Bangladesh University of Engineering & Technology

Department of Electrical Engineering

Course No.: EEE 414

Course Title: Electrical System Design

Project Report

Submitted to:

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Submitted by

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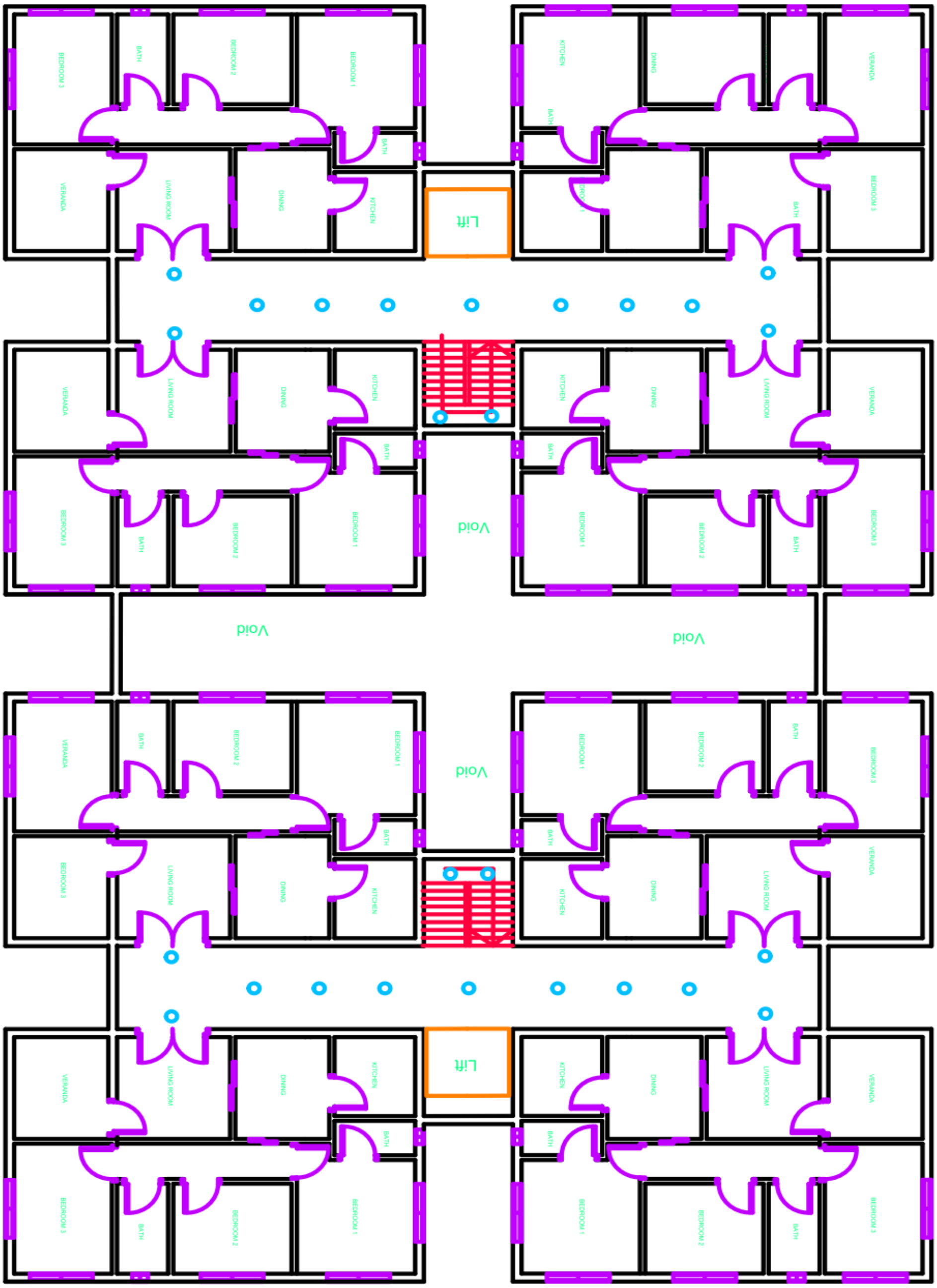
CAD Operator: AutoCAD 2024

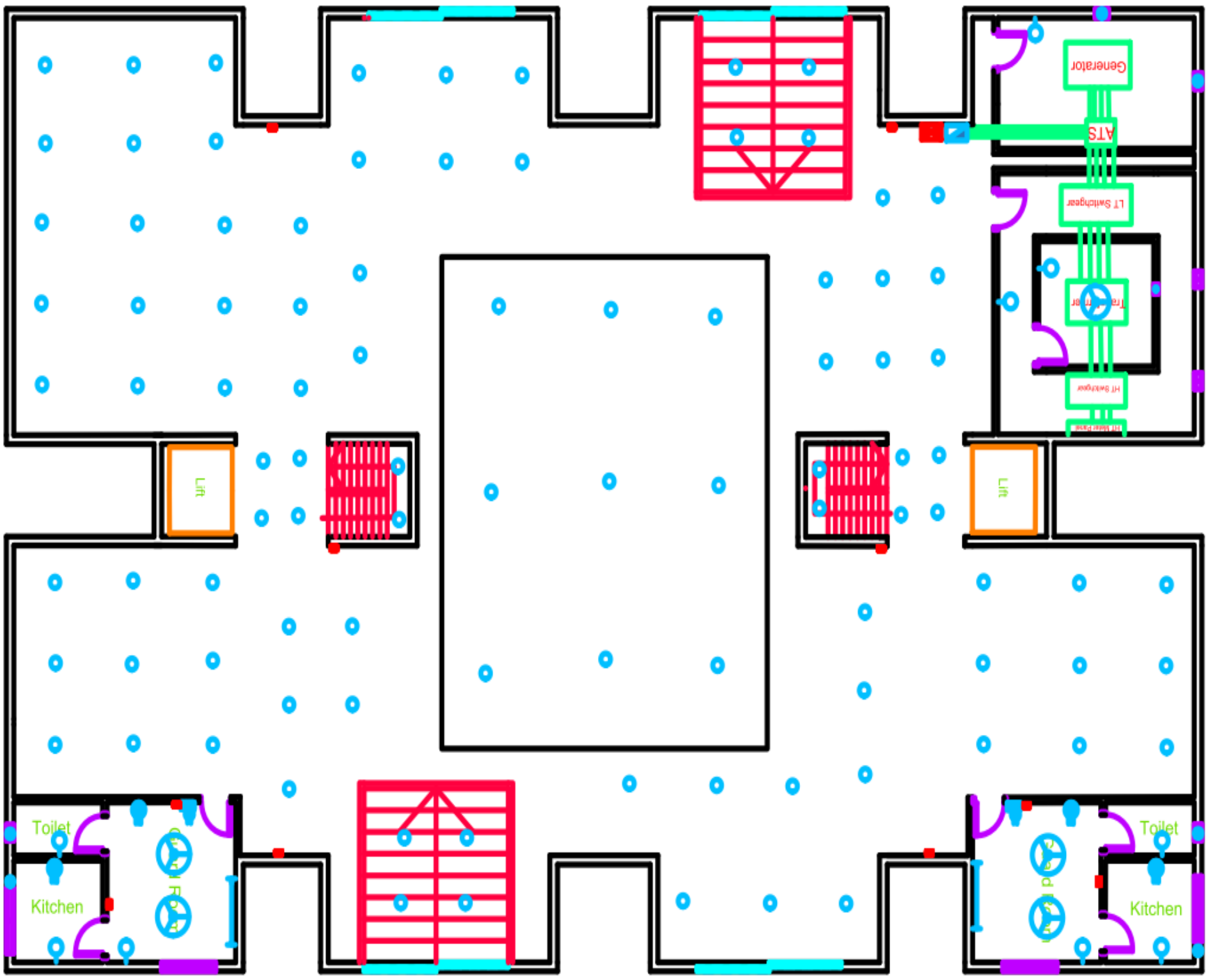
Floors: 4

Units per floor: 8

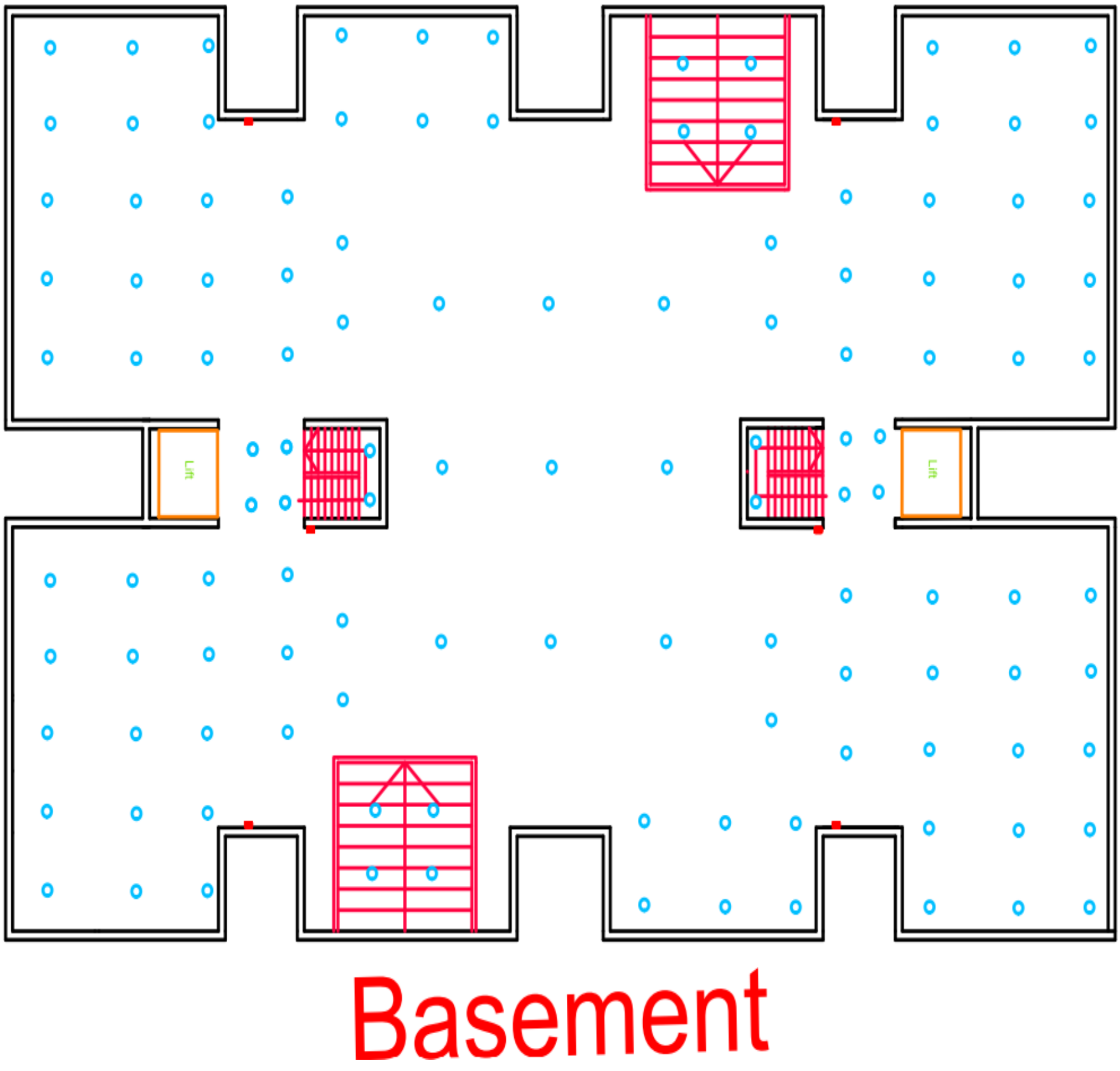
Common Floor Layout



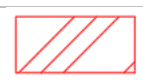
Ground Floor Layout



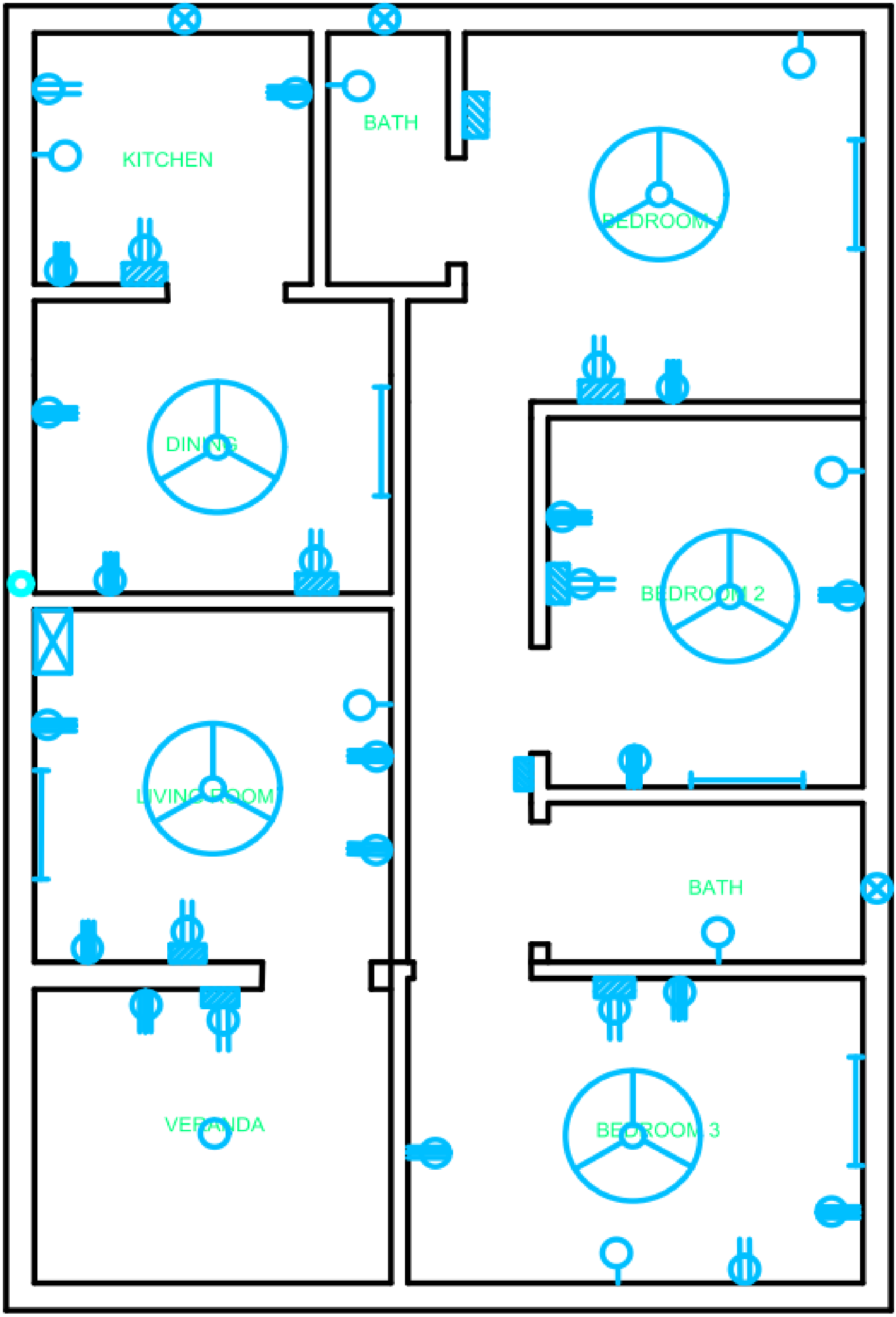
Basement Layout



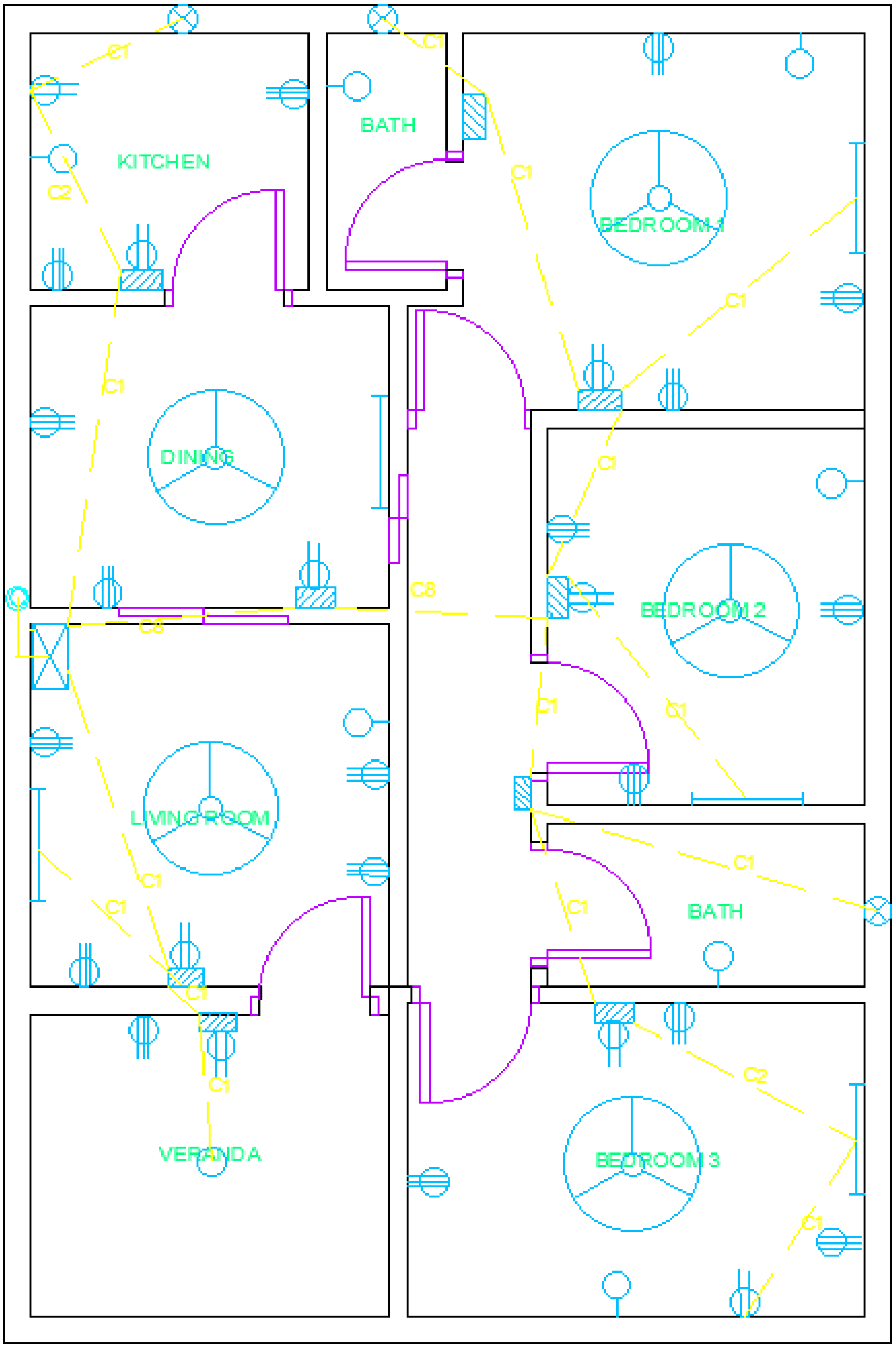
Symbols used in Drawing

Description	Height	Caption	Symbol
Wall Mounted Light	Lintel	LLA	
Ceiling Light	Ceiling	CLA	
Wall Mounted Tube Light	Lintel	TLA	
Fan	Ceiling	F	
Exhaust Fan	Lintel	EF	
2 Pin Socket	Mid Wall	Q	
3 Pin Socket	Lintel	P	
2 Pin TV Antenna Socket	Mid Wall	TV	
Switch Board	Mid Wall	SB	
Sub Distribution Board	Mid Wall	SDB	
Main Distribution Board	Mid Wall	MDB	
Emergency Switch Board	Mid Wall	ESB	
Emergency Sub Distribution Board	Mid Wall	ESDB	
Emergency Main Distribution Board	Mid Wall	EMDB	
Riser	Ceiling	R	

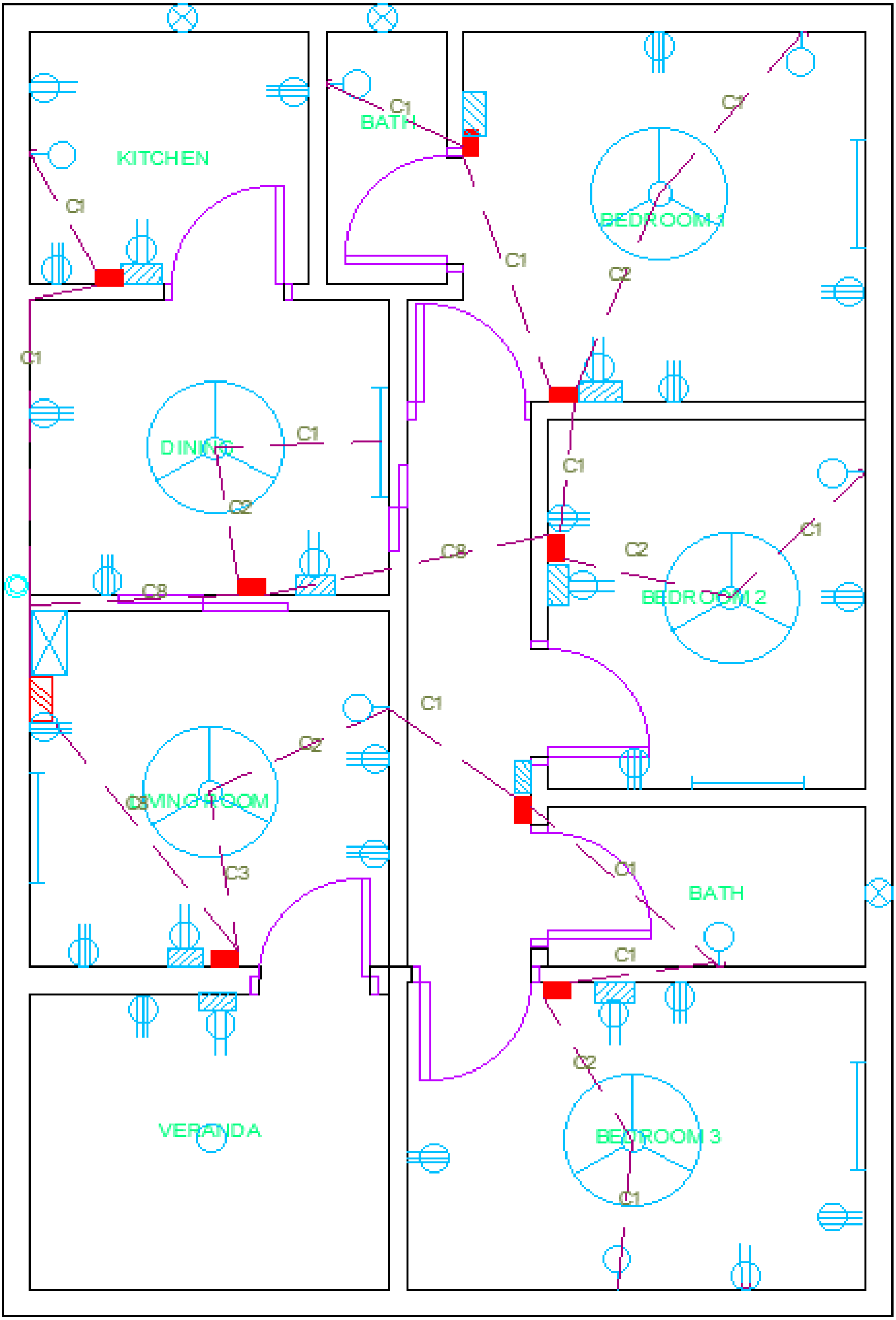
Floor Layout with Fittings and Fixtures



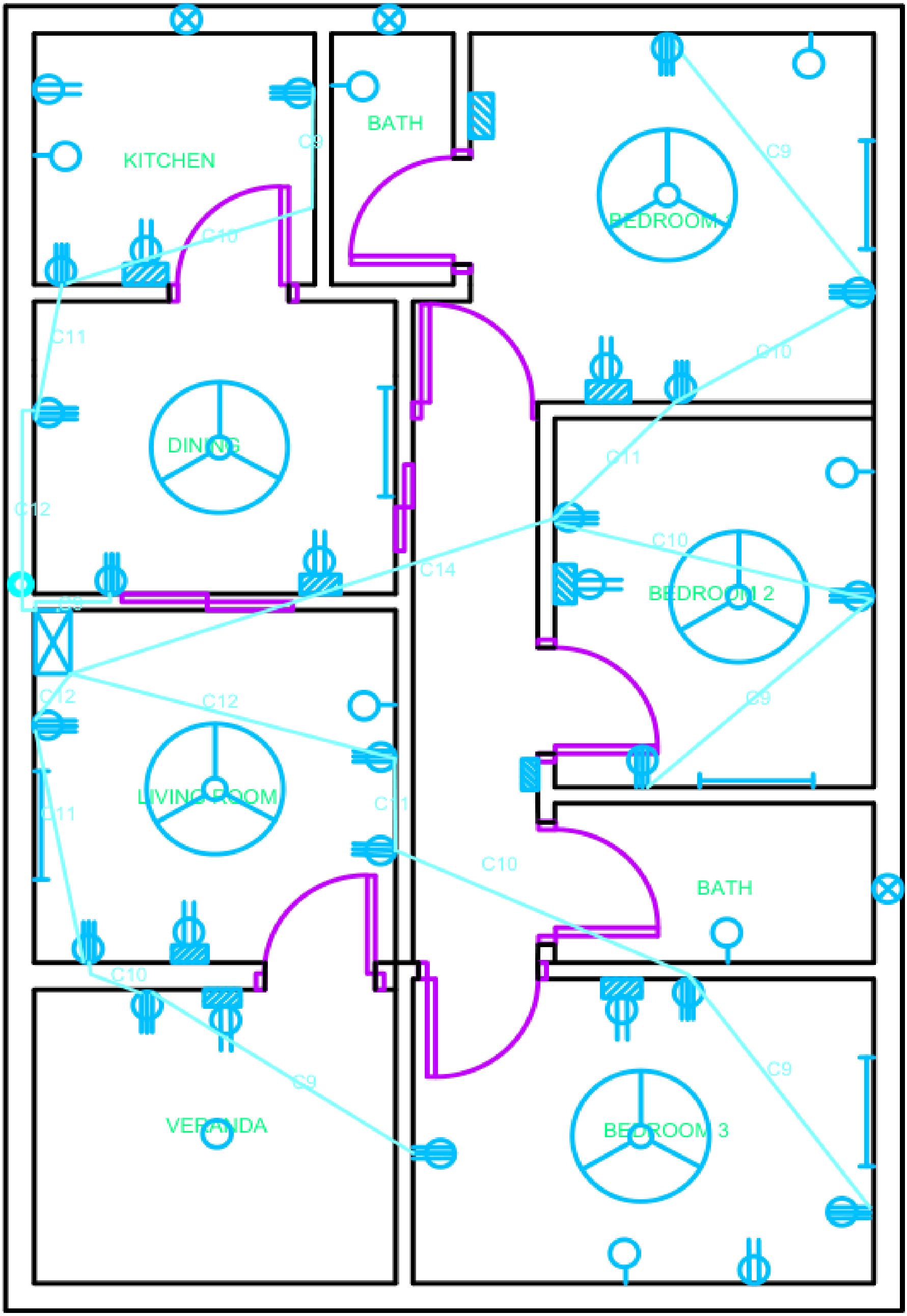
Unit Plan with Main Conduit



Unit Plan with Emergency Conduit



Unit Plan with Power Socket Conduit



FORMULAE AND DATA

Light Calculation:

$$\textbf{\textit{Room Index}} = \frac{\boldsymbol{L * W}}{\textbf{\textit{Mounting Height}} * (\boldsymbol{L + W})}$$

$$\text{Total Lumen} = \sum \mathrm{N}_i * \mathrm{F}_i = \frac{E * L * W}{UF * LLF}$$

where,

L = Length (m), W = Width (m), N_i = Number of light Bulbs of i-th kind Light Source (nos)

F_i = Luminous Flux of i-th kind Light Source (lumen), LLF = Light Loss Factor (Taken 0.9)

E = Luminance Level (lux) for that room

UF = Utilization Factor from the Room Index calculated taking typical (C, W, F) = (0.7,0.5,0.2)

C, W, F = Values for Surface Reflectance for Ceiling, Wall and Floor respectively

Mounting Height = 2 m (Taken)

Note, for simplicity, we have taken UF = 0.7 for all cases (RI not needed)

Fan Calculation:

$$Number\ of\ Fans = \frac{L*W\ (in\ sq.feet)}{100}$$

Load Calculation:

Bedroom-1: (11.81'x11.81')

1 ceiling fan – (100*0.7) W = 70W

1 tube light – (20*0.7) W = 14W

1 Fluorescent Bulb-(20*0.7) W = 14W

1 2-pin 5A socket – (100*0.3) W = 30W

3 3-pin 15A socket – (3*3000*0.3) W = 2700W

Total Load = 2828 W

Toilet-1: (3.28'x8.2')

1 Fluorescent Bulb – (20*0.7) W = 14W

1 exhaust fan – (50*0.7) W = 35W

Total Load = 49 W

Bedroom-2: (9.84'x11.82')

1 ceiling fan – (100*0.7) W = 70W

1 tube light – (20*0.7) W = 14W

1 Fluorescent Bulb-(20*0.7) W = 14W

1 2-pin 5A socket – (100*0.3) W = 30W

3 3-pin 15A socket – (3*3000*0.3) W = 2700W

Total Load = 2828 W

Toilet-2: (9.84’x6.56’)

1 Fluorescent Bulb – (20*0.7) W = 14W

1 exhaust fan – (50*0.7) W = 35W

Total Load = 49W

Bedroom-3: (13.45’x9.84’)

1 ceiling fan – (100*0.7) W = 70W

1 tube light – (20*0.7) W = 14W

1 Fluorescent Bulb-(20*0.7) W = 14W

1 2-pin 5A socket – (100*0.3) W = 30W

3 3-pin 15A socket – (3*3000*0.3) W = 2700W

Total Load = 2828 W

Dining Room: (10.5’x10.17’)

1 ceiling fan – (100*0.7) W = 70W

1 tube light – (20*0.7) W = 14W

1 2-pin 5A socket at SB level – (100*0.3) W = 30W

2 3-pin 15A socket – (2*3000*0.3) W = 1800W

Total Load = 1914W

Living Room: (11.81’x10.5’)

1 ceiling fan – (100*0.7) W = 70W

1 tube light – (20*0.7) W = 14W

1 Fluorescent Bulb-(20*0.7) = 14W

1 2-pin 5A socket – (100*0.3) W = 30W

4 3-pin 15A socket – (4*3000*0.3) W = 3600W

Total Load = 3728 W

Kitchen: (10.5’x8.2’)

1 exhaust fan – (50*0.7) W = 35W

1 Fluorescent Bulb-(20*0.7) = 14W

1 2-pin 5A socket at SB level – (100*0.3) W = 30W

1 2-pin 5A socket at table height – (100*0.3) W = 30W

2 3-pin 15A socket – (2*3000*0.3) W = 1800W

Total Load = 1909W

Veranda: (12.14’x9.18’)

1 ceiling light – (20*0.7) W = 14W

1 2-pin 5A socket at SB level – (100*0.3) W = 30W

1 3-pin 15A socket – (3000*0.3) W = 900W

Total Load = 944W

Total load of 1 unit = 17077 W

Total Lobby load for 1 floor = 28x20x0.7 = **392 W**

Total load for 4 floors = **(8x17077+392) x4 = 548032 W**

Ground:

Each Guard Room: (14.67’x14.33’)

2 ceiling fans – (2*100*0.7) W = 140W

1 Fluorescent Bulb-(20*0.7) W = 14W

1 tube light – (20*0.7) W = 14W

1 2-pin 5A socket at SB level – (100*0.3) W = 30W

1 3-pin 15A socket – (3000*0.3) W = 900W

1 exhaust fan in toilet- (50*0.7) = 35W

1 Fluorescent Bulb in toilet-(20*0.7) W = 14W

1 exhaust fan in kitchen- (50*0.7) W = 35W

1 Fluorescent Bulb in kitchen-(20*0.7) W = 14W

1 3-pin 15A socket in kitchen– (3000*0.3) W = 900W

Total Load = 2096 W

Generator Room: (21.75'x12.5')

2 exhaust fans = (2*50*0.7) W = 70W

1 Fluorescent Bulb-(20*0.7) W = 14W

Total Load = 84 W

Transformer Room: (12.75'x11.5')

1 exhaust fans = (50*0.7) W = 35W

2 Fluorescent Bulb-(2*20*0.7) W = 28W

Total Load = 63 W

Total bulbs = 95x20x0.7 = 1330 W

Total load in ground = 2096x2 + 84 + 63 +1330 = **5669 W**

Total load in basement = 113x20x0.7 = **1582 W**

Lift: (6.83'x7')

4.2.1.2 Stretcher Facility in Lifts

(a) When passenger lifts are installed in any building having more than ten storeys or a height of more than 32 m, each floor served by these lifts must have access to at least one lift with a stretcher facility in accordance with Sec 4.2.1.2(b).

(b) A lift required to have a stretcher facility by Sec 4.2.1.2(a) shall accommodate a raised stretcher with a patient lying on it horizontally by providing a minimum inside platform area 1275 mm wide x 2000 mm long with a minimum clear opening width of 1050 mm, unless otherwise designed to provide an equivalent facility, to allow the entrance and exit of an ambulance stretcher (minimum size 600 mm wide x 2000 mm long) in its horizontal position. These lifts shall be identified by the internationally recognized symbol for emergency medical services.

Rated Load (mass) (kg)	Maximum Available Car Area (see note) (m^2)	Maximum Number of Passengers
975	2.35	14
1000	2.40	14
1050	2.50	15
1125	2.65	16
1200	2.80	17
1250	2.90	18
1275	2.95	18
1350	3.10	19
1425	3.25	20
1500	3.40	22
1600	3.56	23
1800	3.88	26
2100	4.36	30
2500	5.00	36

Building Type	Rise (m)	Minimum Car Speed (m/s)
Hospital (contd.)	31 to 40	1.6
	41 to 55	2.0
	56 to 75	2.5
	Above 75	3.6
Apartments	0 to 25	0.63
	26 to 40	1.0
	41 to 60	1.6
	Above 60	2.0

Our Lift Dimension: 6’10” x 7’ = 2080mm x 2130mm

= 47.8 sq. ft =4.45 m^2

Available area= 4.45 x 0.8 =3.56 m^2

Rated Load, m = 1600 kg

Rated speed, v = 0.63m/s

Rated kW= (mgv)/ŋ = (1600*9.8*0.63)/0.8 = 12.35 kW

<u>Pump: 10 kW</u>

Total load = (load of 4floors+ GF loads + Basement loads+ Roof loads+ Pump + Lift) * 0.7 = (548.03 +5.67+1.58 +? + 10 + 2x20) * 0.7 kW

=605.28*0.7 kW

=423.7 kW

Total kVA = (423.7/0.8) = 529.625 kVA

Overload Factor = 0.9

So, required transformer = 529.625 x 0.9 = 476.66 kVA

Table 8.1.23: Area Required for Transformer and Recommended Area for Substation of Different Capacities

Capacity of Transformer (kVA)	Transformer Area (m^2)	Total Substation Area (with HT, LT Panels & Transformer Room but without Generators), (m^2)
1 × 150	12	45
1 × 250	13	48
2 × 250	26	100
1 × 400	13	48
2 × 400	30	100
3 × 400	40	135
2 × 630	26	100
3 × 630	40	190
2 × 1000	40	180
3 × 1000	45	220

The recommended area required for substation and transformer rooms for different capacities are given in Table 8.1.23 for general guidance. Minimum recommended spacing between the transformer periphery and walls should be :

(i) 0.75 m for Transformer installed in a room with wall on two sides.

(ii) 1.0 m for Transformer installed in a room with wall on three sides.

(iii) 1.25 m for Transformer installed in an enclosed room.

(iv) 1.5 m distance from one to another transformer for multiple transformers in room for 11 kV voltage level and 2.5 m distance for higher level of voltage.

<u>Emergency Load Calculation:</u>

<u>Bedroom-1: (11.81’x11.81’)</u>

1 ceiling fan – (100*0.7) W = 70W

1 Fluorescent Bulb-(20*0.7) W = 14W

Total Load = 84 W

<u>Toilet-1: (3.28’x8.2’)</u>

1 Fluorescent Bulb – (20*0.7) W = 14W

Total Load = 14W

Bedroom-2: (9.84’x11.82’)

1 ceiling fan – (100*0.7) W = 70W

1 Fluorescent Bulb-(20*0.7) W = 14W

Total Load = 84 W

Toilet-2: (9.84’x6.56’)

1 Fluorescent Bulb – (20*0.7) W = 14W

Total Load = 14W

Bedroom-3: (13.45’x9.84’)

1 ceiling fan – (100*0.7) W = 70W

1 Fluorescent Bulb-(20*0.7) W = 14W

Total Load = 84 W

Dining Room: (10.5’x10.17’)

1 ceiling fan – (100*0.7) W = 70W

1 tube light – (20*0.7) W = 14W

Total Load = 84W

Living Room: (11.81’x10.5’)

1 ceiling fan – (100*0.7) W = 70W

1 Fluorescent Bulb-(20*0.7) W = 14W

Total Load = 84 W

Kitchen: (10.5’x8.2’)

1 Fluorescent Bulb-(20*0.7) W = 14W

Total Load = 14W

Total Emergency load of 1 unit = 462 W

Total Lobby load for 1 floor = 28x20x0.7 = 392 W

Total Emergency load for 4 floors = **(462+392) x4 = 3416 W**

Ground:

Each Guard Room: (14.67’x14.33’)

1 ceiling fan – (100*0.7) W = 70W

1 Fluorescent Bulb-(20*0.7) W = 14W

1 exhaust fan in toilet- (50*0.7) = 35W

1 Fluorescent Bulb in toilet-(20*0.7) W = 14W

1 exhaust fan in kitchen- (50*0.7) = 35W

1 Fluorescent Bulb in kitchen-(20*0.7) W = 14W

Total Load = 182 W

Generator Room: (21.75’x12.5’)

2 exhaust fans = (2*50*0.7) W = 70W

1 Fluorescent Bulb-(20*0.7) W = 14W

Total Load = 84 W

Transformer Room: (12.75’x11.5’)

1 exhaust fans = (50*0.7) W = 35W

2 Fluorescent Bulb-(2*20*0.7) W = 28W

Total Load = 53 W

Total emergency bulbs = 87x20x0.7 = 1218 W

Total Emergency load in ground = 182x2 + 84 + 53 +1218 = **1719 W**

Total Emergency load in basement = 113x20x0.7 = **1582 W**

Lift load = 2*20= 40 kW

Pump = 10 kW

Total Emergency load = (3.416 + 1.719 + 1.582 +40 +10) *0.7 = 56.717*0.7= 39.7 kW

Total emergency kVA = (39.7/0.8) =49.625 kVA

Overload Factor= 0.9

So, required generator = 49.625x0.9=44.66 kVA

Table 8.1.24: Area Requirements for Standby Generator Room

Capacity (kW)	Area (m^2)
1 × 25	20
1 × 48	24
1 × 100	30
1 × 150	36
1 × 300	48
1 × 500	56

generators as a general guidance. Minimum recommended spacing between the generator periphery and walls need to be included:

(i) 1.0 m for generator installed in an enclosed room.

(ii) 1.25 m distance from one to another generator for multiple generators in the room.

Our Total load= 371.855 kVA

EMDB load= 37.464 kW

Generator room dimension= 21’9”x12’6” = 25.27 m^2

Transformer room dimension=12’9”x11’6” = 13.63 m^2

Total substation area (w/o Generator) = 21’9”x25’9” = 52m^2

Symbol	Wire Rating (single core) mm^2	Current-Rating (Ampere)	GI Pipe Diameter (inch)
C1	2x1.5 BYM	5A	¾
C2	4x1.5 BYM	5A	¾
C3	6x1.5 BYM	5A	¾
C4	8x1.5 BYM	5A	¾
C5	10x1.5 BYM	5A	1
C6	12x1.5 BYM	5A	1
C7	14x1.5 BYM	5A	1
C8	2x4 BYM +4ECC BYA	15A	1
C9	2x6 BYM +6ECC BYA	20A	1
C10	4x6 BYM +2x6ECC BYA	20A	1
C11	6x6 BYM +3x6ECC BYA	20A	1
C12	8x6 BYM +4x6ECC BYA	20A	1

Power Calculations:

Calculation For EMDB

EMDB load= Total ESDB Load * 0.7 + Emergency Lift Load * 0.7

Total ESDB Load=8*4*ESDB_Each Unit+ ESDB_Ground + ESDB_Basement + ESDB_Lobby

EMDB Current= $\frac{EMDB\ Load}{\sqrt{3}*Line\ Voltage*pf}$

Phase Voltage = 220 V

Line Voltage = $\sqrt{3}$* 220 = 381.05 V

Power Factor, pf = 0.8

Total ESDB Load = 8*4*660+560*4+2080+1360+800 = 27600 W = **27.6 kW**

Emergency Lift Load = 24 kW

EMDB Load= 0.7* (27.6+24) = 36.12 kW

EMDB Current= $\frac{36.12*1000}{\sqrt{3}*381.05*0.8}$ **= 68.4 A**

So, 70 A TP MCCB is needed from EMDB to MDB.

Wire is 4x50 rm NYY + 25 rm BYA ECC

Generator Sizing

EMDB LOAD =36.12 KW, Assumed pf = 0.8

Generator size= EMDB LOAD/pf = 36.12 kW/ 0.8

= 45.15 KVA

60 KVA with ATS is available

Calculation for MDB

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

0.7*Total SDB Load = 8*4*SDB_Each Unit + SDB_Ground

= (8*4*17765 +3908) W

= 572388 W =572.388 KW

Pump Load = 10000 W

Main Lift Load = 24 kW = 24000 W

MDB Load =572388 + (51600 +10000) * 0.7 = 615508 W = 615.508 kW

MDB Current= $\frac{MDB\ Load}{\sqrt{3}*Line\ Voltage*pf}$ **=** $\frac{615508}{\sqrt{3}*381.05*0.8}$ **= 798.56 A**

So**, 585 A TP MCCB** is needed from **MDB to Main Line**.

Wire: 4x 630 rm NYY +315 rm BYA ECC

Pump Current Calculation

Pump power = 10000 W 3 phase; assumed pf= 0.8

Pump Current= $\frac{10000}{\sqrt{3}*381.05*0.8}$ **= 18.94 A**

CB: 20 A TP MCCB

Wire: 4x 6 rm NYY +6 rm BYA ECC

Calculation for Transformer

Total load = (load of 4floors+ GF loads + Basement loads+ Roof loads+ Pump + Lift) * 0.7 = (548.03 +5.67+1.58 +? + 10 + 2x20) * 0.7 kW

=529.625 *0.7 kW

=370.7375 kW

Total kVA = (370.7375/0.8) = 463.42 kVA

Overload Factor = 0.9

So, required transformer = 463.42 x 0.9 = 417.08 kVA

So, **11/0.415 kV, 50 Hz, 400 kVA**, DYN 11, Oil Immersed Transformer with 4-6% Impedance is needed.

Lift Sizing

Main/Emergency Lift Load =24000*0.7 KW, Assumed pf = 0.8

Line Current for = $\frac{24000*0.7}{\sqrt{3}*381.05*0.8}$ **= 31.81 A**

CB: 40 A TP MCCB

Wire: 4x 16 rm NYY +16 rm BYA ECC

Calculation for PFI Plant:

Desired power factor=0.95; Θ_2=18.195^0

$\mathbf{Q_{req}}$=P (tanΘ_1 – tanΘ_2) = 219668* (tan (36.86) - tan (18.195)) = 92549.62 VAR =

Current supplied by PFI,

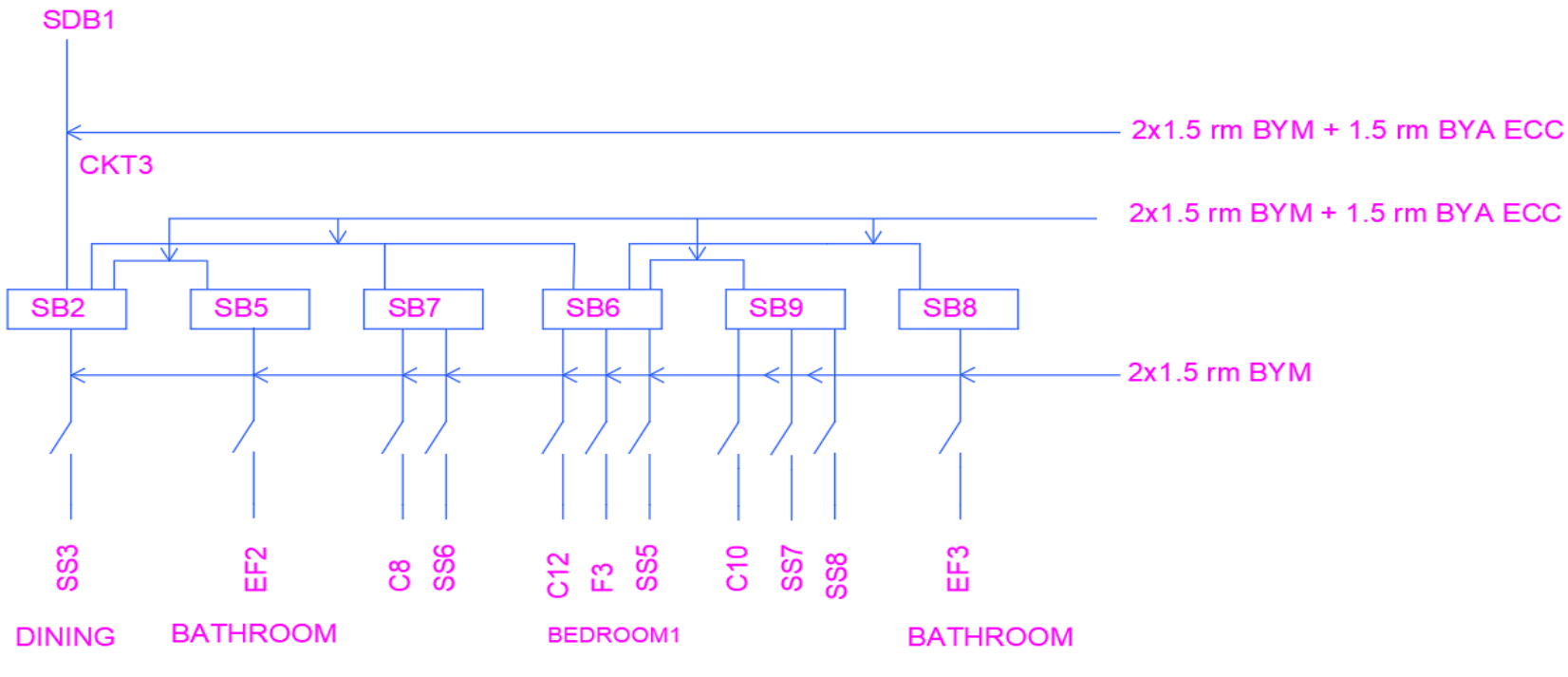
I=$\frac{92549.69}{3*220*0.95}$ = **147.61 A**

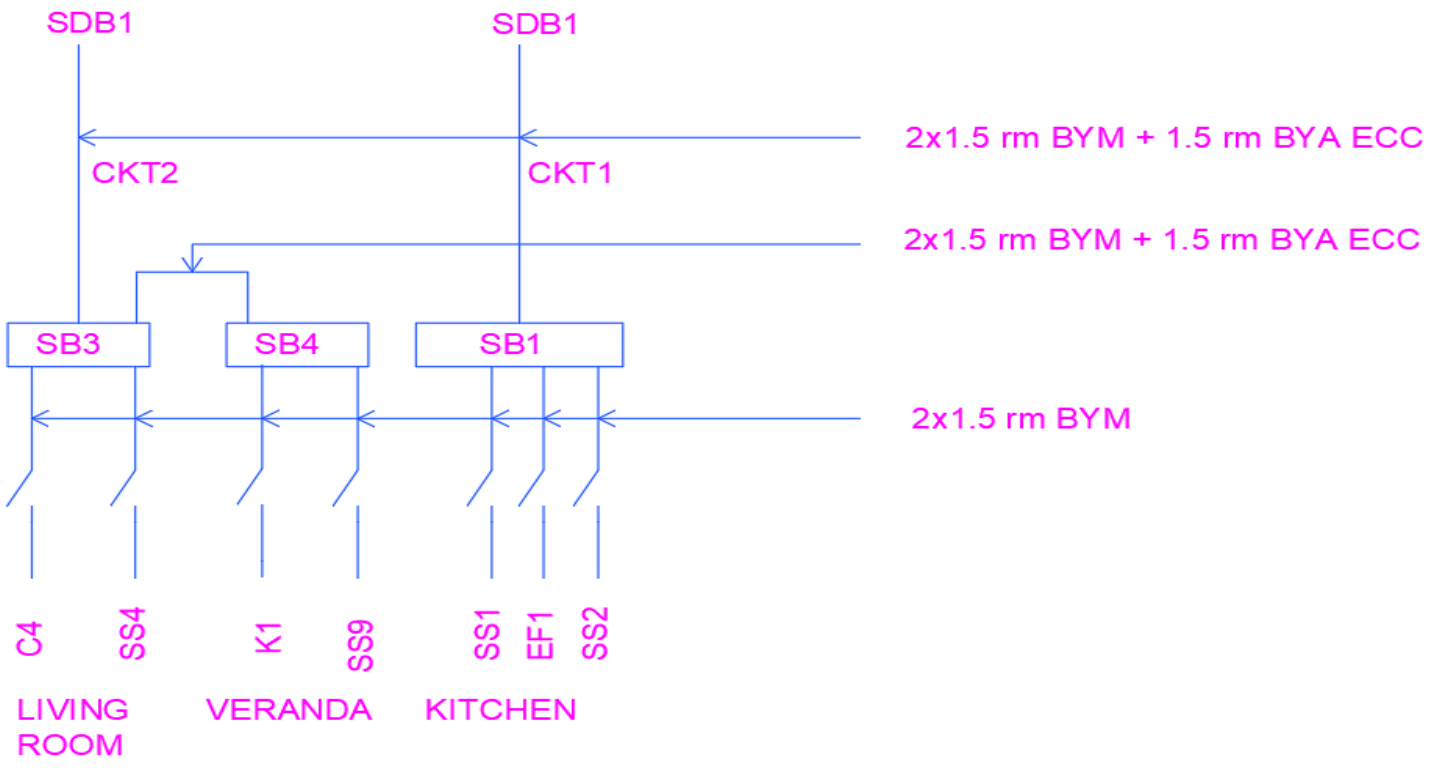
CB: 150 TP MCCB

Wire: 4 x 120 rm NYY + 70 rm BYA ECC

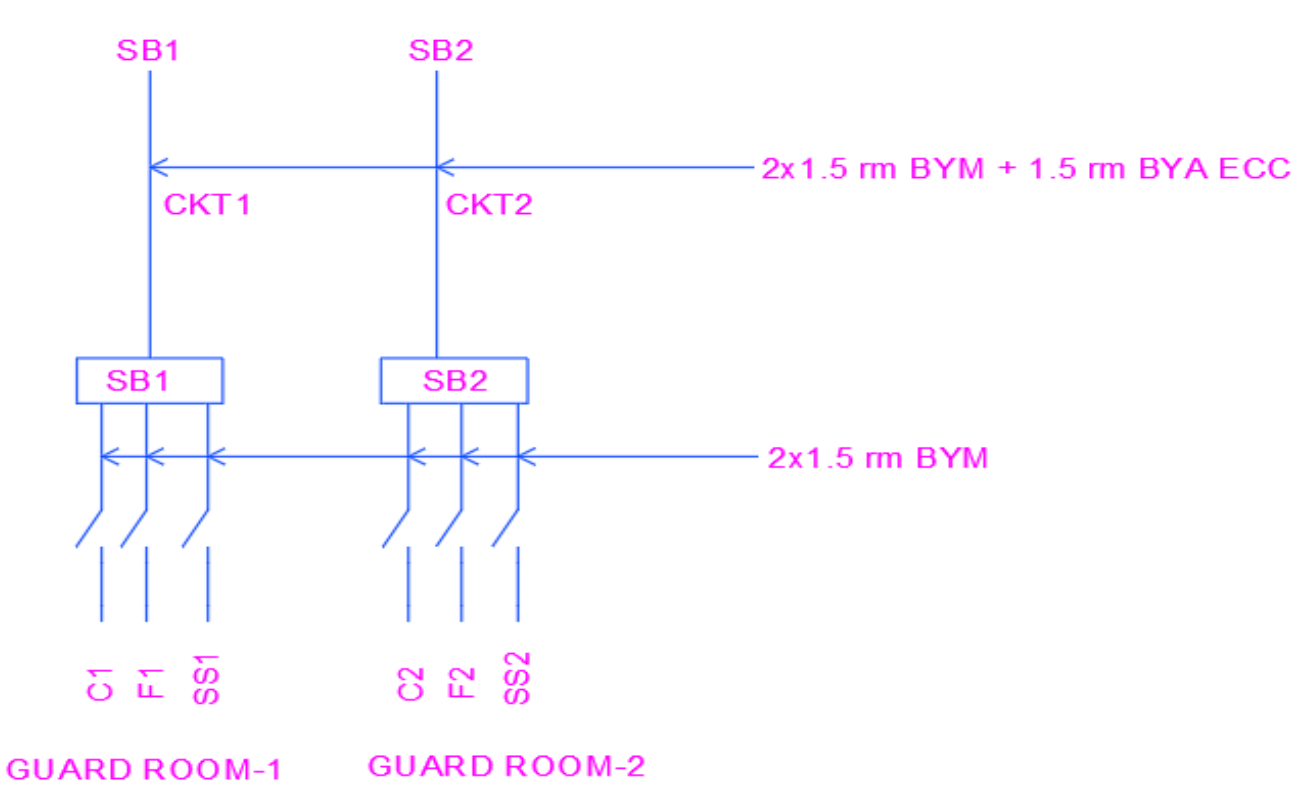
Switchboard Diagrams

Switch Board Connection Diagram of Common Unit

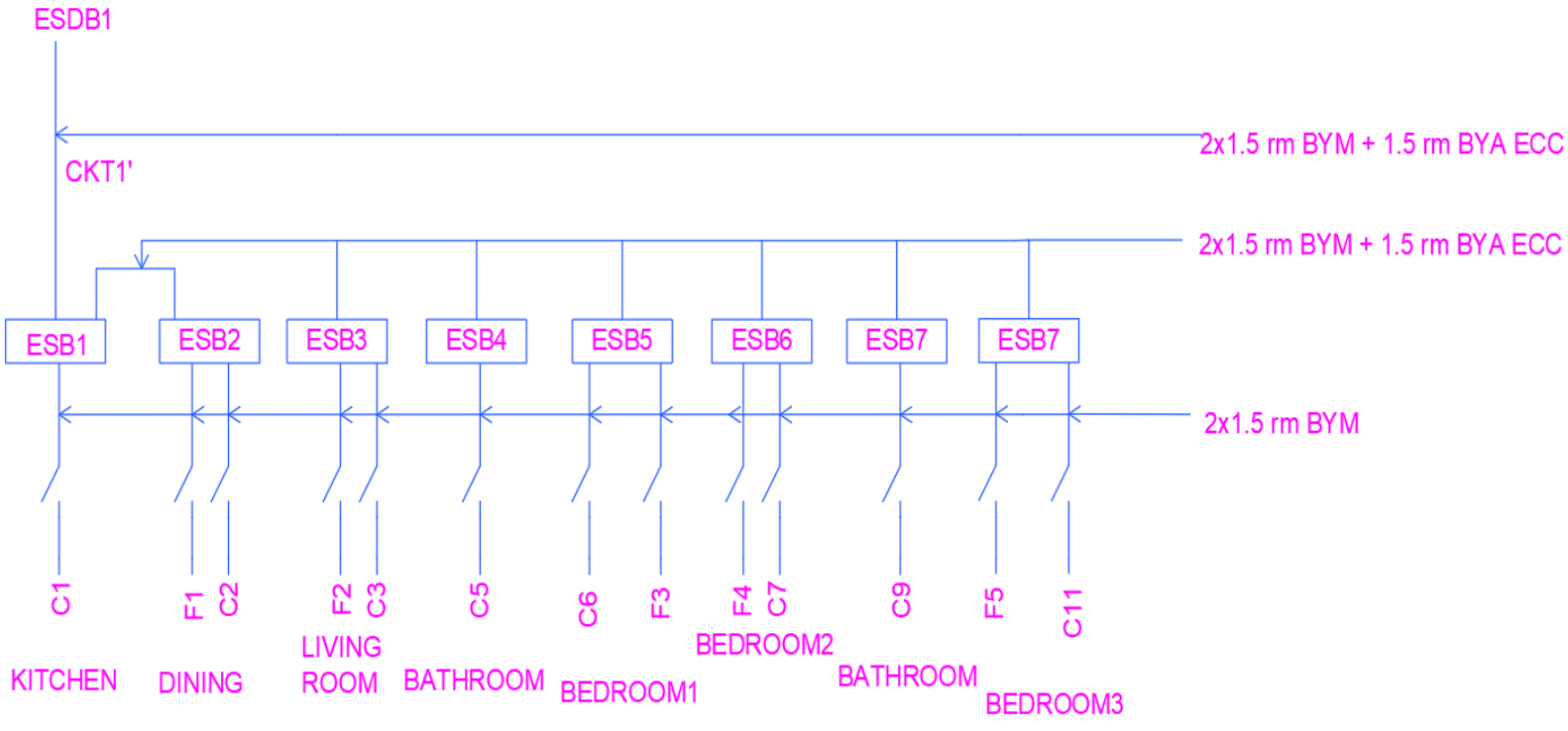




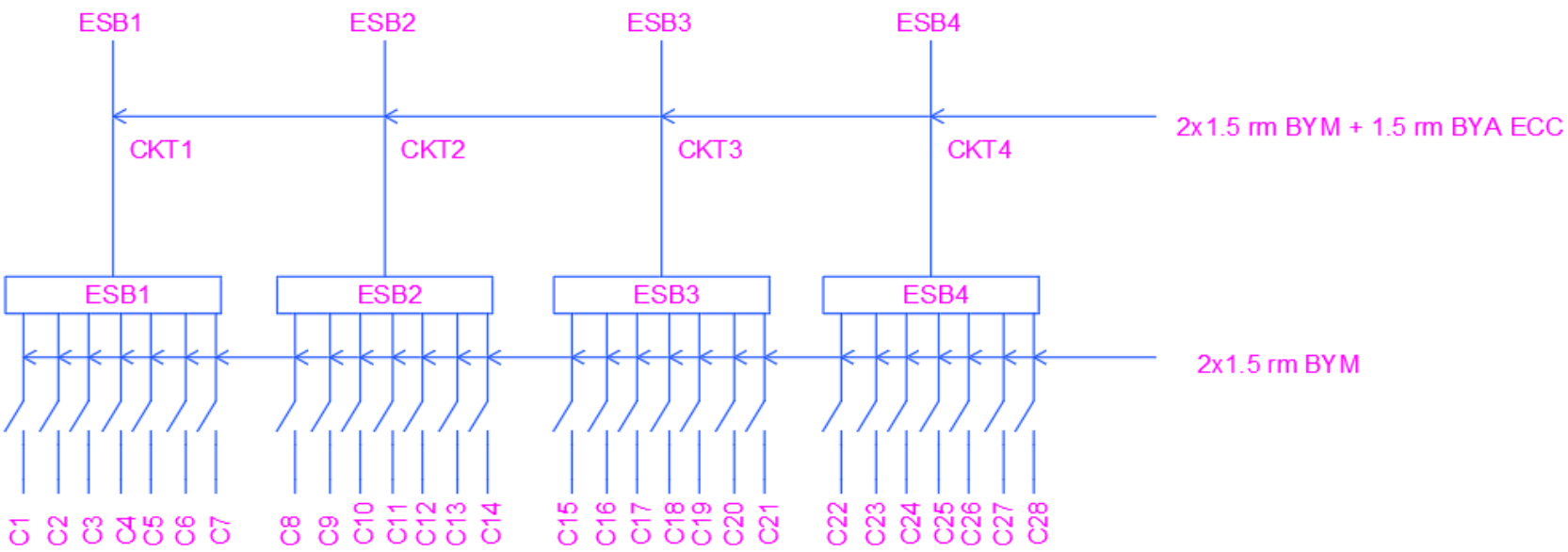
Switch Board Connection Diagram of Ground Floor



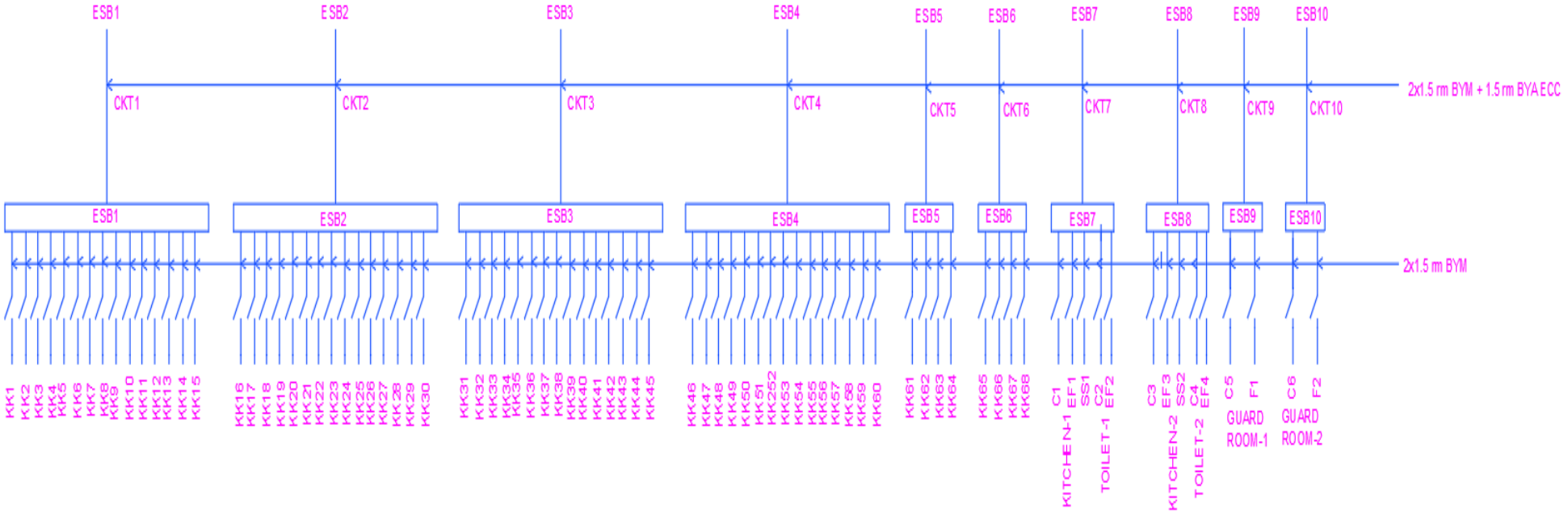
Emergency Switch Board Connection Diagram of Common Unit



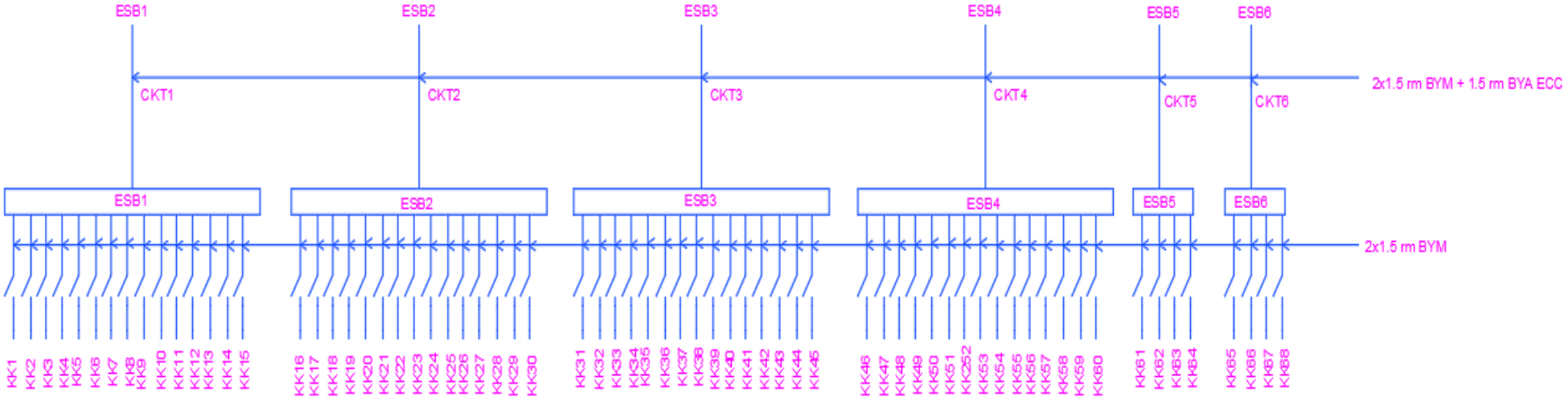
Emergency Switch Board Connection Diagram of Lobby



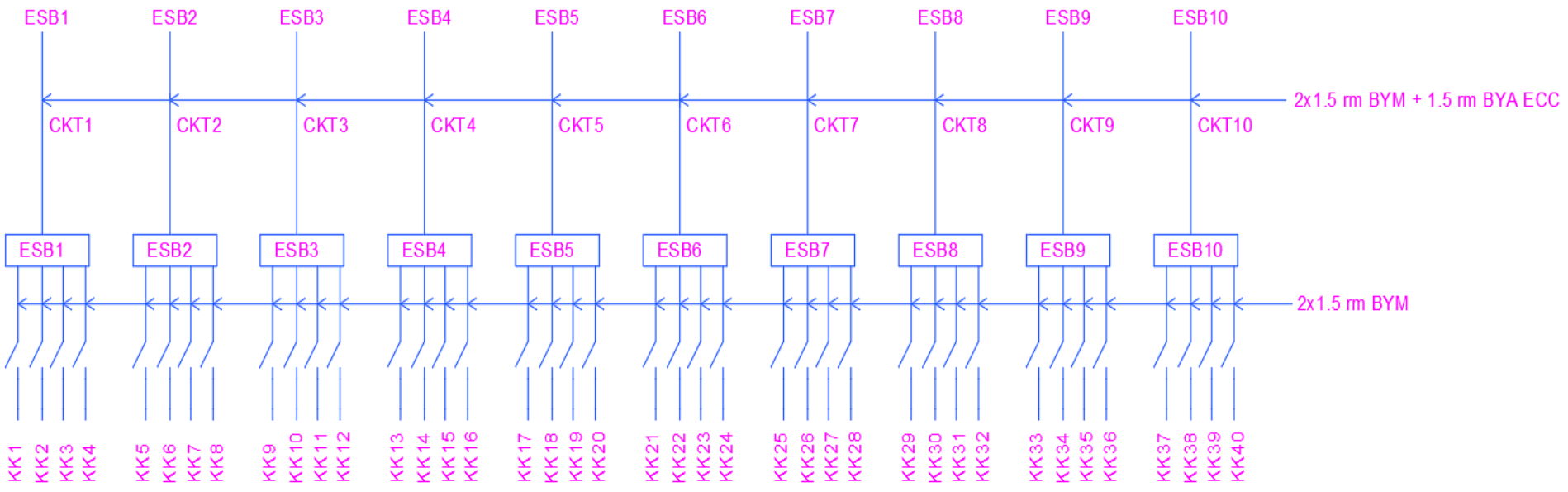
Emergency Switch Board Connection Diagram of Ground Floor



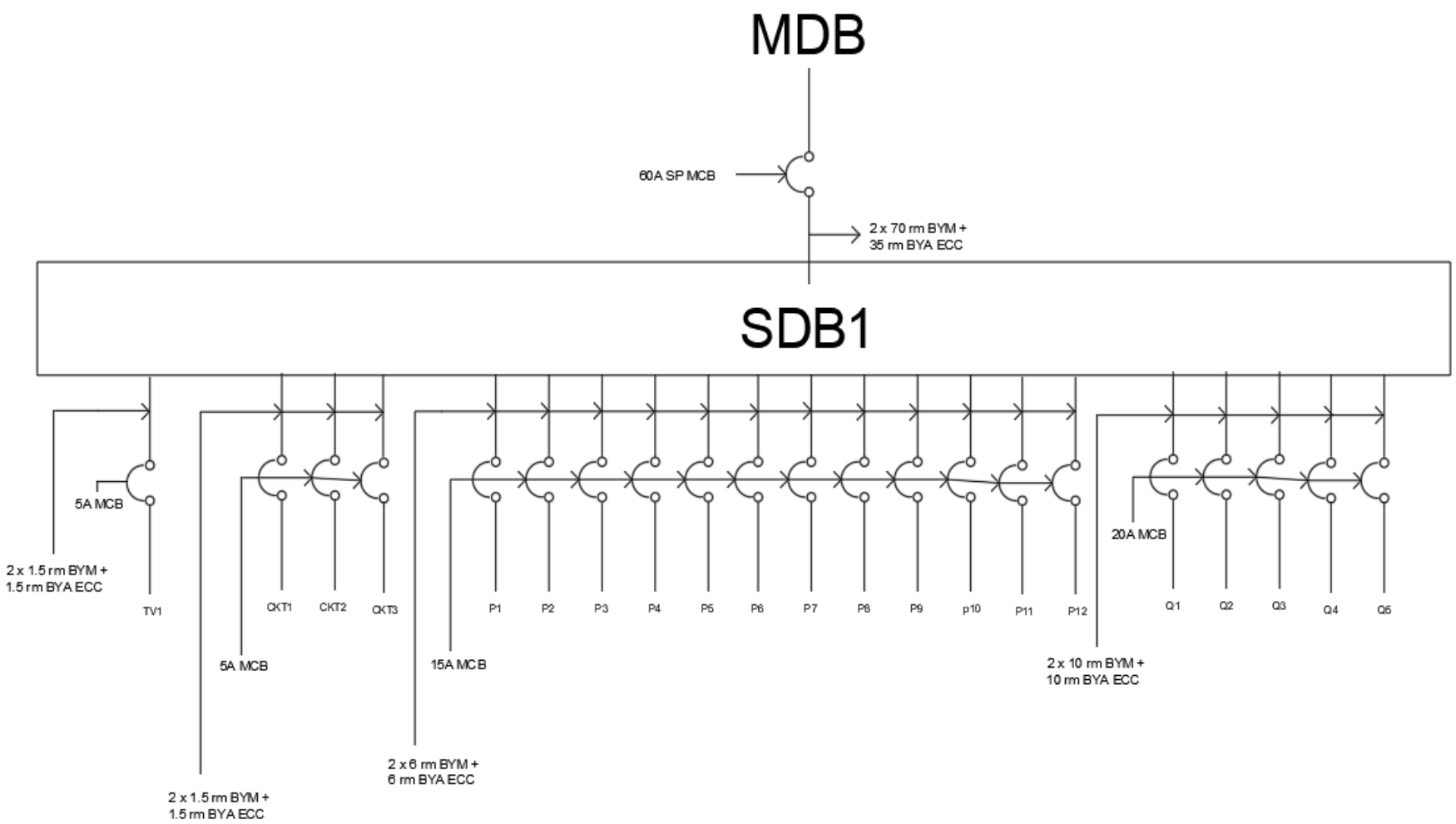
Emergency Switch Board Connection Diagram of Basement

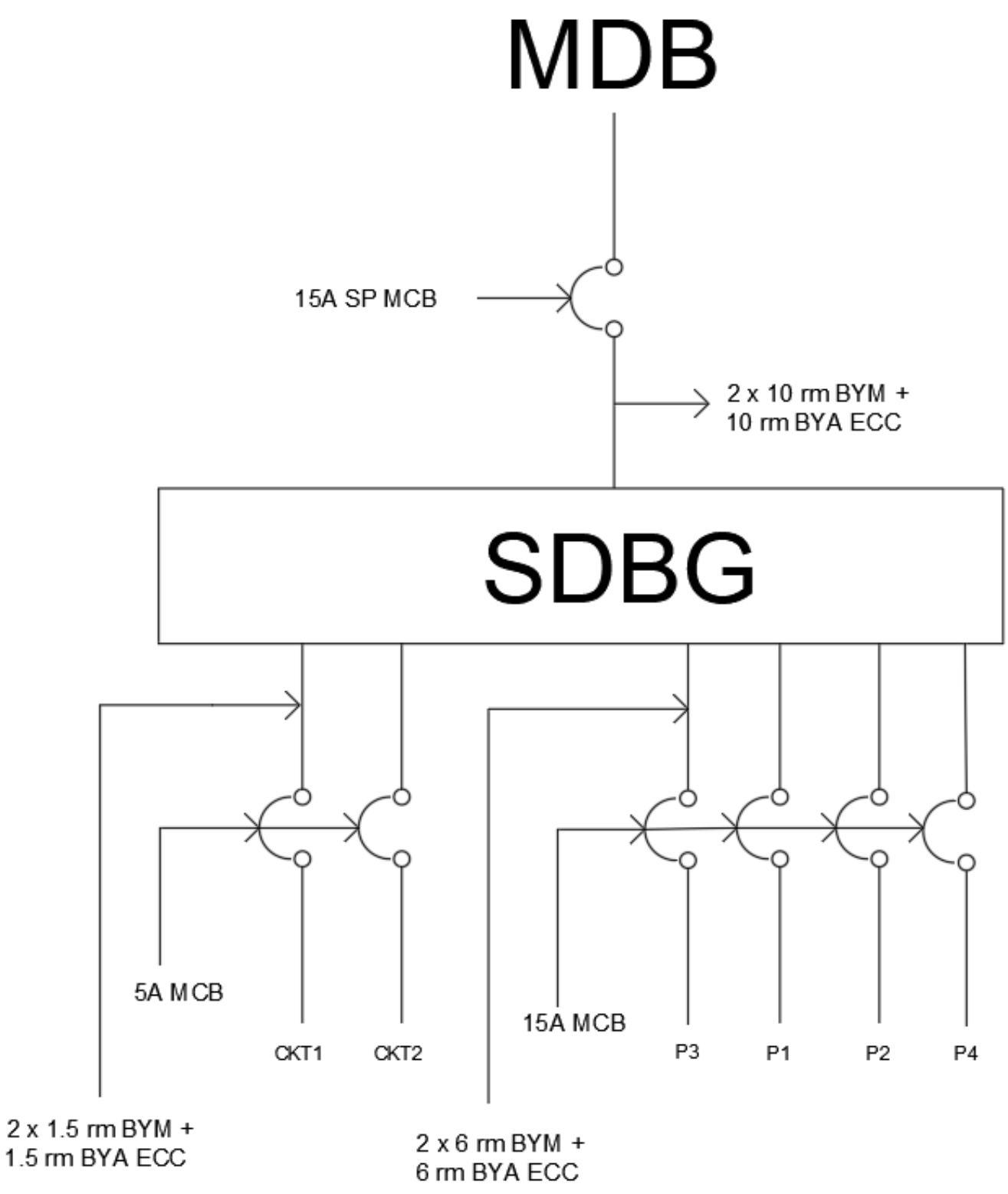


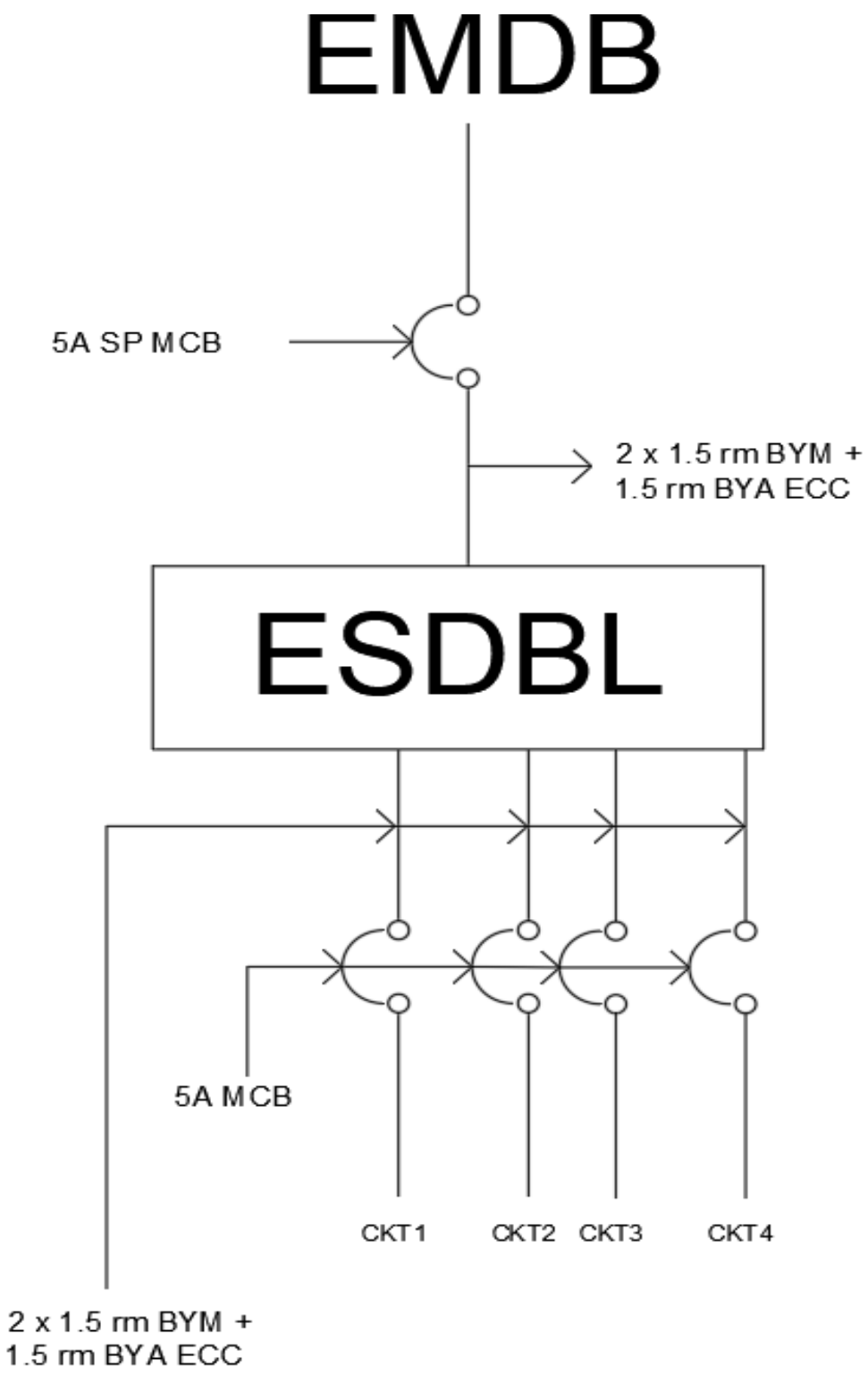
Emergency Switch Board Connection Diagram of ROOF

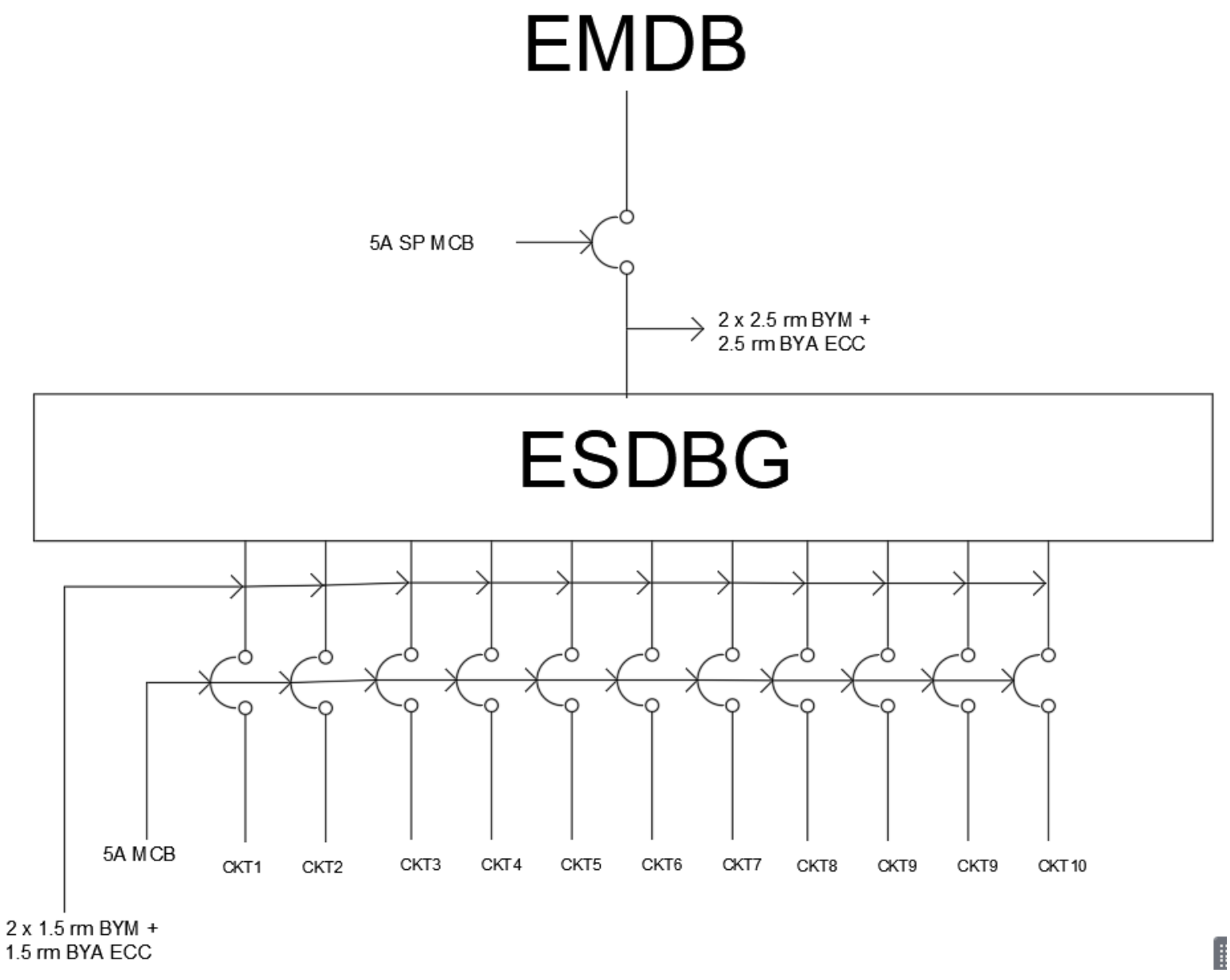


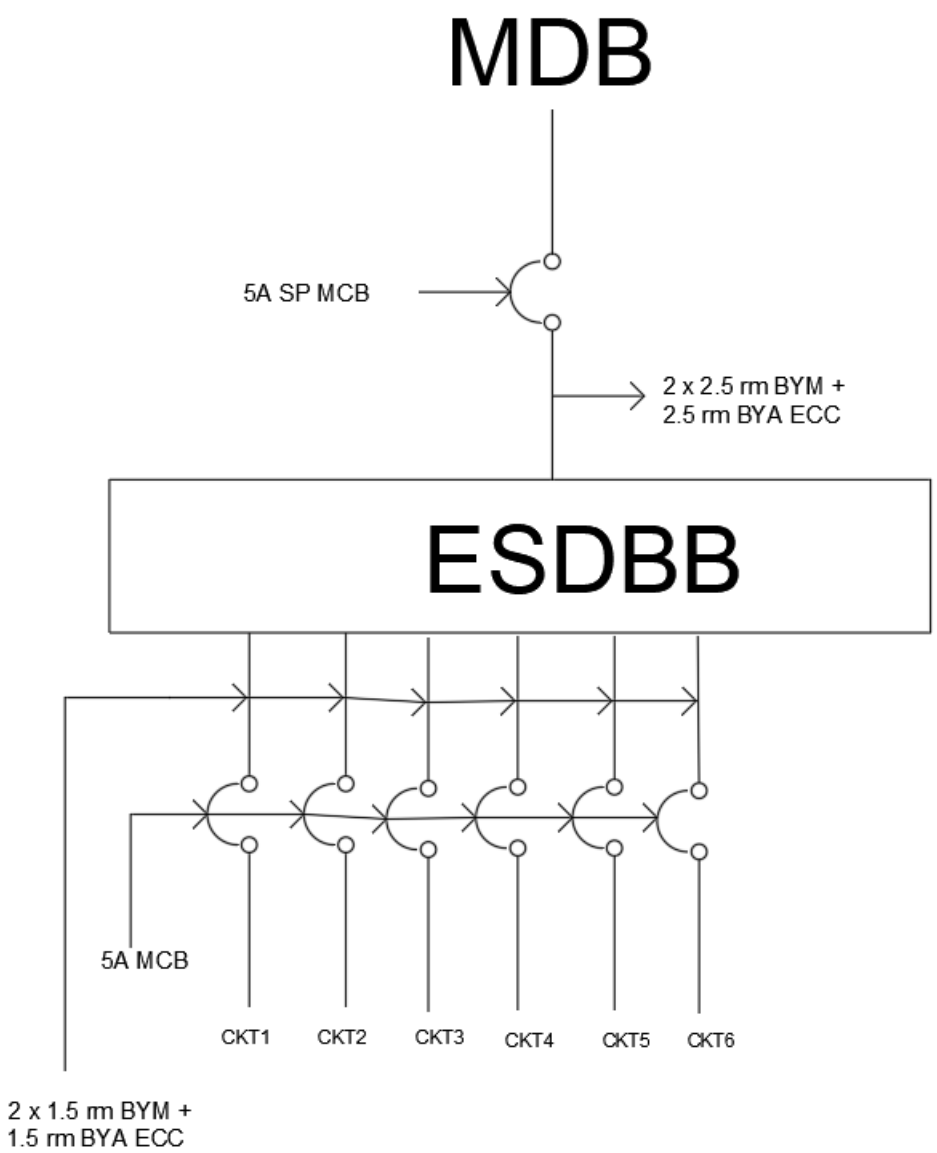
DBs Diagram (SLD)

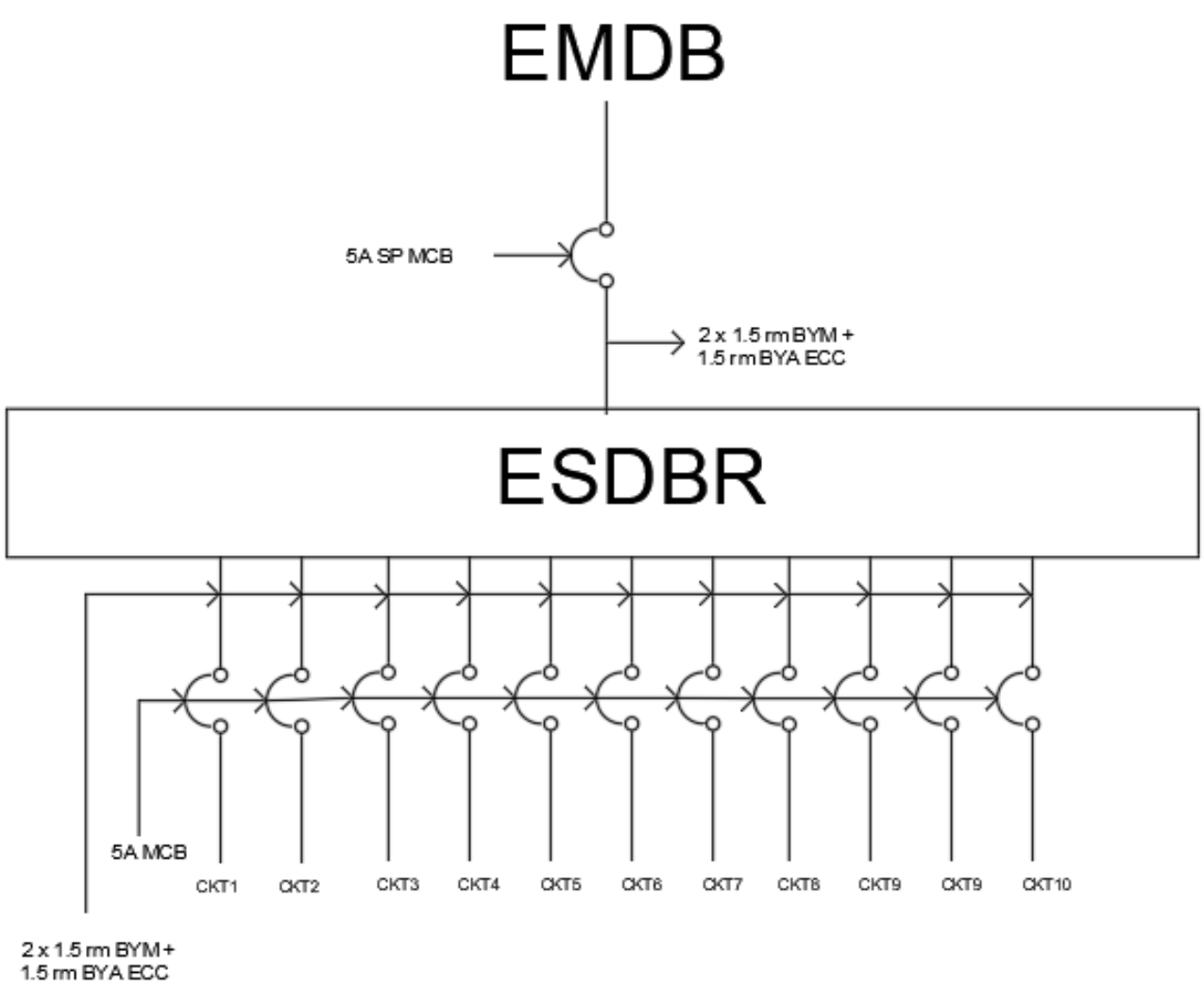


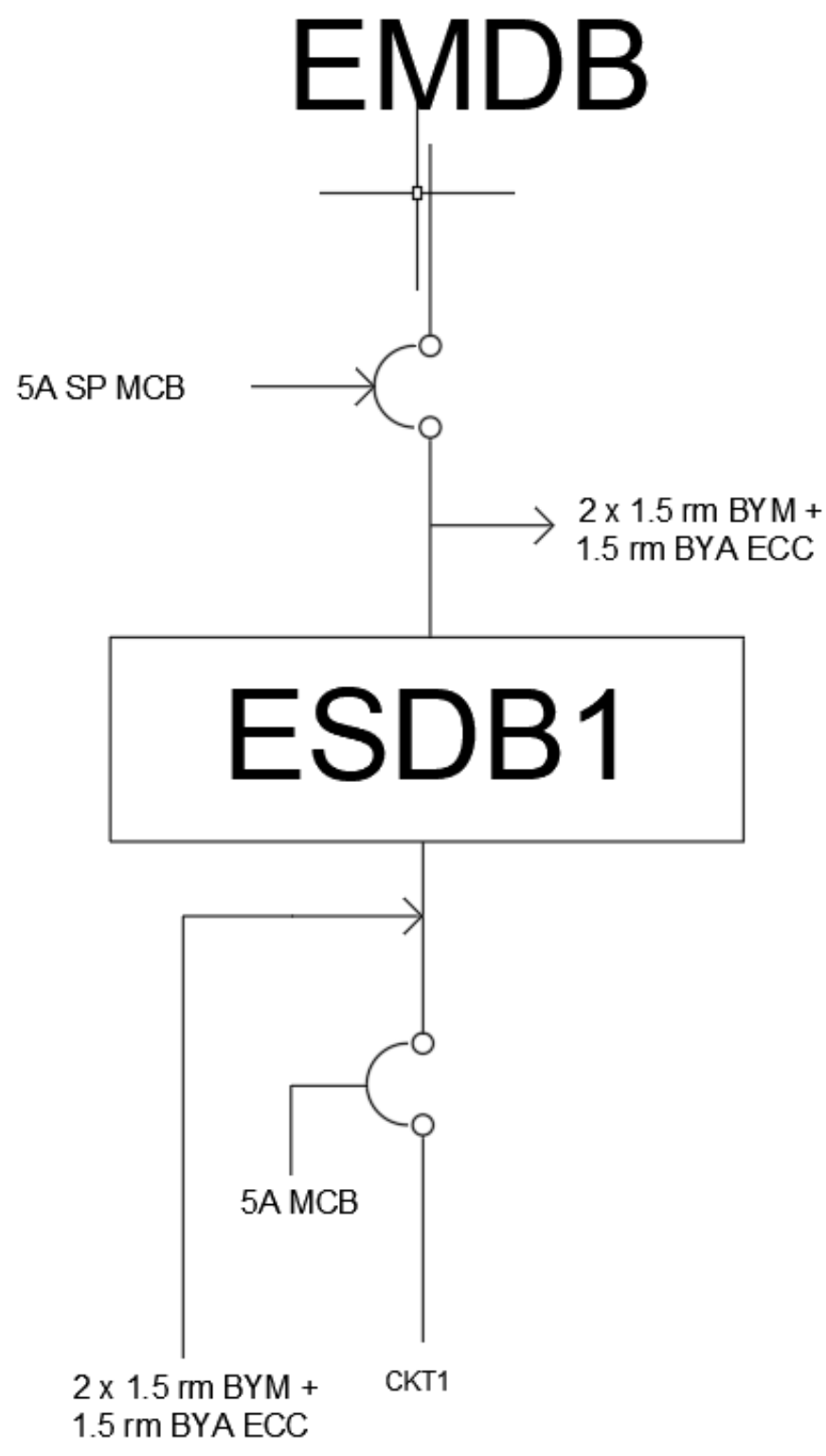


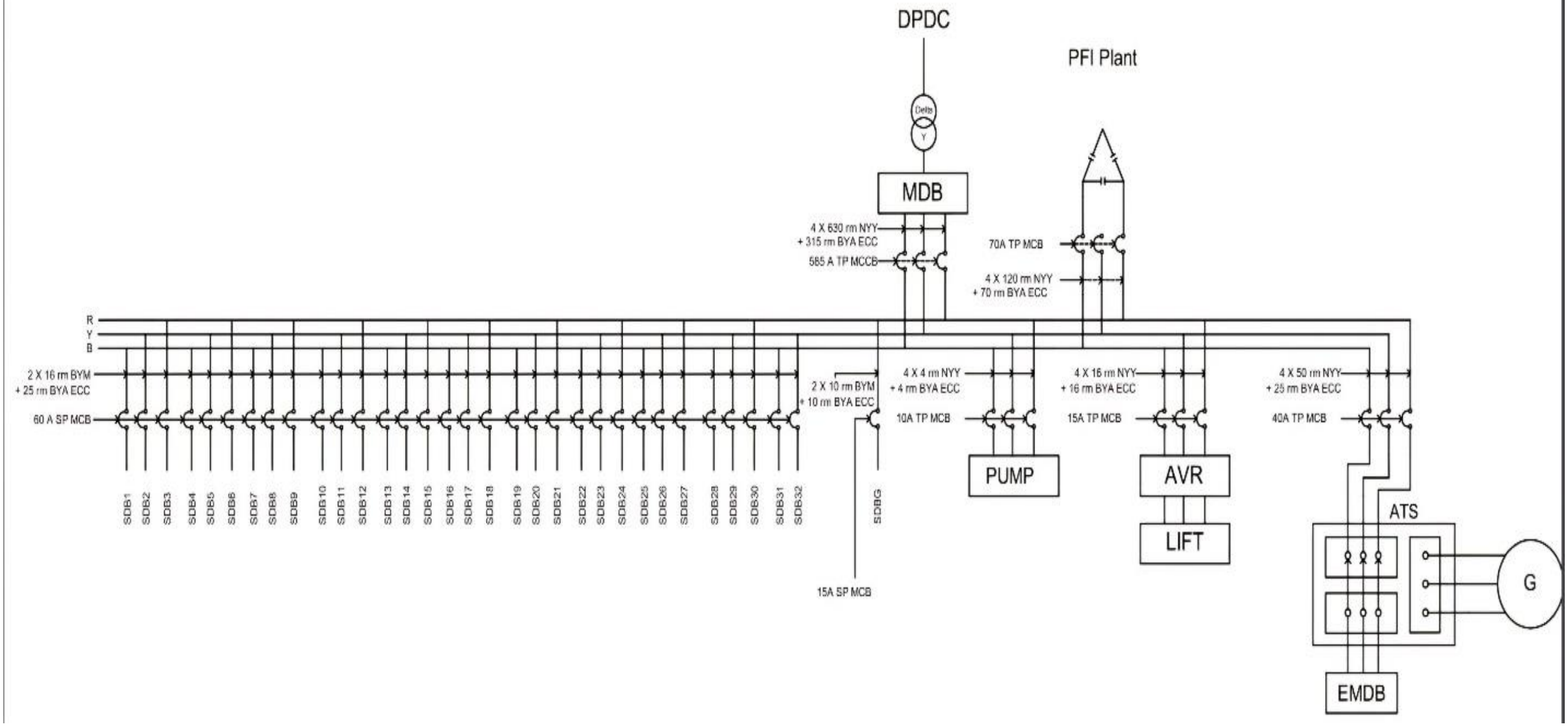

EMDB
5A SP MCB
2 x 1.5 rm BYM +
1.5 rm BYA ECC
ESDBL
5A MCB
CKT1
CKT2
CKT3
CKT4
2 x 1.5 rm BYM +
1.5 rm BYA ECC

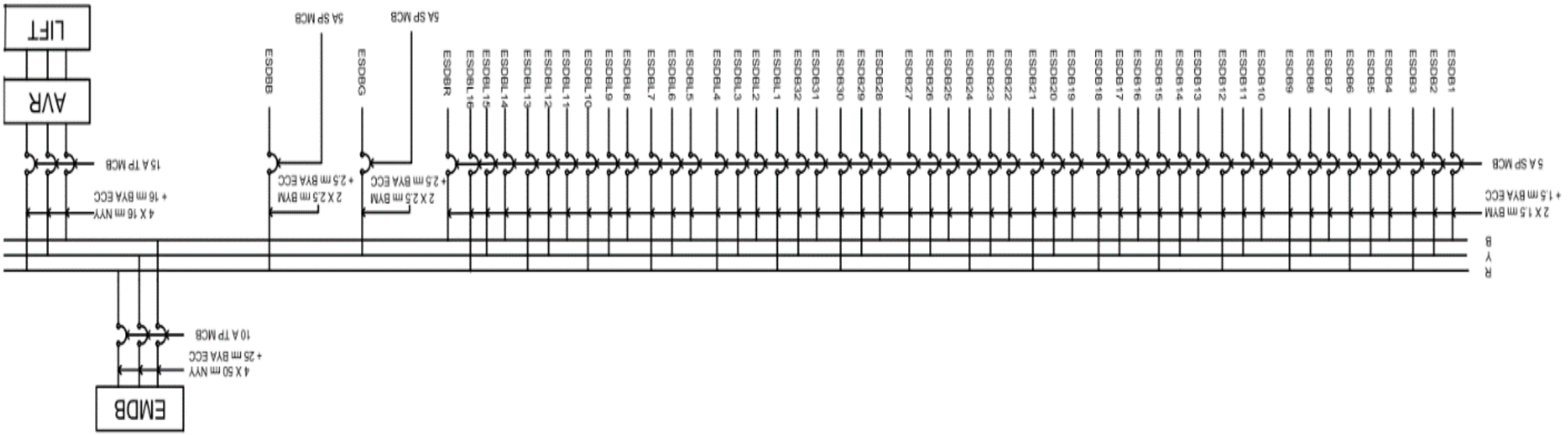

EMDB
5A SP MCB
2 x 2.5 rm BYM +
2.5 rm BYA ECC
ESDBG
5A MCB
CKT1
CKT2
CKT3
CKT4
CKT5
CKT6
CKT7
CKT8
CKT9
CKT9
CKT 10
2 x 1.5 rm BYM +
1.5 rm BYA ECC


MDB
5A SP MCB
2 x 2.5 rm BYM +
2.5 rm BYA ECC
ESDBB
5A MCB
CKT1
CKT2
CKT3
CKT4
CKT5
CKT6
2 x 1.5 rm BYM +
1.5 rm BYA ECC


EMDB
5A SP MCB
2 x 1.5 rm BYM +
1.5 rm BYA ECC
ESDBR
5A MCB
CKT1
CKT2
CKT3
CKT4
CKT5
CKT6
CKT7
CKT8
CKT9
CKT9
CKT10
2 x 1.5 rm BYM +
1.5 rm BYA ECC


EMDB
5A SP MCB
2 x 1.5 rm BYM +
1.5 rm BYA ECC
ESDB1
5A MCB
2 x 1.5 rm BYM +
1.5 rm BYA ECC
CKT1


DPDC
PFI Plant
Delta
Y
MDB
4 X 630 rm NYY
+ 315 rm BYA ECC
585 A TP MCCB
70A TP MCB
4 X 120 rm NYY
+ 70 rm BYA ECC
R
Y
B
2 X 16 rm BYM
+ 25 rm BYA ECC
60 A SP MCB
SDB1
SDB2
SDB3
SDB4
SDB5
SDB6
SDB7
SDB8
SDB9
SDB10
SDB11
SDB12
SDB13
SDB14
SDB15
SDB16
SDB17
SDB18
SDB19
SDB20
SDB21
SDB22
SDB23
SDB24
SDB25
SDB26
SDB27
SDB28
SDB29
SDB30
SDB31
SDB32
2 X 10 rm BYM
+ 10 rm BYA ECC
SDBG
15A SP MCB
4 X 4 rm NYY
+ 4 rm BYA ECC
10A TP MCB
PUMP
4 X 16 rm NYY
+ 16 rm BYA ECC
15A TP MCB
AVR
LIFT
4 X 50 rm NYY
+ 25 rm BYA ECC
40A TP MCB
ATS
G
EMDB


EMDB
10 A TP MCB
4 X 50 mm NYY
+ 25 mm BYA ECC
AVR
LIFT
15 A TP MCB
4 X 16 mm NYY
+ 16 mm BYA ECC
5A SP MCB
2 X 2.5 mm BYM
+ 2.5 mm BYA ECC
ESDBB
ESDBG
ESDBR
ESDBL16
ESDBL15
ESDBL14
ESDBL13
ESDBL12
ESDBL11
ESDBL10
ESDBL9
ESDBL8
ESDBL7
ESDBL6
ESDBL5
ESDBL4
ESDBL3
ESDBL2
ESDBL1
ESDB32
ESDB31
ESDB30
ESDB29
ESDB28
ESDB27
ESDB26
ESDB25
ESDB24
ESDB23
ESDB22
ESDB21
ESDB20
ESDB19
ESDB18
ESDB17
ESDB16
ESDB15
ESDB14
ESDB13
ESDB12
ESDB11
ESDB10
ESDB9
ESDB8
ESDB7
ESDB6
ESDB5
ESDB4
ESDB3
ESDB2
ESDB1
5A SP MCB
2 X 1.5 mm BYM
+ 1.5 mm BYA ECC
R Y B

Lightning Protection System

Risk Assessment

[BNBC section 1.3.33.5]

Index	Parameter	Class	Value
A	Use of Structure	Houses and similar buildings	2
B	Type of Construction	Brick, plain concrete or masonry with nonmetal roof	4
C	Contents or Consequential Effects	Schools, hospitals, children's and other homes, places of assembly	10
D	Degree of Isolation	Structure located in a large area having structures of similar or greater height	2
E	Type of Terrain	Flat terrain at any level	2
F	Height of Structure	15-18 m	5
G	Lightning Prevalence	Over 21	21
Total			46

Risk assessment factor is greater than 40. So, lightning protection system is mandatory for increased safety.

LPS Design Parameters

[BNBC section 1.3.33.6 and 1.3.33.7]

Lightning Arrestor:

We are using rolling sphere method:

Max. values or rolling sphere radius corresponding to the Class of LPS

Class of LPS	Rolling sphere radius
I	20 m
II	30 m
III	45 m
IV	60 m

We are taking Rod Height, h = 2ft=24 inch=0.6096 m

Considering LPS class-I, r=20m

separation distance between the rods, d=2√ (2rh-h^2) =9.8m=32.15’

Roof perimeter = 2 x (132’-6” +87’-45/16”) = 439.46875’=133.95m

Number of lighting arrestors, n= (133.95/9.8) =13.67≈14

We have placed arrestors 32.15’ apart, 5 arrestors along the length of the roof perimeter and 4 arrestors along the width. 2 on the corner of each lift control room. Total **18 lightning arrestors.**

It shall be made with copper rod of minimum 12 mm diameter with tin coating on top.

Down conductor:

Total Area = 11558.56 sq ft = 1074 sq m

Number of down conductors [1 conductor for first 80 sq m]

= (1074- 80)/100 = 9.94≈10

So, we need use total of **11 down conductors** as well as ground electrodes.

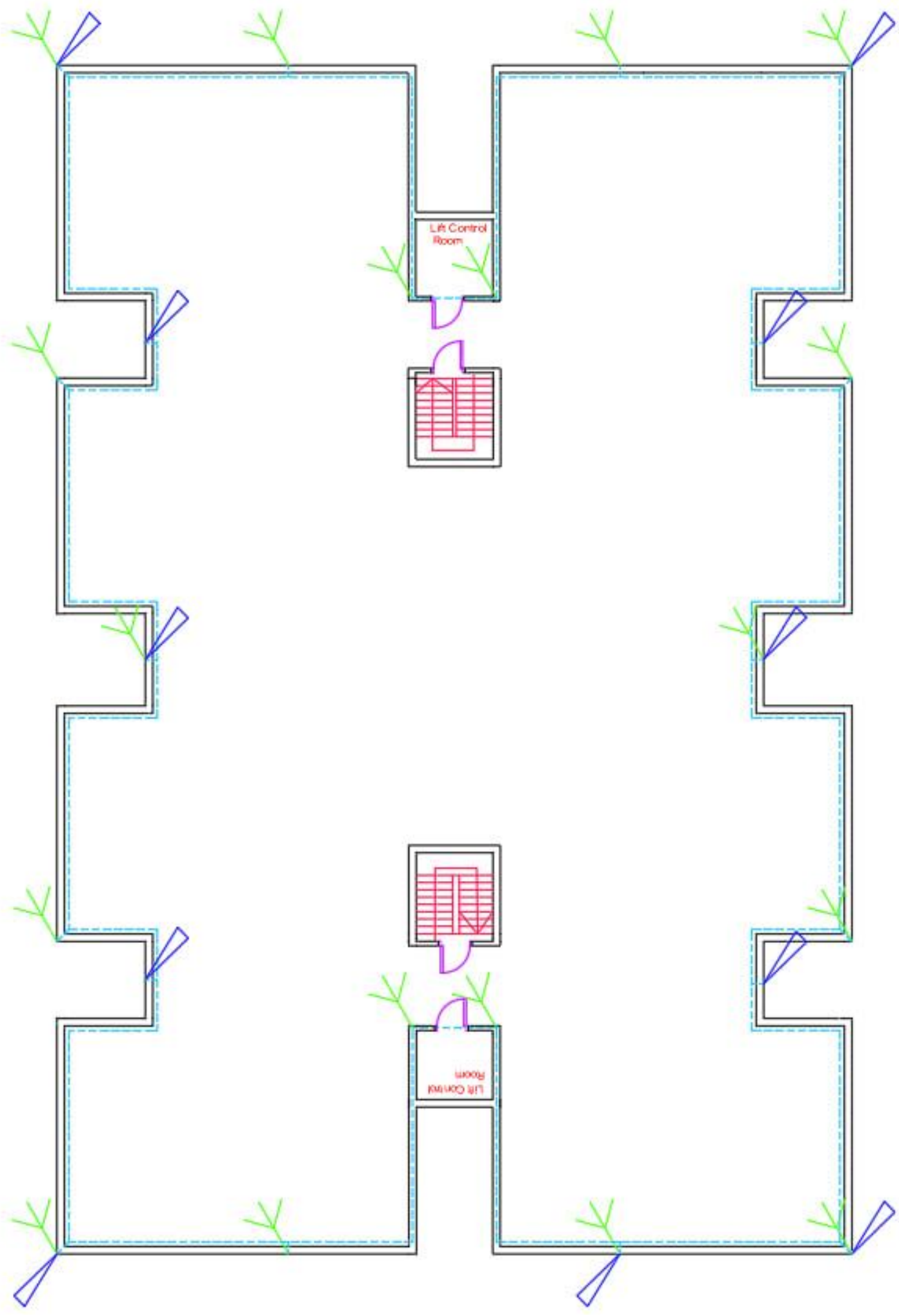
A Down Conductor shall be made with copper strip or Stranded PVC insulated annealed copper cable.

Roof Conductors

Roof conductors are placed 6” away from the roof railing connecting all the lightning arrestors to the down conductors.

It should be made with copper strip or Stranded PVC insulated annealed copper cable.

Roof Layout (Lightning Protection System)



Earthing

[BNBC section 1.3.32]

Earth Electrode

For each down conductors we have used earth electrodes to complete earthing of lightning protection system. Total resistance should be less than 10 ohms.

GI pipe earth electrodes are suggested.

Earth Led

PVC insulated wiring copper cables of appropriate size having Green + Yellow bi-color insulation should be used as earth lead wire.

Earthing busbar

Copper earthing busbars should be used for earthing of each side of transformer.

Earthing Pits

An earthing pit should be constructed around the top of the Earth Electrode, below the ground level using 250 mm brick walls on a CC floor with a 150 mm thick RCC slab cover on top having lifting hooks. The top of the earth electrode (in case of pipe earthing) shall remain 375 mm above the top of the bottom CC floor of the pit. The minimum inside dimension of the earthing pit shall be 600 mm × 600 mm × 600 mm.

Roof Layout (Earthing System)