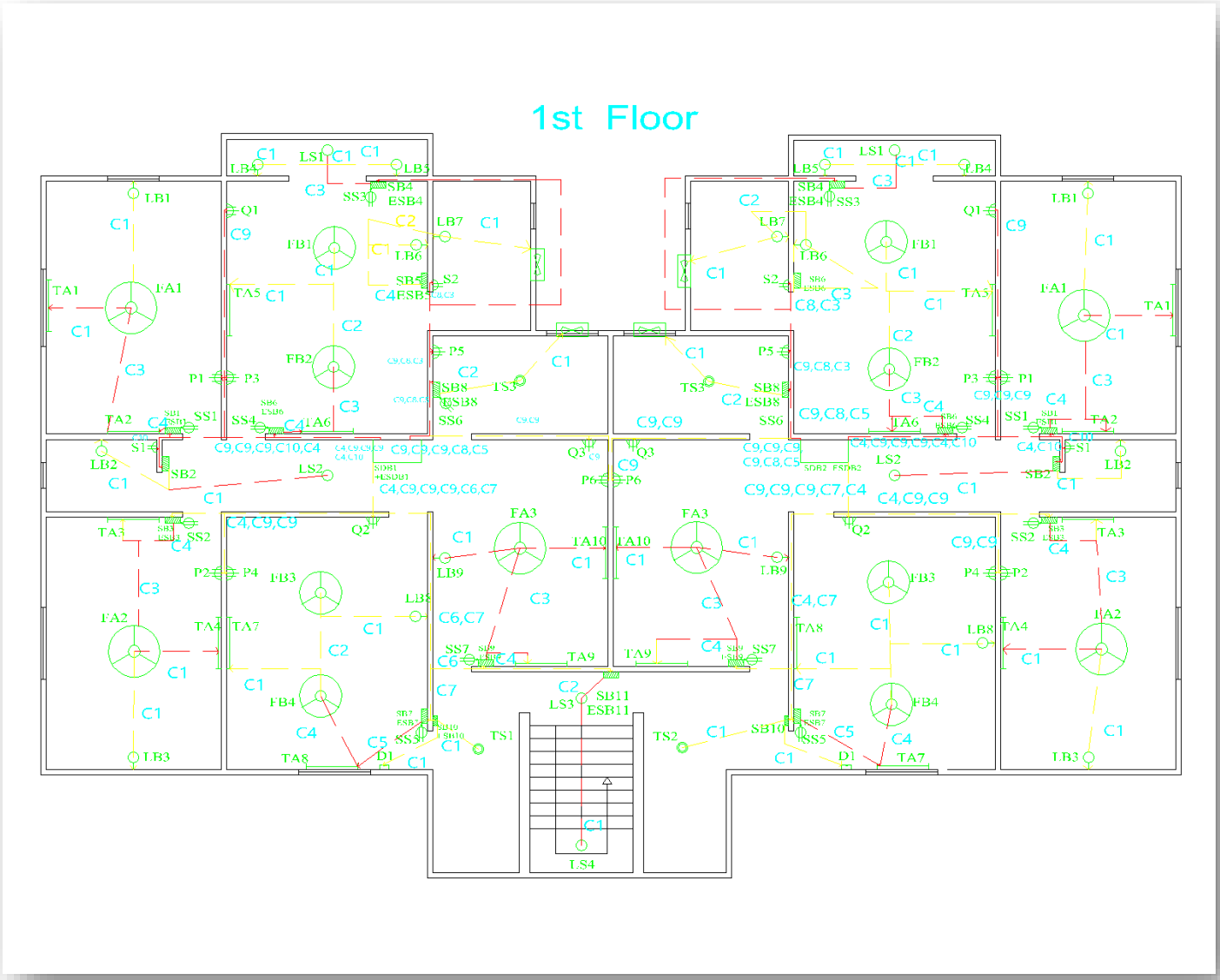
Number of Lights, N = 0.5

So, 1 Light Bulb is needed.

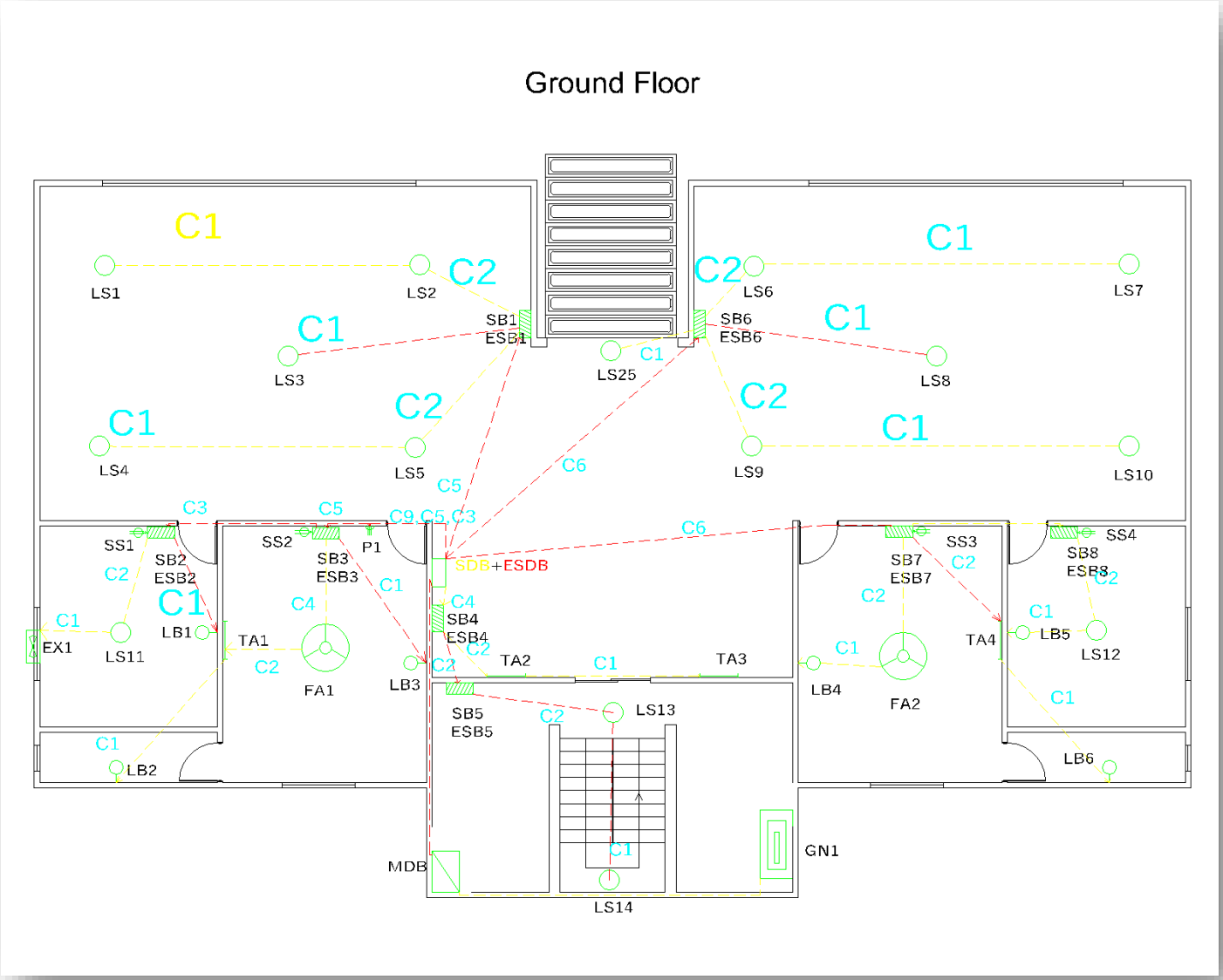
Ground floor fittings & Fixtures



Conduit of first floor



Conduit of ground floor



Legends

Description	Height	Caption	Symbol	
			Fitting & Fixtures	Conduit Layout
4'-40W Wall Mounted Fluroscent Tube Light	Lintel	TA		
2'-20W Wall Mounted Fluroscent Tube Light	Lintel	TB		
60 W Incandescent Light Bracket	Lintel	LB		
23W Energy Bulb	Ceiling	LS		
60W Staircase Light	Ceiling	TS		
36"-56" Sweep Fan	Ceiling	FA		
28"-36" Sweep Fan	Ceiling	FB		
Generator	Floor	GN		
Main Distribution Board	Switchboard	MDB		
12" Exhaust Fan	Lintel	EX		
5A-2 Pin Socket in Switchboard	Switchboard	SS		
5A-2 Pin Socket	Skirting	S		
15A-3 Pin Socket	Skirting	P		
20A-3 Pin Socket	Skirting	Q		
Doorbell	Switchboard	D		
Switchboard	Switchboard	SB,ESB		
Sub Distribution Board	Switchboard	SDB,ESDB		

Conduit Schedules

Name	Cable Size	Conduit Size
C1	2 x 1.5 rm BYM	3/4"
C2	4 x 1.5 rm BYM	3/4"
C3	6 x 1.5 rm BYM	3/4"
C4	8 x 1.5 rm BYM	1"
C5	10 x 1.5 rm BYM	1"
C6	12 x 1.5 rm BYM	1"
C7	14 x 1.5 rm BYM	1"
C8	2 x 4 rm BYM + 4 rm BYA	1"
C9	2 x 6 rm BYM + 6 rm BYA	1"
C8,C9	2 x 4 rm BYM + 4 rm BYA 2 x 6rm BYM + 6 rm BYA	1"
C10	14X1.5 rm BYM 6 X 1.5 rm BYM	1"

Conduit symbols

Conduit Type	Symbol
Normal Concealed Conduit	
Normal Concealed Conduit Going Up	
Normal Concealed Conduit Going Down	
Normal+Emergency Concealed Conduit	
Normal+Emergency Concealed Conduit Going Up	
Normal+Emergency Concealed ConduitGoing Down	

Calculation for Conduit & SDB & ESDB

Formula for Ampere Rating, I= $\frac{P}{V*pf}(A)$

Pf = 0.75 is considered on an average.

Light Bulb, LB = 30 W

Tube Light, TA = 40 W

Ceiling Light, LS = 23 W

Double Celling Light, TS = 60W

Ceiling Fan, FA = 100 W

Ceiling Fan, FB = 75W

Switchboard 2 pin socket, SS = 100W

Exhaust Fan, EX = 35W

Doorbell, D = 50 W

S1, S2 (5 A 2 pin socket) (bathroom) = 100W

All Internal wires are below 5 A rating so 2 x 1.5 rm BYM is used in all internal wiring.

To Sub Distribution Board (SDB)

For Ground floor

CKT1 Rating

$$I=\frac{LS1+LS2+LS3+LS4+LS5}{220*0.75}$$

$$\Rightarrow I=\frac{23+23+23+23+23}{220*0.75}=\frac{115}{220*0.75}=0.7A$$

So, 2 x 1.5 rm BYM + 1.5 BYA ECC are used.

CKT2 Rating

$$I=\frac{(SS1+LB1+LS11+EX1)+(SS2+FA1+TA1+LB2+LB3)}{220*0.75}$$

$$\Rightarrow I=\frac{(100+30+23+35)+(100+100+40+30+30)}{220*0.75}=\frac{488}{220*0.75}=2.96A$$

So, 2 x 1.5 rm BYM + 1.5 BYA ECC are used.

CKT3 Rating

$$I=\frac{(TA2+TA3)+(LS13+LS14)}{220*0.75}$$

$$=>I=\frac{2*40+2*23}{220*0.75}=\frac{126}{220*0.75}=0.76A$$

So, 2 x 1.5 rm BYM + 1.5 BYA ECC are used.

CKT4 Rating

$$I=\frac{LS6+LS7+LS8+LS9+LS10+LS15}{220*0.75}$$

$$=>I=\frac{23*6}{220*0.75}=\frac{138}{220*0.75}=0.84A$$

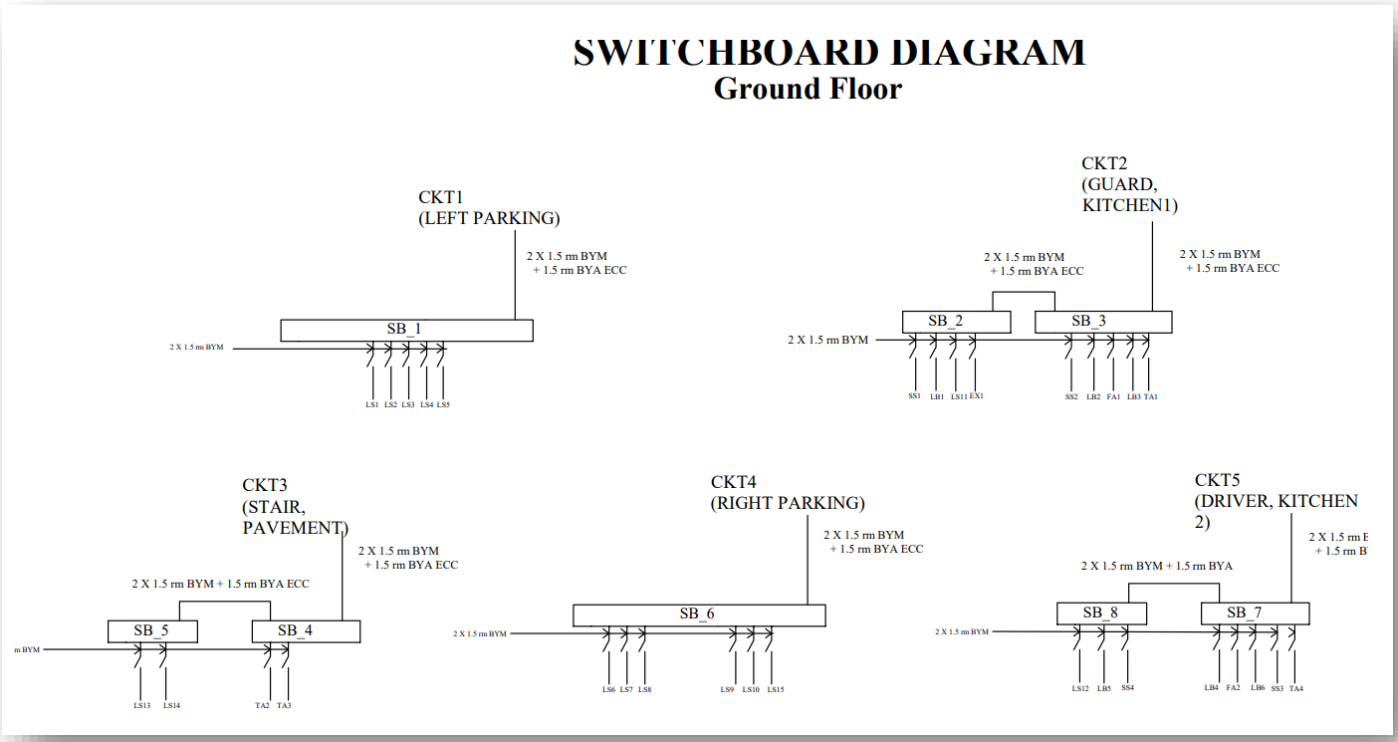
So, 2 x 1.5 rm BYM + 1.5 BYA ECC are used.

CKT5 Rating

$$I=\frac{(SS3+FA2+TA4+LB4+LB6)+(SS4+LB5+LS12)}{220*0.75}$$

$$=>I=\frac{(100+100+40+30+30)+(100+23+30)}{220*0.75}=\frac{453}{220*0.75}=2.75A$$

So, 2 x 1.5 rm BYM + 1.5 BYA ECC are used



First & Second Floor:

CKT1 Rating

$$I=\frac{(SB1+SB2+SB6)}{220*0.75}=\frac{(SS1+TA1+TA2+FA1+LB1)+(S1+LB2+LS2)+(SS4+TA5+TA6+FB1+FB2)}{220*0.75}$$

$$=>I=\frac{(100+40+40+100+30)+(100+30+23)+(100+40+40+75+75)}{220*0.75}=\frac{793}{220*0.75}=4.81A$$

So, 2 x 1.5 rm BYM + 1.5 BYA ECC are used.

CKT2 Rating

$$I=\frac{(SB4+SB5+SB8)}{220*0.75}=\frac{(SS3+LB4+LB5+LS1)+(LB6+LB7+EX1+S2)+(SS6+TS3+EX2)}{220*0.75}$$

$$=>I=\frac{(100+30+300+23)+(30+30+35+100)+(100+60+35)}{220*0.75}=\frac{843}{220*0.75}=5.11A$$

So, 2 x 2.5 rm BYM + 2.5 BYA ECC are used.

CKT3 Rating

$$I=\frac{SS2+TA3+TA4+LB3+FA2}{220*0.75}\text{; SB3}$$

$$=>I=\frac{100+40+40+30+100}{220*0.75}=\frac{310}{220*0.75}=1.88A$$

So, 2 x 1.5 rm BYM + 1.5 BYA ECC are used.

CKT4 Rating

$$I=\frac{(SB7+SB9+SB10)}{220*0.75}=\frac{(SS5+LB8+TA7+TA8+FB3+FB4)+(SS7+LB9+TA9+TA10+FA3)+(TS1+D1)}{220*0.75}$$

$$=>I=\frac{(100+30+40+40+75+75)+(100+30+40+40+100)+(60+50)}{220*0.75}=\frac{780}{220*0.75}=4.73A$$

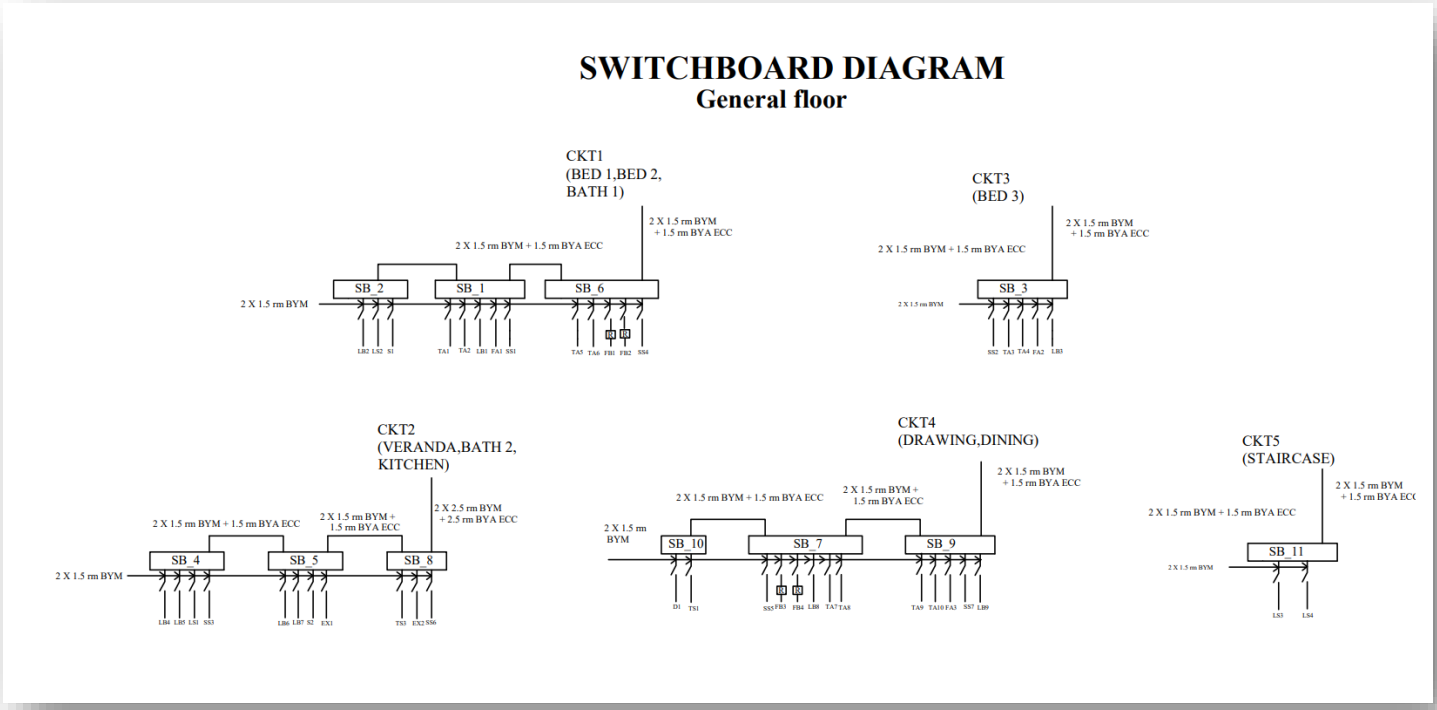
So, 2 x 1.5 rm BYM + 1.5 BYA ECC are used.

CKT5 Rating

$$I=\frac{LS3+LS4}{220*0.75}\text{; SB11}$$

$$=>I=\frac{2*23}{220*0.75}=\frac{46}{220*0.75}=0.28A$$

So, 2 x 1.5 rm BYM + 1.5 BYA ECC are used.



(General floor indicates 1st and 2nd floor.)

Calculations for SDB

SDB load= Total load x 0.7 + Total P socket load x 0.2 + Total Q socket x 0.2

Total Load = CKT1 load + CKT2 load + CKT3 load + CKT4 load + CKT5 load

SDB Current = $\frac{SDB\ (Load)}{Voltage*pf}$

P Load = 2500 W

Q Load = 4000W

Voltage = 220 V

Power Factor, pf = 0.75

Ground Floor

CKT1 Load = 115W

CKT2 Load = 488W

CKT3 Load = 126W

CKT4 Load = 138W

CKT5 Load = 453W

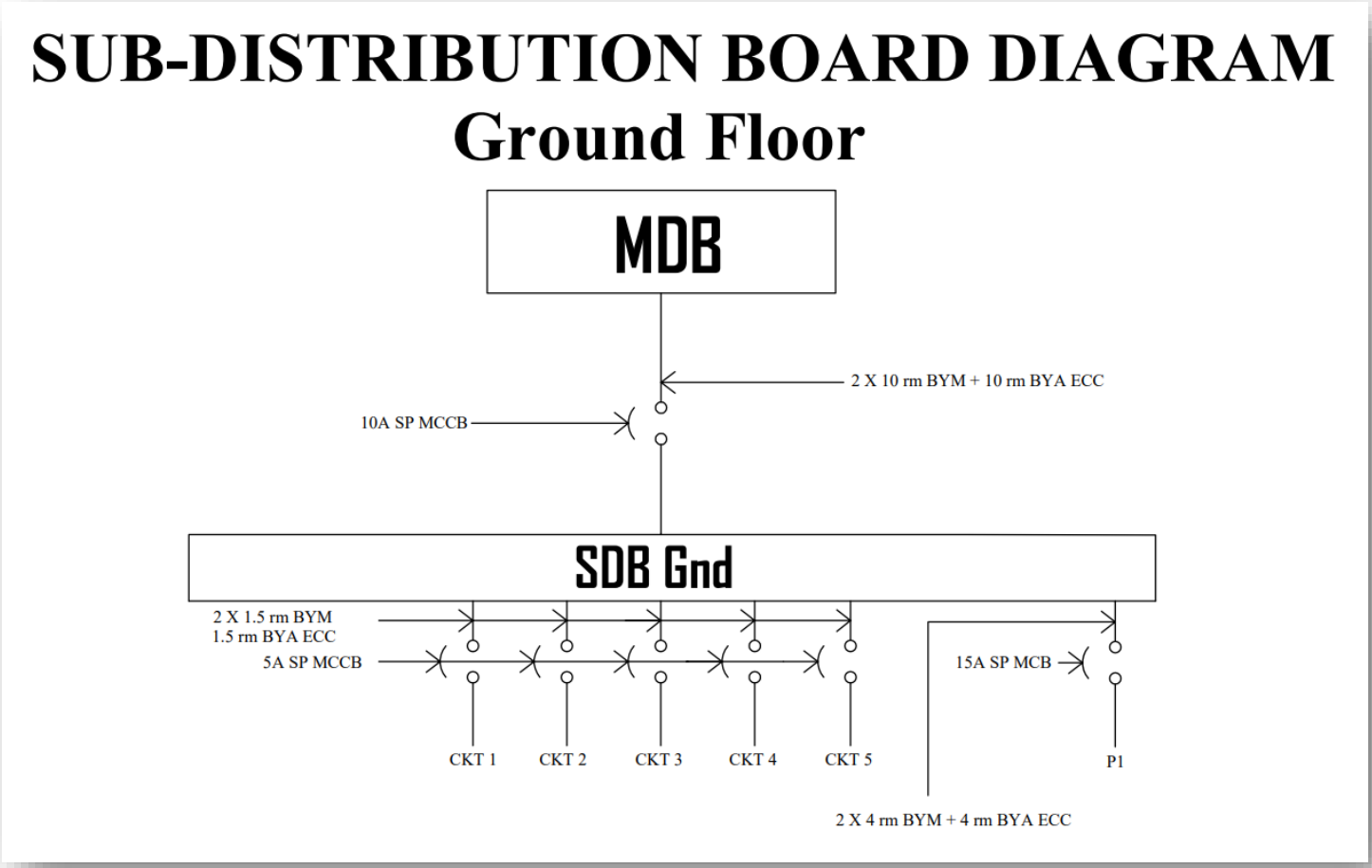
Ground floor has only 1 P socket and no Q socket.

Total load = 115W + 488W + 126W + 138W + 453W = 1320W

SDB Load = (1320W * 0.7) + (2500W * 0.2) = 1424W

SDB Current=$\frac{1424}{220*0.75} = 8.63A$

So, 10 A SP MCCB is needed from SDB to MDB.



First & Second Floor:

CKT1 Load = 793W

CKT2 Load = 843W

CKT3 Load = 310W

CKT4 Load = 780W

CKT5 Load = 46W

General floor has 6 P socket and 3 Q socket.

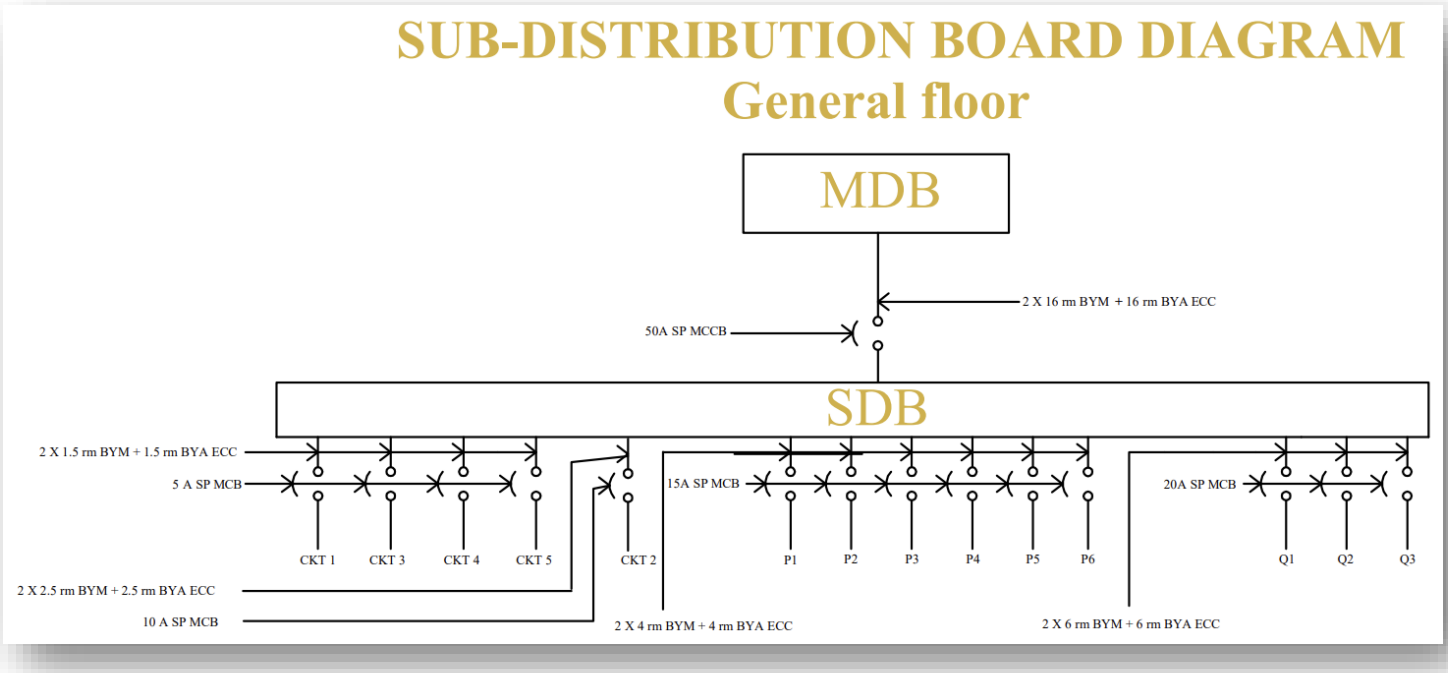
Total load = 793W + 843W + 310W + 780W + 46W = 2772W

SDB Load = (2772W * 0.7) + (6 * 2500W * 0.2) + (3 * 4000W * 0.2) = 7340.4 W

SDB Current=$\frac{7340.4}{220*0.75} = 44.49A$

So, 50 A SP MCCB is needed from SDB to MDB.

For CKT2 the current rating was above 5A, so we have used a 10A SP MCB.



To Emergency Distribution Board (ESDB)

For Ground floor

CKT1' Rating

$$I=\frac{LS3}{220*0.75}=\frac{60}{220*0.75}=0.36A$$

So, 2 x 1.5 rm BYM + 1.5 BYA ECC are used.

CKT2' Rating

$$I=\frac{SB2+SB3}{220*0.75}=\frac{LB1+LB3}{220*0.75}=\frac{30+30}{220*0.75}=0.36A$$

So, 2 x 1.5 rm BYM + 1.5 BYA ECC are used.

CKT3' Rating

$$I=\frac{LS14}{220*0.75}=\frac{23}{220*0.75}=0.139A$$

So, 2 x 1.5 rm BYM + 1.5 BYA ECC are used.

CKT4' Rating

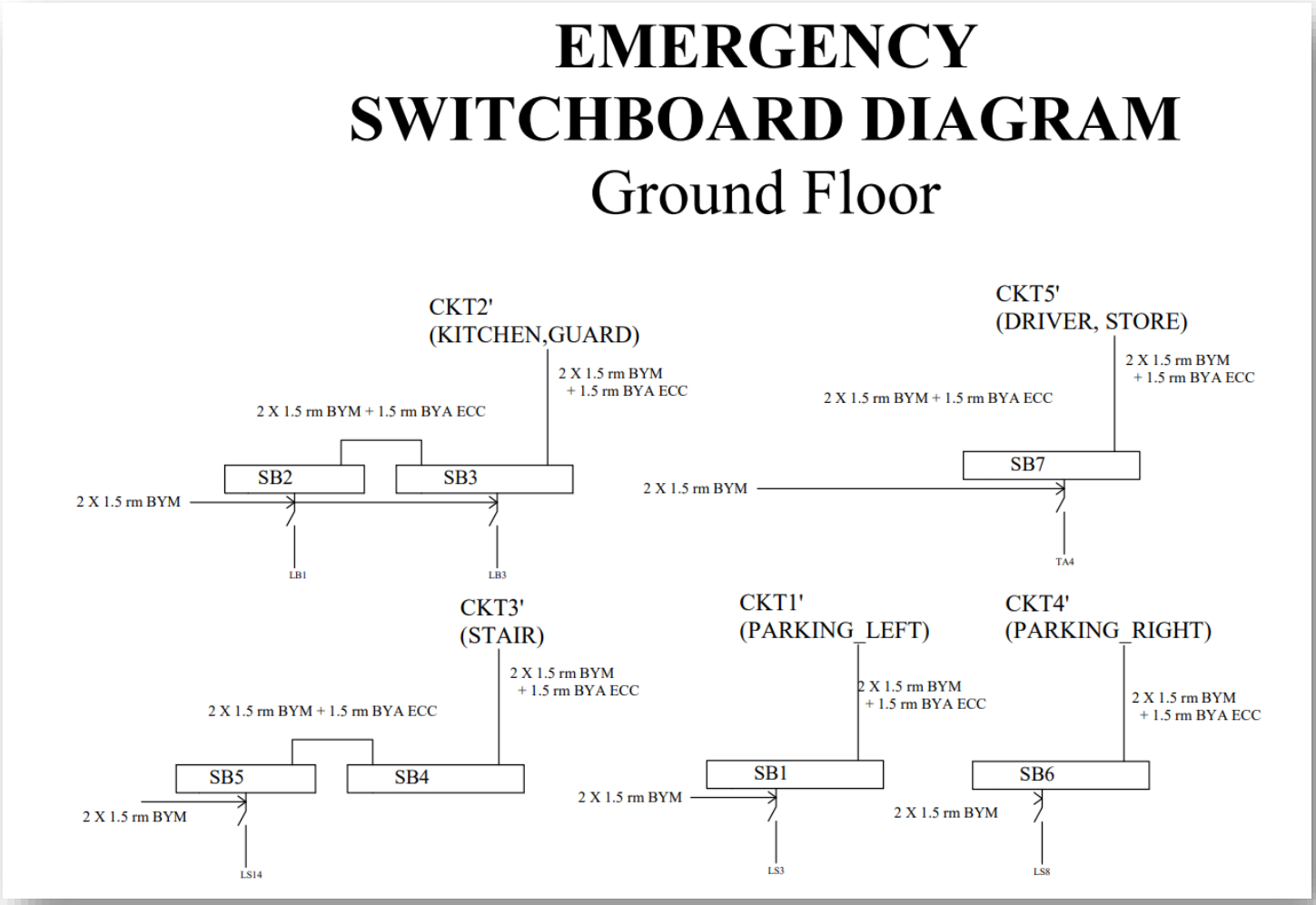
$$I=\frac{LS8}{220*0.75}=\frac{23}{220*0.75}=0.139A$$

So, 2 x 1.5 rm BYM + 1.5 BYA ECC are used.

CKT5' Rating

$$I=\frac{TA4}{220*0.75}=\frac{60}{220*0.75}=0.36A$$

So, 2 x 1.5 rm BYM + 1.5 BYA ECC are used.



First & Second Floor:

FB (42" diameter fan) [4 per unit] = 75W

S1, S2 (5 A 2 pin socket) (bathroom) = 100W

CKT1' Rating

$$I=\frac{(SB1+SB2+SB6)}{220*0.75}=\frac{TA1+(S1+LS2)+(TA6+FB2)}{220*0.75}=\frac{40+(100+23)+(40+75)}{220*0.75}=\frac{278}{220*0.75}=1.68A$$

So, 2 x 1.5 rm BYM + 1.5 BYA ECC are used.

CKT2' Rating

$$I=\frac{TA4}{220*0.75}=\frac{40}{220*0.75}=0.24A$$

So, 2 x 1.5 rm BYM + 1.5 BYA ECC are used.

CKT3' Rating

$$I=\frac{S2+LS8}{220*0.75}=\frac{100+23}{220*0.75}=0.745A$$

So, 2 x 1.5 rm BYM + 1.5 BYA ECC are used.

CKT4' Rating

$$I=\frac{TA8+FB8}{220*0.75}=\frac{40+75}{220*0.75}=0.7A$$

So, 2 x 1.5 rm BYM + 1.5 BYA ECC are used.

CKT5' Rating

$$I=\frac{TA10+LB9}{220*0.75}=\frac{40+30}{220*0.75}=0.424A$$

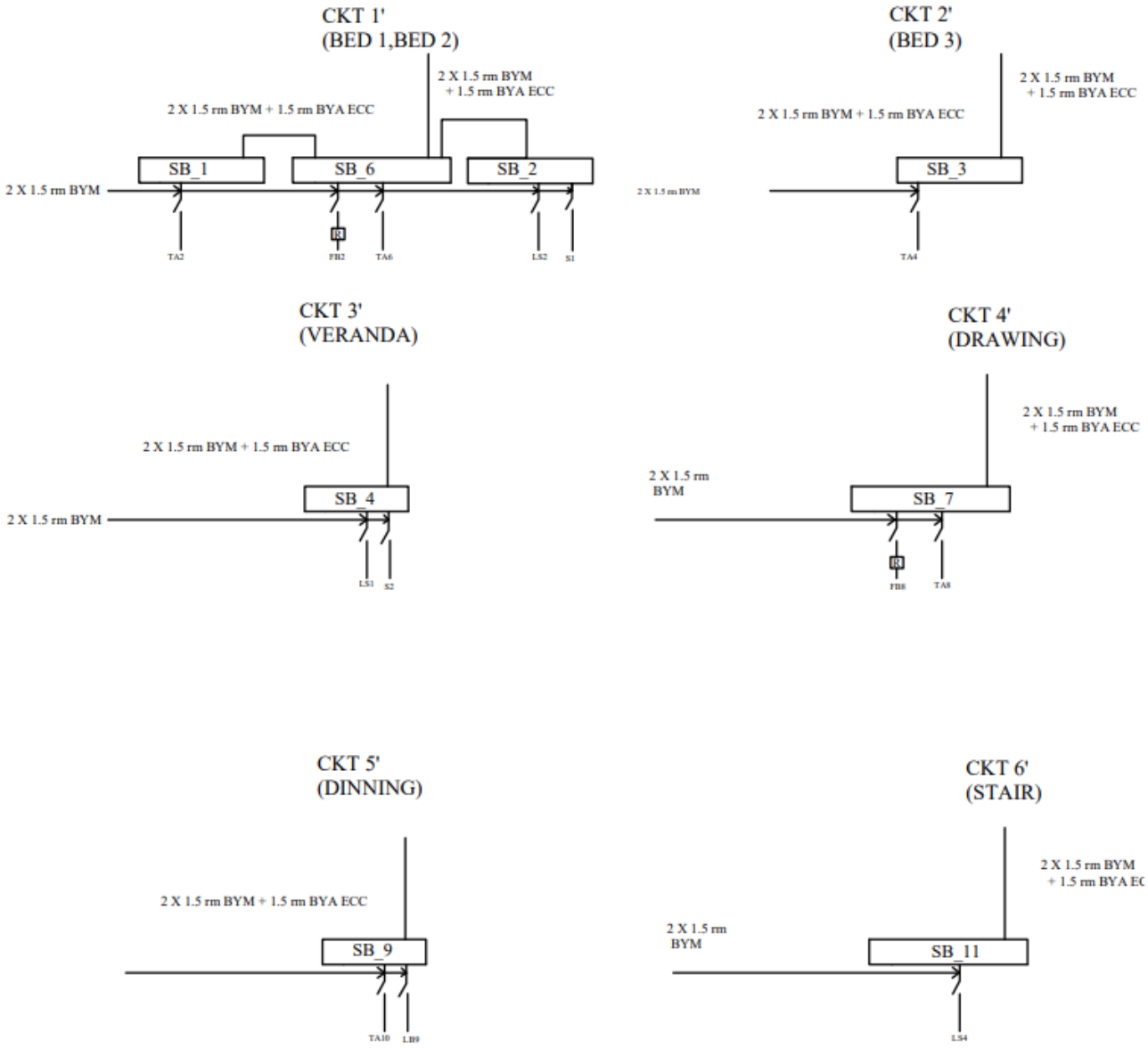
So, 2 x 1.5 rm BYM + 1.5 BYA ECC are used.

CKT6' Rating

$$I=\frac{LS4}{220*0.75}=\frac{23}{220*0.75}=0.14A$$

So, 2 x 1.5 rm BYM + 1.5 BYA ECC are used.

EMERGENCY SWITCBOARD DIAGRAM



Calculations for ESDB

ESDB load= Total load x 0.7 + Total P socket load x 0.2 + Total Q socket x 0.2

Total Load = CKT1 load + CKT2 load + CKT3 load + CKT4 load + CKT5 load

ESDB Current = $\frac{ESDB\ Load}{Voltage * pf}$

P Load = 2500 W

Q Load = 4000W

Voltage = 220 V

Power Factor, pf = 0.75

Ground Floor:

CKT1' Load = 60W

CKT2' Load = 60W

CKT3' Load = 23W

CKT4' Load = 23W

CKT5' Load = 60W

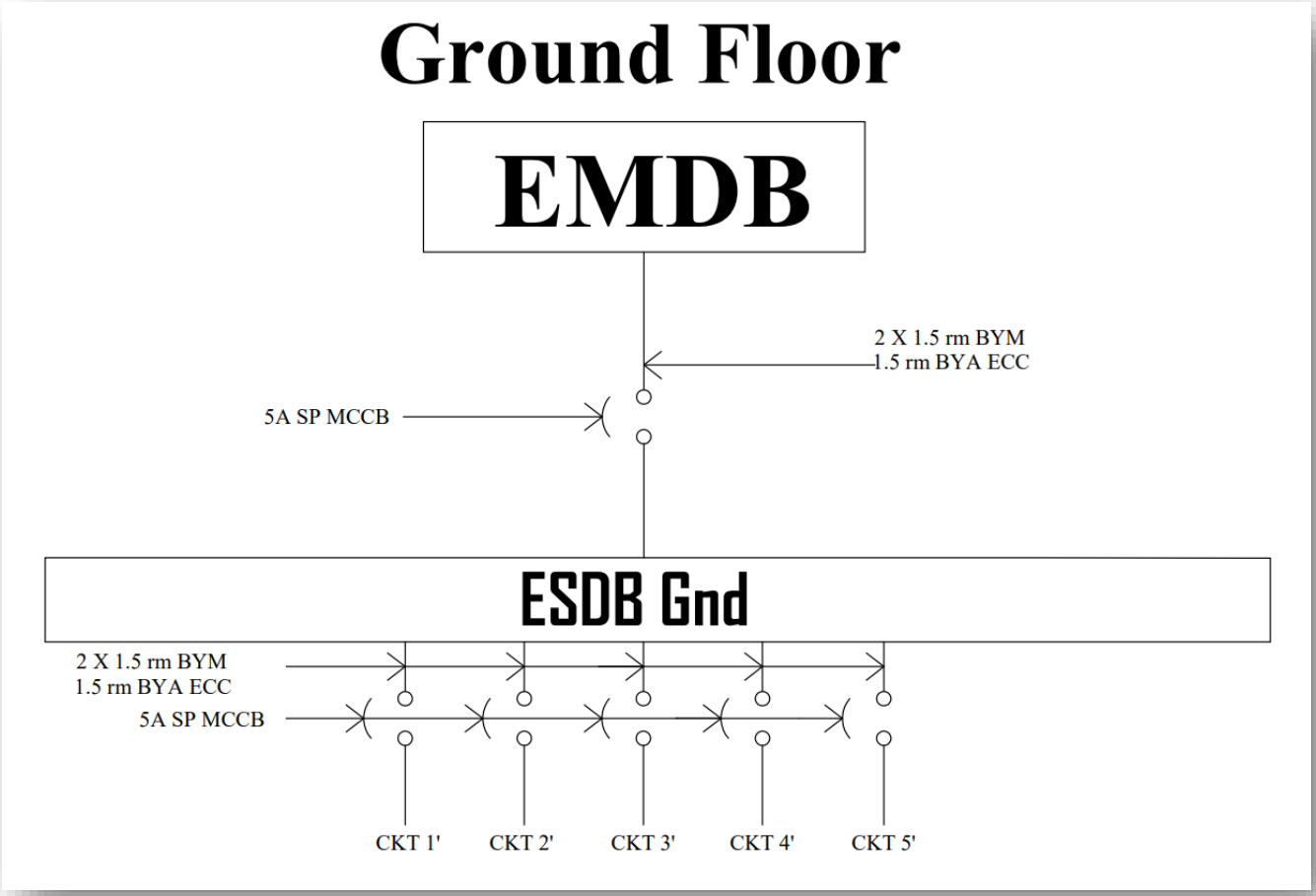
Ground floor has only 1 P socket and no Q socket.

Total load = 60W + 60W + 23W + 23W + 60W = 226W

ESDB Load = (226W * 0.7) + (2500W * 0.2) = 658.2W

ESDB Current=$\frac{658.2}{220*0.75} = 4A$

So, 5 A SP MCCB is needed from ESDB to EMDB



First & Second Floor:

CKT1' Load = 278W

CKT2' Load = 40W

CKT3' Load = 123W

CKT4' Load = 115W

CKT5' Load = 70W

CKT6' Load = 23W

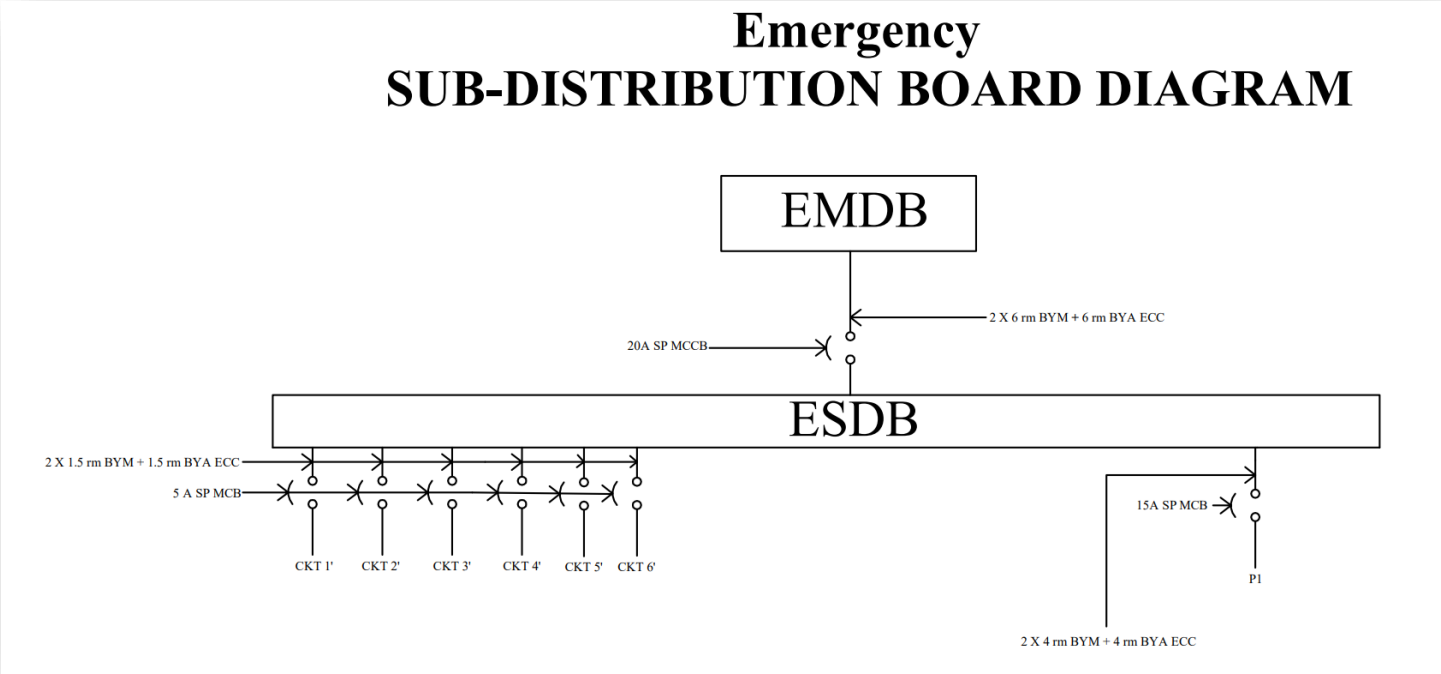
Ground floor has 3 P socket and 1 Q socket.

Total load = 278W + 40W + 123W + 115W + 70W + 23W = 649W

ESDB Load = (649W * 0.7) + (3 * 2500W * 0.2) + (4000W * 0.2) = 2754.3 W

ESDB Current=$\frac{2754.3}{220*0.75} = 16.7A$

So, 20 A SP MCCB is needed from ESDB to EMDB



Calculation of EMDB & MDB

Total ESDB load = 4*2754.3 + 658.2 = 11675.4 W
Total SDB Load = 4*7340.4 + 1424 = 30785.6 W

General rule for selecting earth cables:
Upto 16 rm, ECC and neutral are of the same size
If > 16 rm => ECC = 16 rm
If >32 rm => ECC size will be half.

BYM has two PVC insulations, BYA has one PVC insulation.

Calculations for EMDB:

EMDB Load = Total ESDB load * 0.7 + Lift load * 0.7 [if lift is added]

Total ESDB load = 4*2754.3 + 658.2 = 11675.4 W

[the load consumption for 10 units in the 1st to 2nd floor has been added to the load consumption of the ground floor]

$$\textbf{EMDB Current} = \frac{\textbf{EMDB (Load)}}{\textbf{Line Voltage} * \textbf{pf}}$$

Phase voltage = 220 V
Line voltage = $\sqrt{3}$*220 = 381 V

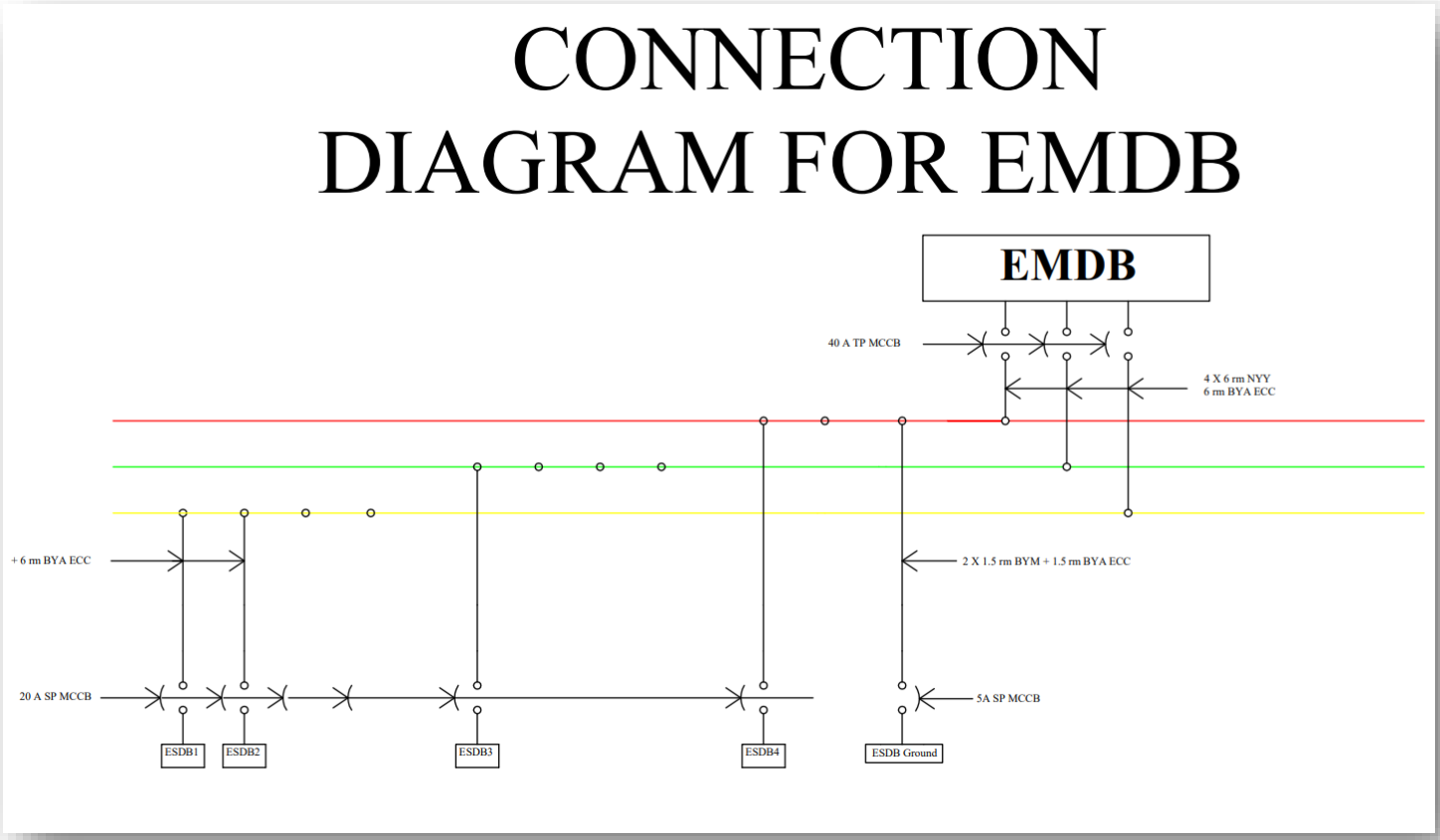
Power factor, pf = 0.75 (as assumed before)

ESDB load = 11675.4 W

EMDB load
= Total ESDB Load* 0.7 [considering a duty cycle of 70%]
= 11675.4 * 0.7
= 8172.78

EMDB Current= $\frac{8172.783}{381*0.75} = 16.51A$

So, a 20 A TP MCCB is needed from EMDB to MDB. 2*6 rm BYM will be needed. 6 rm BYA ECC will be needed.



Calculations for MDB

MDB Load =Total SDB load*0.7+(EMDB Load + Pump load) *0.7

Total SDB Load = 4*7340.4 + 1424 = 30785.6 W
[the load consumption for 4 units in the 1st and 2nd floor has been added to the load consumption of the ground floor]

$$\textbf{MDB Current} = \frac{\textbf{MDB (Load)}}{\textbf{Line Voltage} * \textbf{pf}}$$

Phase voltage = 220 V
Line voltage = √3*220 = 381 V

SDB Load = 30785.6 W

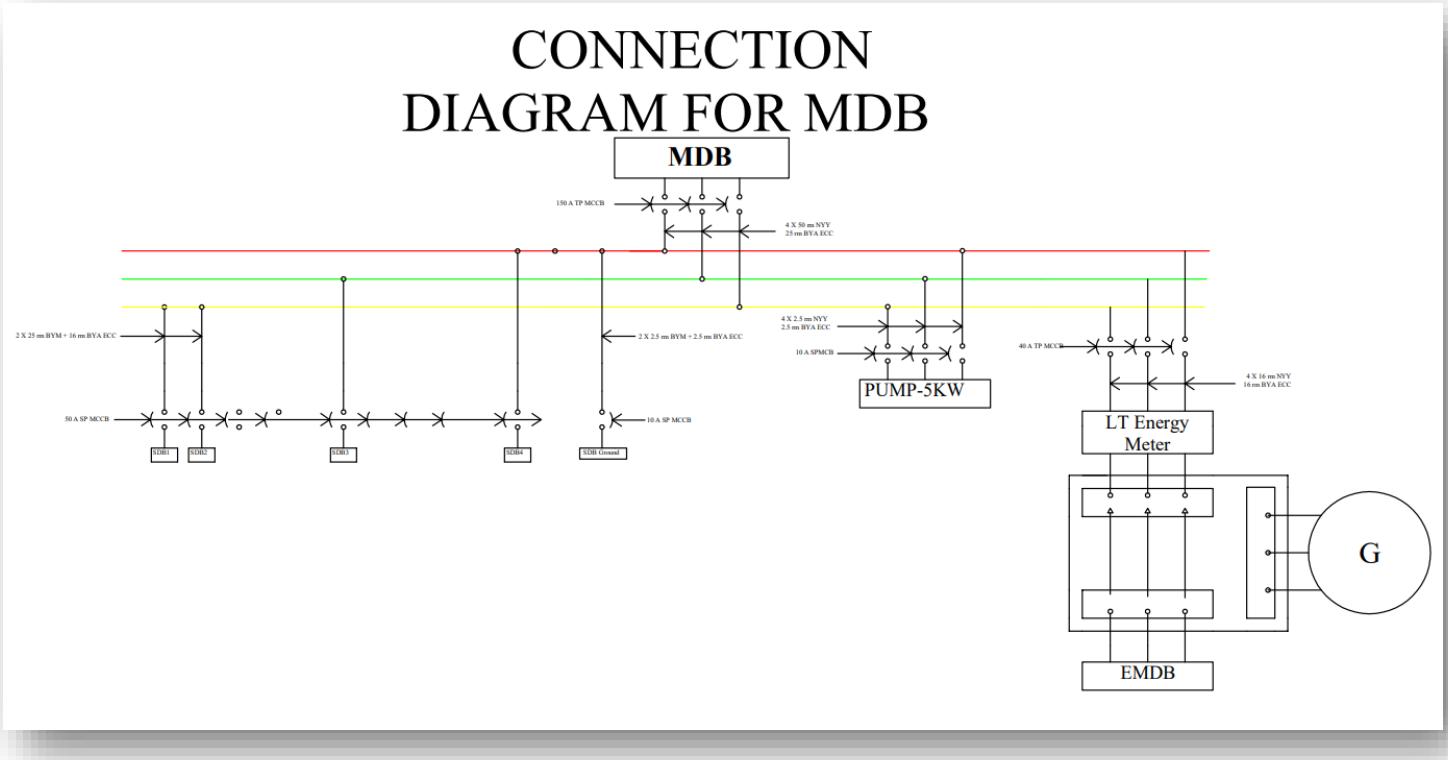
Pump load = 5000 W (assumed)

So,

MDB Load = 30785.6 * 0.7 + (5000+8172.78) *0.7 = 30770.866 W

$$\textbf{MDB Current} = \frac{30770.866}{381 * 0.75} = \textbf{62.16 A}$$

So, a 70 A TP MCCB is needed from MDB to main line. 2*50 rm BYM wire will be needed.50/2 = 25 rm BYA ECC will be needed.



Current Rating and Wire Size

A	B	C	D	E	F		G	H	I		J	
					a'	b'			a"	b"	a"'	B"'
3/0.029	1.5	5	16	10	6	10		27	27	22	16	20
7/0.029	2.5	10	16	10	4	7		16	36	30	22	28
7/0.036	4	15	14	10	3	5	1	10	47	39	30	37
7/0.044	6	20	14	10	2	4	1	6.8	59	50	38	47
7/0.052	10	30	10	10	1	2	1.5	4	78	68	52	63
7/0.064	16	40	10	10		1	1.5	2.6	100	94	70	85
19/0.052	25	50	6	6		1	2	1.6	130	125	91	110
19/0.064	35	60	6	6			2	1.2	155	160	112	136
19/0.072	50	70	6	6			2	0.93	185	195	136	164
19/0.083	70	100	1/0	1/0			2	0.65	225	245	173	207
37/0.072	95	120	1/0	1/0			2.5	0.48	270	300	216	253
37/0.083	120	150	1/0	1/0			2.5	0.4	310	350	244	291
37/0.093	150	200	1/0	1/0			3	0.34	350	405		333
37/0.130	185	250	3/0	3/0			3.5	0.29	390	460		381
61/0.093	240	300	3/0	3/0			4	0.24	450	555		452
61/0.103	300	425	3/0	3/0			4	0.22	515	640		526
91/0.093	400	585	3/0	3/0			6	0.2	586	770		639
91/0.103	500	685	3/0	3/0			6	0.18	680	900		752
127/0.103	630	800	3/0	3/0			6	0.17	800	1030		855

A : Single core cable construction diameter, inch .... as per Imperial Standard Size :B.S.S (old).

B : Single core cable construction area, mm² .... as per Metric Standard Size : VDE.

C : CB designed current rating amps.

D : ECC (Earth Continuity Conductor), SWG.

E : EL (Earthing Lead), SWG

F : No. of cables in
- a') 3/4" diameter conduit
- b') 1" diameter conduit

G : GI pipe diameter (for 4 – core cable), inch.

H : Volt drop /amp/meter, Vd in mV (For PVC insulated, non-armoured single core cable 600/1000 volts as per BICC Metric Supplement, page 20-22, September 1969).

I : Maximum Current rating (For Type : NYY to VDE 0271/3, 69)
- a") 30° C ambient temperature, underground, amps
- b") 35° C ambient temperature in air, amps

J : Maximum current carrying capacity (For Type : BYA to B.S. 6004 : 1975)
- a"') Bunched & Enclosed in conduit, two cables single phase at 35° C, amps
- b"') Clipped to a surface or on a cable tray bunched and un-enclosed two cables single phase at 35° C, amps

NYY : PVC insulated and PVC sheathed cable, rated voltage 600/1000 volts.

BYA : PVC insulated non-sheathed single core cable, rated voltage 450/750 volts.